

OF THE

FOUNDED FEBRUARY, 1892

99th Year 1991



Danny G. Wooton

PRESIDENT 1990-91



THE COAL MINER

TRUE – he plays no grandstand role in life But his importance is vital, great and just: For without his toil in earth's caverns deep, Civilization would soon crumble into the dust. AD 1964 From his poem – Vachel Davis

(Dedicated on State Capitol Lawn, Springfield, Illinois, October 16, 1964)

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- 1991 Richard R. Shockley, Center for Research on Sulfur in Coal, Carterville, IL

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PROCEEDINGS

OF THE

ILLINOIS MINING INSTITUTE

FOUNDED FEBRUARY, 1892

Ninety-Ninth Year

1991

Annual Meeting Collinsville, Illinois September 26-27, 1991

Illinois Mining Institute, Champaign, Illinois

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PROCEEDINGS OF THE ILLINOIS MINING INSTITUTE

Ninety-Ninth Annual Meeting Collinsville, Illinois Thursday and Friday, September 26-27, 1991

The opening session of the 99th Annual Meeting of the Illinois Mining Institute was convened at 10:00 A.M., Thursday, September 26, 1991, in the Mississippian Room of the Gateway Center. Danny G. Wooton, President of the Institute, presided.

Danny Wooton: Welcome to our new location for the 99th Annual Meeting of the IMI. I'd like to welcome everyone. We have some new faces out here. We have a new place and a new format this year, so we are really excited about the changes we are going to make in IMI in the years to come.

The first thing this morning, I would like to go through the program and just briefly review it, since there is a new format. This morning, of course, we are about to begin our technical session. We have a fine panel of speakers and interesting topics. At noon, in the La Salle Room, we will have our annual luncheon. There are still plenty of luncheon tickets available if anyone is interested in going. Phyllis Godwin, out front, has those. Also this year, which is a new format, we have increased our exhibit area for our vendors. They are located across the lobby, and I think if you go visit there you will see that we have a tremendous number of booths and exhibitors as compared to past years. They will be open until 7:00 this evening, and they will open up again in the morning. Tonight from 5:00 to 7:00 we have, I guess the highlight of our meeting to some folks, the Fellowship Hour. Tomorrow morning, we will have our business meeting at 8:00 o'clock. We would like to ask everybody that can to attend. We are going to set the tune for events to come, and next year being the 100th celebration of the IMI, this will be a very important business meeting. Also, tomorrow morning at 10 o'clock, we will present the second technical session, and the meeting will be adjourned upon the conclusion of that session.

I have two requests: if anyone knows of a IMI member who passed away since our meeting last year, please get those names to Phyllis Godwin, so that we can recognize them at the luncheon today. Also, this year we started a committee that has been inactive the last several years, the membership committee. This committee is composed of Charles Woolbright, Joy Technologies, and Mike Mitchell, AMAX Coal Company. Their function this year as a committee is to seek input from you, the members, and come to the Executive Board meeting this afternoon and modify the format and modify our meeting as the membership sees fit. So you have a great opportunity to influence what we are going to do here next year and in years to come. So get with Charlie Woolbright or Mike Mitchell and let your feelings be known; we will certainly entertain those feelings at the Executive Board meeting.

This year when we put together a program committee, Dave Webb of Freeman United Coal Mining Company and Paul Clites of Monterey Coal Company, graciously offered their time. Then right after Paul accepted, he took off to Houston and transferred; that left Dave Webb from Freeman kind of holding the bag, so to speak. Dave, a general superintendent from Freeman United, is operating one coal mine and trying to get another one going. Taking care of a job like that is certainly a fulltime job, but Dave has really put forth a tremendous amount of effort to put together a fine program this year. We certainly appreciate what he has done. Dave, I'll turn it over to you.

THURSDAY MORNING TECHNICAL SESSION

Dave Webb: Good morning and welcome to this morning's technical session of the IMI. Ifeel we have assembled a wide array of papers for this year's technical session that will involve a lot of trends, innovative research and new technology being applied to today's Illinois coal industry. I wish to thank all our speakers for their efforts and for being here with us this morning to share their expertise and research. Also, Danny Wooton and Heinz Damberger for their assistance in selecting this panel. I would request that after each individual paper, everyone withhold their questions until the end of that paper, at which time if you would come forward to one of the microphones if you do have a question and if you would announce your name, then go ahead with your question. We need your name because these sessions are recorded for our publication that comes out annually.

With that, I am very pleased to introduce you to our first speaker, Keith Smith who is president of Freeman Coal Sales, Inc., in Marion, Illinois. Keith has put together a paper on "Marketing High Sulfur Coal in the Current Environment." I think it is a timely paper for today's coal industry in Illinois. Keith.



Program Chairman, David Webb, opens Thursday morning technical session.

MARKETING HIGH SULFUR COAL IN THE CURRENT ENVIRONMENT

W. KEITH SMITH

President, Freeman Coal Sales, Inc. Marion, Illinois



INTRODUCTION

I'd like to thank the Chairman of the Technical Sessions, David L. Webb of Freeman United Coal Company, for inviting me to speak to you today. Dave is so well connected and so highly regarded, I often refer to him as the "Godfather" of our Crown area mines, so I thought I shouldn't refuse his offer.

Production people make heroes out of us salesmen a lot more often than the other way

around, and Dave is doing exactly that for us. He is increasing production and productivity levels at Crown II mine, not an easy task. At the same time, he's reopened our Crown III mine and is at a total production level of well over 2.0 million tons annually. Keep up the good work, Dave.

I'm glad the title for this presentation is "Marketing of High Sulfur Coal in the Current Environment" and doesn't refer to the selling of coal. It may be a fine distinction, but an old boss of mine who started me out in the sales, gave me only one simple guideline, but he said I must always follow it. That was, "You must sell your product for more than it cost you to produce it." I'm afraid that for the past several years our industry has been guilty of not selling our product, but marketing it an "incremental cost," "direct mining cost," "cash cost," or some other euphemism meaning less than the amount required to keep our industry healthy and growing. I am sure this has been in hope of maintaining our position in the market while waiting for it to improve to a point where we can achieve the required return.

There have been several factors that have contributed to the current market environment which I feel are necessary to address briefly since they have affected high sulfur coal. However, I do not want to dwell on them because they definitely now fall into the "spilled milk" category and crying about them will not get us where we need to be.

EFFECTS OF CLEAN AIR LEGISLATION

The first area to be addressed is the various pieces of Clean Air Legislation and the utilities' reactions to them. Now, I can't be up here bashing our biggest customers, but the fact of the matter is that we had Clean Air Legislation in 1970. It required 1.2 lbs. of SO₂ per million Btu compliance levels for new units. An amendment of 1977 mandated "scrubbing" for new units at either 70 percent or 90 percent SO₂ removal levels. A few utilities complied and built new units with scrubbers (table 1).

Table 1. Electric utilities within Illinois.

Central Illinois Light Company Duck Creek* Edwards Station

Central Illinois Power Service Coffeen Grand Tower Hutsonville Meredosia Newton*

> Crawford Fisk

Joliet

Electric Energy Joppa

Illinois Power

Baldwin Havana Hennepin Vermilion Wood River

Southern Illinois Power Coop Marion*

Springfield Water and Power Dallman* Lakeside

Kincaid Powerton Waukegan Will County

Commonwealth Edison

*Plants with scrubber systems

Many more, for a number of reasons, including nuclear plant capital cost overrun fiascoes, chose to avoid the issue in a variety of ways such as extending the life of existing units. This has led to the current situation where, in terms of megawatts, less than ten percent of the coal-fired units on the Phase I hit list will be less than 20 years old by 1995 (table 2).

The end result has been another Clean Air Amendment, passed last November which, as did the previous changes, has caused a lot of confusion for utility planners. The majority seem to be following the path of least resistance and going for fuel switching to low sulfur coal as seen in the recent large solicitations for low sulfur coal by A.E.P., TVA and the Southern Company. Scrubbers cost \$150 million to \$300 million in capital for which the pass-through to rate payers is questionable, plus there are substantial additional operating expenses. Table 2. Phase I affected sources-Illinois.

1989 Tota	1 Tons	Purc	hased

Utility	Plant	Tonnage
Central Illinois Public Service	Coffeeen	1,635,700
	Grand Tower	187,500
	Meredosia	596,000
Commonwealth Edison	Kincaid	1,892,000
Electric Energy	Joppa	2,149,420
Illinois Power	Baldwin	4,105,770
	Hennepin	613,460
	Vermilion	435,630

I will be happy to tell you as much as I can about the new clean air legislation if there are specific questions later, but since the regulations are not expected to be out for another month or so, and there will undoubtedly be legal tests beyond that, a lot of what I can say will be speculative.

The bottom line is that, according to Illinois Geological Survey information, only 15 percent of current Illinois production will meet the Phase I SO₂ requirements and none will meet Phase II levels (Fig. 1)



Major - Gleater than 1 million tone Figure 1. Major Illinois producers–1989 production. I will also note that in the last 20 years, since the first Clean Air Act, while national coal consumption grew from 600 million tons per year to over one billion tons, Illinois annual production has remained flat at 60 million tons.

As I said, I do not want to blame utilities. We, as a nation, put too much pressure on low utility rates, much as we do on low fuel prices. The belief is that this will help our economy and make us more competitive in the world market. It doesn't seem to be working.

I've talked about some of the downside of low utility rates. Low fuel prices also have negative effects, like keeping us burning gasoline instead of ethanol, methanol, or liquefied petroleum gases. They allow us to haul coal 1,000 miles or more across the country into markets that would normally use a local source.

I don't want to tread on the ground of Dick Lawson of the National Coal Association (NCA) by talking about the true cost of imported oil. We all saw his predictions come true in the Desert Storm operation. The Senate Energy Committee recently agreed that the actual cost of Middle East crude oil is \$200 per barrel, not \$20.





ILLINOIS BASIN COAL CONSUMPTION GROWTH

I said we shouldn't complain, so I had better get off this track and talk about marketing Illinois high sulfur coal. I will start out by showing you a map that illustrates the current distribution of Illinois coal shipments (Fig. 2). You can see that most has stayed pretty close to home although the Mississippi River system has helped increase our market reach.

Next, I will show you a ten-year forecast for the U.S. market (table 3). I should preface all these forecast numbers by saying they have proven to be less than accurate in the past, and this is only one of many different projections. However, the general agreement is that growth is predicted to be moderately good and will be better in some areas than others. Overall, we can expect another 130 million tons of coal to be consumed by 1995 and 290 million more tons by 2000.

Table 3. U. S. market coal consumption growth-ten year forecast.

Coal consumption growth — 1.7 to 2.7% annually Additional 130 million tons by 1995 Additional 290 million tons by 2000 Power River Basin increases by 60 million tons Central Appalachia increases by 70 million tons

Again, this is better news for some than others. Most of this gain, especially in the early years, will go to low sulfur coal producing areas. The Powder River Basin is projected to get 60 million tons of this new business and Central Appalachia, 70 million tons.

Table 4 shows that the Illinois Basin market (and MAIN area utilities in general) should enjoy a 2.0 percent annual coal use growth. However, Illinois Basin producers will probably not benefit and, in the short term, will suffer a decline of some 12 million tons or more. As you narrow the scope of these projections they become even less reliable, but the scene for Illinois coal has continued to get even more gloomy since these projections were made. The 86 cents per million Btu deliveries to Union Electric and Electric Energy this year indicate the kind of market penetration we have to combat. This selling price would net about \$16 per ton at a generic Illinois mine, and that really hurts.

Adding to this short-term crunch are the number of contract roll-overs between now and 1995 (more than one-half of all utility-contracted coal turns over each year nationwide) and the potential for environmental force majeures in 1995. This is very tough news. We will have to fight hard to maintain markets for Illinois coal. Cut-throat business will be the order of the day, with some dropping-out of mines inevitable. The strong producers, either ones with low-cost operations or with deep pockets, will make it through. Table 4. Illinois Basin market coal consumption growth-ten year forecast.

Illinois Basin	2.0% annual growth
Market Area Consumption Growth	Increase by 26 million tons — 1995 Increase by 38 million tons — 2000
Illinois Basin Coal Shipments	134 million tons — 1985 143 million tons — 1990 131 million tons — 1995 135 million tons — 2000

Predictions for beyond the year 2000 are stable growth for high sulfur coal with new plant construction that will include scrubbers or other clean coal technology. I like to view the plans by a large number of utilities to add gas turbines to solve short term peaking requirements in this decade as positive because a number of 30 to 50 MW units together with the addition of combined cycles may be later converted to gasified units with coal as a feedstock and will be beneficial for us in the long run. As far as we have seen, all new baseload units are planned to be coal-fired.

I want to take a moment out to applaud those companies using or planning to use new clean coal technologies such as the planned gasified unit at the City of Springfield, the fluidized bed combustion boilers at ADM's Decatur plant and the recently announced 220 MW coal gasification unit for Tampa Electric. Many of these developments are results of federal Clean Coal Technology funding or other subsidized programs. While state intervention is not always a good idea, it has certainly helped our industry. Recently enacted Illinois legislation, for example, has ensured the continued use of about four million tons of Illinois production that would have been part of Phase I reductions.

SALES AND MARKETING GOALS

My final illustration (table 5) includes some positive goals for our industry. The first gets back to the coal mine operations. Productivity began leveling off in Illinois mines in 1986 and 1987. We need to revitalize our efforts in this area. More efficient equipment is one area that can be addressed, and I know there are additional new longwalls planned for some Illinois mines, which is good where conditions allow.

Perhaps continuous haulage is another area that can improve performance. Certainly we need to make every effort to improve labor and benefit costs on a per ton basis. I don't want to get into Dave's territory here, so I will simply stress that right now is the time to get the "last squeal out of the pig" for mining costs. The second part of the cost of coal is in the transportation of our product to the consumer. We need to take every advantage of efficiencies in rail, barge and trucking industries that we can find.

Blending of coal qualities on the river systems is an area that is being utilized more and more. This can be especially beneficial in the export market where we see substantial opportunities opening up from 1993 onwards, when subsidies of \$15 per ton for British coal and up to \$40 per ton for German coal are scheduled to end. This could potentially add 95 million tons per year to the world coal market.

The third area depicted of niche markets and value-added services is a little bit trickier but can have very positive results. It includes offering special quality controls including blending; special transportation packages such as sizing of the trains, loading schedules, and back hauls; special services such as ash disposal or scrubber sludge disposal; and special packages that include supplying other commodities such as lime or limestone.

Table 5. Sales and marketing goals.

- Agressively bid for major long-term contracts as they roll-over to expand market share where you have the low cost delivered product.
- Develop programs to enhance transportation/blending capabilities to penetrate growth markets in south and exports with Illinois coal.
- Seek niche markets where "value-added" services can enhance your product.

CONCLUSION

I want to conclude by passing on a rosy prediction I heard at the NCA (National Coal Association) convention this spring, and that is for a very good coal market by the year 2030. I'm sure you are as thrilled to hear this as that audience was. One guy told me he had been able to get by his annual board of directors' meetings by telling them that the coal business was going to get better in five years, and they had always bought off on that. He said if he was to go into the next meeting and tell them it was going to get better in 40 years, they'd give him the bum's rush.

I'm going to try to compromise with you and say it will get better for Illinois producers in the next ten years and hope you will allow me to get out of here with that. Dave Webb: Thank you very much, Keith, for all your research and your insight into the Illinois coal industry. We appreciate your being here today. I know you might have to leave a little bit early, so thank you very much for being with us this morning.

Heinz Damberger: We are testing this facility this year, and, clearly, this room is not going to be large enough. So, tomorrow morning we are going to move our technical session to the La Salle Room; the same place where we will have our luncheon today. Next year, we will be in there for both technical sessions.

Dave Webb: Our next speaker is David L. Kuck, who is president of Iceberg Cribs, Inc. He would like to present us with a paper on "Mine Support by Ice Pillars." Mr. Kuck. [Mr. Kuck's paper was not available for publication.]

INDUSTRY/UNIVERSITY/GOVERNMENT COOPERATIVE RESEARCH PROGRAM FOR DISPOSAL AND UTILIZATION OF COAL COMBUSTION RESIDUES FROM ILLINOIS BASIN COAL USERS (DUCCR)

YOGINDER P. CHUGH

Director of DUCCR Research Program, Southern Illinois University at Carbondale Carbondale, Illinois



INTRODUCTION

"Disposal and Utilization of Coal Combustion Residues from Illinois Basin Coal Users (DUCCR)" is a new (January, 1992) research program of the State of Illinois funded by the Illinois Department of Energy and Natural Resources through the Illinois Coal Development Board and industrial affiliates. The DUCCR is a cooperative research effort with participation from industry (coal companies, utilities, etc.), academic and research institutions, and state

and federal agencies. This paper briefly describes the background of the research program and the type of research it proposes to undertake to assist the Illinois Basin coal industry.

BACKGROUND OF THE PROBLEM

In the U.S, energy resources may be termed as "Strategic or Critical Minerals", which must be protected and conserved for national security reasons. Last year's events in the Middle East have brought these issues to the forefront again in establishing a U.S. energy policy. Coal is an abundant national resource which has helped and can continue to help ensure America's energy security and independence. The U.S. is ranked number one in coal production in the world, with over 975 million tons produced in 1989. During the same year, the U.S. consumed about 900 million tons of coal; about 80 percent of this was used for power generation. At the current rate of production of about one billion tons per year, the U.S. has ample proven reserves of coal to last at least 300 years.

Conventional combustion of coal in coal-fired boilers results in a considerable amount of residues (10 to 12 percent of coal combusted, fly ash,

bottom ash, boiler slag, etc.) which must be disposed of or used in an environmentally sound manner. Recent commercial clean coal technologies, such as flue gas desulfurization (FGD), using wet scrubbers, or fluidized bed combustion (FBC), produce even more (10 to 15 percent) combustion residues than conventional coal-fired boilers. According to statistics compiled by the American Coal Ash Association (ACAA), in 1989, the U.S. produced about 87.5 million tons of coal combustion residues from about 766 million tons of coal. The distribution of this by type of residue was: fly ash, 53 million tons; bottom ash, 14 million tons; boiler slag, 4 million tons; and FGD sludge, 16 million tons. Overall, about 25 percent of these residues were used, and the remaining were disposed primarily in landfills. The utilization of these residues by type of residue (percent of the amount produced) was distributed as follows: fly ash, 19 percent; bottom ash, 34 percent; boiler slag, 59 percent; and FGD sludge, 0.7 percent.

The Electric Power Research Institute (EPRI) has estimated the current national average disposal cost for residues to be about \$10/ton and expects it to increase three-fold over the next decade due to increasing environmental constraints and associated costs. Recently passed federal Clean Air Act Amendments (CAAA) requirements to cap utility emissions of sulfur dioxide at 8.9 million tons in the U.S. and to reduce nitrogen oxides emissions by about 2.0 million tons after the year 2000, are expected to severely impact the utilization of high-sulfur coal. Utilities and other large coal users will either substitute with low-sulfur coal or adopt clean coal combustion technologies, which will greatly reduce emissions of sulfur oxide emissions into the atmosphere. The more common processes currently available to reduce sulfur oxide emissions are flue gas desulfurization (FGD) and fluidized bed combustion (FBC). It is expected that about 55,000 MW of additional generation capacity will be scrubbed by the year 2000. Other technologies currently under development, such as gasification, liquefaction, advanced coal beneficiation, direct combustion in gas turbines and diesels, dry and wet FGD processes, may also produce large amounts of residues, with significantly different physical and chemical characteristics than the residues produced today. The requirement to remove air-toxins from flue gases is also expected to change the characteristics of residues. Thus, the use of clean coal technologies in the future is expected to significantly increase the volume and change the physical and chemical characteristics of residues produced. Some of the impacts of these actions by utilities may be summarized as follows.

 Overall increase in residues generation from about 90 million tons annually in 1989 to about 250 million tons annually in the year 2000.

 Significant increase in quantities of the FGD sludge from about 15 million tons in 1989 to about 45 million tons in 2000. Unless effective and environmentally sound technologies can be developed to use FGD sludge, most of it will have to be disposed. Very little information exists on the environmental impacts of large-scale disposal of sulfite and sulfate-rich sludge disposal in different host environments.

 Low-temperature combustion technologies required to control nitrogen oxides will increase the carbon content in the residues, which may significantly impact the utilization of fly ash.

The impacts described above will be particularly severe for states producing and using high-sulfur coals such as Illinois, Indiana, Ohio, Missouri, Kentucky, and West Virginia. Disposal and utilization of these residues in an economical and environmentally sound manner is an important consideration for utilities nationwide deciding whether to use highsulfur coal or to switch to low-sulfur coal to meet the requirements of the CAAA.

STATEMENT OF THE PROBLEM

Illinois is known to have the largest resource of bituminous coal in the United States (1990 Illinois Coal Facts, p.8). About 140 million tons of coal is produced annually from the Illinois Coal Basin in Illinois, southwestern Indiana, and western Kentucky. A vast majority of recoverable reserves and production from the Illinois Coal Basin is, however, high-sulfur coal. Illinois, Indiana, Kentucky, and Missouri are among the top ten sulfur dioxide producers in the U.S., and they will have to significantly reduce emissions over the next decade to meet the requirements of the CAAA. This could be achieved through the use of FGD and FBC processes rather than by switching over to low-sulfur western coal. The use of these technologies significantly increases generation of coal combustion residues which must be disposed of or utilized. Over the next ten years, it is expected that Illinois coal users alone may produce about 15 million tons of coal combustion residues annually. Therefore, there is an urgent need to determine costefficient, environmentally safe methods of handling, disposal and utilization of these residues. The development of these methods will not only aid the coal industry in the Midwest but throughout the U.S.

Although considerable research has been done on the utilization of coal combustion residues, most of it has been on fly ash, bottom ash, and boiler slag, and very little of it has been on residues generated from combustion of Illinois Basin coals (1-6). A very limited amount of research has been done on characterization, disposal and utilization of FGD and FBC residues from Illinois Basin coals, and considerably more remains to be done. Furthermore, co-disposal and co-utilization of coal wastes from the Basin (typically acidic) with coal combustion residues (typically alkaline) present possibili-

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ties to minimize surface and ground water pollution problems. A favorable resolution of the problems of disposal of combustion residues and of their utilization is critical to maintaining a healthy Midwestern coal industry.

RESEARCH PROGRAM GOALS AND OBJECTIVES The goals of the proposed six-year research program are:

- Conduct highly focused applied research and demonstration studies to permit industry to utilize and to dispose of coal combustion residues from Illinois Basin coal users in an economic and environmentally sound manner.
- Develop data for federal and state regulatory agencies so that efficient, effective, and sound rules and regulations can be developed for permitting and for monitoring the environmental impacts of the disposal and utilization of combustion residues of Illinois Basin coals.

Specific objectives of the DUCCR program include:

- Develop cost-effective, environmentally sound technologies for the disposal and utilization of coal combustion residues. Some alternatives to be considered will include utilization of residues in agronomic, construction, manufacturing, and ground control or mine subsidence control; underground disposal alone or in combination with coal processing residues in abandoned and/or active mines; and surface disposal alone or in combination with coal processing residues at surface areas of surface and underground coal mines.
- Prepare comprehensive technical documentation of engineering, economic, and environmental information developed in the course of research activity.
- Develop decision-making tools to assist the coal and utility industries, as well as the regulatory agencies, with the selection of appropriate disposal technologies.
- Identify appropriate regulatory requirements and environmental monitoring programs to ensure environmental safety and to foster public acceptance.
- Prepare publications and conduct seminars designed to disseminate results of research, and demonstration work to users (industry,

researchers, federal and state agencies, legislative bodies, etc.) and other pertinent information to the public at-large.

RESEARCH PROGRAM

Previous and Ongoing Studies: An Overview

The utilization of coal combustion residues is not a new idea; it has been practiced since the turn of the century. Also, residues have been disposed of primarily in landfills, abandoned underground mines, or surface mines. The residues have been used as virgin or manufactured engineering materials such as Portland cement, lime, sand, stone, etc. Since the enactment of the Resource Conservation and Recovery Act (RCRA) in 1976, the concern for potential air, surface water, and groundwater pollution, as well as land utilization impacts due to disposal and utilization of residues, has significantly increased. In 1980, and then in 1988, coal combustion residues were classified as non-hazardous solid waste (subtitle D) whether they were disposed of or utilized. Conventional coal-fired boiler residues, flue gas desulfurization residues (FGD), most advanced clean coal technology residues and some coal processing residues are presently exempted from being classified as hazardous. However, these exemptions could change in the future and significantly impact disposal and utilization alternatives.

Considerable research has been done and continues to be done by the U.S. Department of Energy (USDOE), the Electric Power Research Institute (EPRI), the University of North Dakota (UND), the U.S. Bureau of Mines (USBM), the U.S. Environmental Protection Agency (USEPA), Pennsylvania State University, Purdue University, Radian Corporation, and Baker, Inc., on the disposal and utilization of coal combustion residues. Most of the results of these studies have been included in Materials Research Society Symposia Proceedings (I-VI), (1-6) and EPRI reports and manuals (7-19). Most of these studies, however, have been conducted on coals other than from the Illinois Basin. Over the past ten years, Southern Illinois University at Carbondale and the Illinois State Geological Survey have been engaged in studies related to the disposal and utilization of coal combustion residues (20-24, 28-52). In addition, a large study has been initiated by the Ohio Coal Development Office, USDOE, Ohio Edison, American Electric Power, EPRI, and Dravo on land applications, uses of dry FGD by-products from FBC residues, spray driers, and duct sorbent injections (53). Limited information is also available on the utilization of residues on agricultural lands.

Over the past few years, coal companies from the Basin have actively looked at available options to dispose of fly ash, FGD and FBC residues. Currently, one mine operator is successfully disposing of fly ash underground; another one plans to dispose of it in a surface mine. Two mine operators plan to dispose of FBC residues and coal processing waste in combination. One mine operator is considering disposing of FGD residues

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in an active underground mine. Significant interest among mine operators in the Illinois Coal Basin provides DUCCR with a unique opportunity to conduct laboratory and field research and demonstration studies.

Research Program Components

It is proposed that the research program will have at least five major components:

- Characterization of residues and by-products.
- Disposal technology in surface facilities, surface mines alone or in combination with coal processing and coal mining residues.
- Determination of environmental impacts of surface and underground disposal and utilization.
- Residue utilization and by-products recovery from combustion residues.
- Socio-economic, policy, and legal issues.

A brief discussion of the research program needs in each of the five component areas above is given in the following paragraphs. This is based on a limited review of the pertinent literature, on discussions with a few experts from federal and state agencies, and on input from Illinois Coal Basin coal companies and utilities. Specific research projects within the component areas will be developed based on identified research needs from: 1) an in-depth literature review and synthesis during Year One; and 2) input from the USDOE, EPRI, USBM, USEPA, UND, the Illinois Environmental Protection Agency (IEPA), limestone companies, coal users, the coal industry, sorbent manufacturers, selected experts from research institutions and consulting companies.

Characterization of Residues and By-Products

Characterization studies are a prerequisite to the development of environmentally sound and economic methods of disposal and utilization of coal combustion residues. Characterization studies may be further subdivided under four categories: physical, chemical, engineering, and regulatory. Physical characteristics include particle size and shape distribution, porosity, permeability, water content, etc. The chemical characterization includes determination of minerals, chemical components and their forms, trace elements, their leaching characteristics, and feasibility of their extraction for utilization purposes. Engineering properties include their short and long-term handling and flow properties, strength-deformation properties, dewatering properties, weathering properties, and how the residues may react with their natural environment and with disposal, utilization, and handling systems. Characterization for regulatory purposes is extremely important for: 1) residue classification from federal and state laws; 2) impact on coal mining and coal utilization industries from current and proposed regulations; 3) compliance characteristics; and 4) development of simple and meaningful characterization techniques based on field performance of residues in disposal areas and utilization products. The physical and chemical characteristics of residues are variable even for a single combustion source because of variable coal composition and combustion temperature. For this reason, engineering as well as regulatory characteristics also vary considerably.

Considerable research has been done on the characterization of residues from conventional coal combustion technologies (1-7, 10, 16, 18, 19). Limited data are also available for technologies such as FGD and FBC (23,49,50,60-63), but data gaps exist. Residues from emerging coal technologies will require considerably more characterization in the laboratory as well as in the field. A large number of characterization techniques are available, and their suitability for different types of residues in different natural environments needs to be defined.

At present, little or no characterization data exist in the open literature from the Illinois Coal Basin for co-disposal or co-utilization of coal combustion residues with coal processing wastes. It is proposed to collect such characterization data under the DUCCR program. The following research areas have been identified as important:

- Synthesis of available data on bed ash, fly ash, and FGD sludge from wet and dry scrubber systems for currently utilized and developing coal technologies.
- Develop comparisons between combustion residues and other commonly utilized commercial products to identify differences and similarities.
- Identify important chemical and physical characteristics of residues and by-products and their determination procedures for industry and regulatory agencies.
- Identify co-disposal and co-utilization possibilities and associated environmental impacts for combustion, FGD, and coal processing residues based on developed properties.
- Identify by-products recovery potential from combustion, as well as processing residues.

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Disposal Technology

Technology for the disposal of residues in landfills from conventional coal combustion is relatively well developed. Advanced clean coal technology residues generally contain high levels of calcium compounds such as calcium oxide. This can lead to thermal pollution and curing and hardening of combustion residues during the transportation and disposal of residues. Since space in landfills is rapidly decreasing and land in the Illinois Coal Basin is prime agricultural land, surface and underground mines (active and abandoned) have been identified as possible sites for disposal of coal wastes and coal combustion residues. Considerable work has been done by the USBM in disposal technology (25). Most of this work was for disposal of coal processing wastes and fly ash. These technologies will require some modification for disposal and management of residues from advanced combustion technologies alone or in combination with coal processing wastes. Similarly, utilization of residues, alone or in combination with coal processing residues, will require development of technology for the transport, handling, and storage of residues. The following areas of research have been identified as important for DUCCR:

- Synthesis of available data on dry and wet disposal technologies to identify those suitable for surface and underground disposal of combustion residues alone or in combination with coal processing residues.
- Identify conditions suitable for viable technologies and develop their relative economics.
- Develop system components for each viable technology identified above. For example, for a wet underground disposal system, we need to develop a range of solids concentrations, co-disposal mixtures, borehole spacing, etc.
- Recommend the design of wells suitable for underground disposal in mines, as well as for monitoring of environmental impacts, to comply with the Groundwater Protection Act and regulations.
- Recommend procedures as well as technologies for dealing with fugitive dust while practicing dry disposal techniques.
- Study liner (soil, clay, synthetic) requirements for surface as well as underground mine disposal.
- Develop bulkhead design for wet and dry underground disposal.

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Identify techniques for mapping abandoned underground mine workings from the surface to plan underground disposal.

Environmental Impacts of Disposal and Utilization

Management of combustion residues requires consideration of possible adverse impacts on air, surface and ground water, and on land utilization. Improved disposal or utilization techniques may also lead to modifications of environmental regulations to ensure environmental safety. Impacts on ground water due to leaching and transport of trace elements is considered to be the most serious environmental impact. A large amount of field experimental data on ground water impacts have been collected by USDOE, EPRI, and UND, but almost all of it is for monofills consisting of combustion residues. Similar data will need to be collected in the DUCCR program for co-disposal fills of combustion residues and coal processing wastes in a variety of geological and hydrological conditions. Fugitive dust generated during the handling of dry combustion residues can be a serious health and safety problem which must be suitably abated.

Research areas identified in need of additional study are given below:

- Geologic and hydrogeologic site investigations and study of techniques for planning disposal projects.
- Gathering data on ground water impacts by monitoring monofill as well as co-disposal fill areas under a variety of soil, topographic, and geologic conditions. Such data need to be collected for surface and underground disposal areas.
- Prediction of ground water impacts based on residue characterization, geologic and hydrogeologic conditions, and soil data.
- Review current standards for ground water impacts and establish revised standards, if appropriate.
- Required reclamation techniques to minimize the effects of disposal on agricultural productivity and quality.
- Long-term impacts of disposal and utilization.
- Simulation and prediction of field environmental impacts from laboratory studies.
- Surface contamination from fallout of combustion residues.

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- Wind erosion of materials.
- Surface subsidence due to wet underground disposal techniques.

Residue Utilization and By-Products Recovery

Currently, about 25 percent of the conventional coal combustion residues and 0.7 percent of the FGD sludge is being utilized in markets such as cement and concrete products, structural fills, road base/sub-base, mineral filler in asphalt, snow and ice control, blasting grit/roofing granules, grouting coal mining applications, wallboard, etc. Similar data for FBC residues are not available. In the future, two factors will tend to decrease the amount of residues being utilized on a percentage basis: 1) the production of residues from advanced clean coal technologies such as the FGD and FBC is expected to increase dramatically, particularly in the Midwest, and suitable uses for these have not been developed to the extent that they have been developed for conventional coal combustion residues; and 2) Resource Conservation and Recovery Act (RCRA) classification of residues as "solid waste" will impede the utilization potential of residues. Therefore, additional research is required to evaluate the large volume utilization potential of residues as engineering materials in an environmentally sound manner, as well as to consider recovering valuable by-products from residues. The following research areas were identified as important for the DUCCR program:

- The possibility of using fully oxidized FGD sludge for quality gypsum wallboard.
- Making lightweight blocks for construction of underground stoppings for ventilation control.
- Disposal of residues between two sets of stoppings to develop explosion proof stoppings.
- Development of facing cements for stoppings to minimize leakage and to provide flexural strength.
- Development of lightweight prismatic bars to replace wooden posts and crib members underground.
- Microbial treatment and beneficiation of residues.
- Feasibility of co-utilization of coal processing/coal combustion residues.

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- Making structurally acceptable products.
- Feasibility of recovering some trace elements as useful by-products.
- Feasibility of using residues for catalysts in coal-conversion processes.
- Possibility of developing cements for grouted roof bolts.
- Utilization of residues in agriculture, highway construction, and mine reclamation.

Socioeconomic, Policy, and Legal Issues

The development of disposal and utilization alternatives under the DUCCR program will require the formulation and/or resolution of several policy and legal issues. The socio-economic impacts of these alternatives must also be considered. The program research must identify the relative economics of different alternatives developed during the course of this study. The research in this program must also be directed toward: 1) the classification of coal combustion residues and coal processing wastes alone or in combination, and 2) development of simple tests for use by industry and state and federal agencies for permitting and compliance purposes. For example, a simpler, less costly leachate test than is currently practiced could be developed for Illinois Basin coal residues. The industry representatives have identified the following research areas to be important:

- Underground disposal of residues would be environmentally sound where it could be done. Issues pertaining to underground disposal include: legal rights for mined-out space, subsidence rights due to wet disposal, surface rights for drilling boreholes, utilization potential of health and safety hazards associated with venting of noxious gases into the atmosphere, water pollution potential of excess water being pumped to the surface and for aquifers between the injection zone and surface, availability of and impact on water resources, and water pollution of groundwater.
- Possibility of developing small-scale industries using residues as raw material.
- Relative economics of viable disposal and utilization technologies developed during the course of the program and their market impacts.

Assessment of legislation and regulations in light of research findings and recommend revisions, if warranted.

INFORMATION TRANSFER PROGRAM

An effective broad-based information transfer program at both the regional and national levels will be an integral part of the DUCCR program. The most important objective of the information transfer program will be to ensure that the information developed is effectively communicated to all user groups. Therefore, program activities will be developed and conducted at different levels of complexity with regard to the basic scientific and practical application aspects of the disposal and utilization of residues.

CONCLUDING REMARKS

The development and commercial use of clean coal technologies for combustion of high sulfur coal will require significant research in efficient and effective disposal and utilization of coal combustion residues. Recognizing this need, the State of Illinois has initiated the DUCCR research program. Active participation of the industry in the program will keep the research applied and focused and ensure that the results are transferred to the users in a timely manner. The broad research program presented here will become focused within a year. The author would welcome suggestions and comments on the research program.

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REFERENCES

- McCarthy, G.J., and R.J. Lauf (Editors), Fly Ash and Coal Conversion By-Products; Characterization, Utilization, and Disposal. Volume 43; 1985.
- McCarthy, G.J., F.P. Glesser, and D.M. Roy (Editors), Fly Ash and Coal Conversion By-Products: Characterization, Utilization, and Disposal. Volume 65; 1986.
- McCarthy, G.J., and others (Editors), Proceedings of Fly Ash and Coal Conversion By-Products: Characterization, Utilization and Disposal III. Volume 86; 1987.

- McCarthy, G.J., and others (Editors), Proceedings of Fly Ash and Coal Conversion By-Products: Characterization, Utilization and Disposal IV. Volume 113; 1988
- Hemmings, R.T., and others (Editors), Proceedings of Fly Ash and Coal Conversion By-Products: Characterization, Utilization and Disposal V. Volume 136; 1989.
- Day, R.L., and others (Editors), Proceedings of Fly Ash and Coal Conversion By-Products: Characterization, Utilization and Disposal VI. Volume 178; 1990.
- Battelle, Pacific Northwest Laboratories, Chemical Characterization of Fossil Fuel Combustion Wastes. EPRI Project 2485-8, Final Report, September 1987, Richland, Washington.
- ETHURA Grants Pass, Round-Robin Evaluation of Regulatory Extraction Methods for Solid Wastes. EPRI Project 2485-8, Interim Report, December 1986, Richland, Washington.
- Little, Authur D., Leaching Studies on Utility Solid Wastes: Feasibility Experiments. EPRI Project 2485-4, Final Report, August 1985, Cambridge, Massachusetts.
- Battelle, Pacific Northwest Laboratories, Inorganic and Organic Constituents in Fossil Fuel Combustion Residues. EPRI Project 2485-8, Interim Report, August 1987, Richland, Washington.
- Radian Corporation, Environmental Performance Assessment of Coal Ash Use Sites: Little Canada Structural Ash Fill. EPRI Project 2796-1, Final Report, May 1990, Austin, Texas.
- Radian Corporation, Environmental Performance Assessment of Coal Ash Use Sites. EPRI Project 2796-1, Interim Report, May 1990, Austin, Texas.
- Battelle, Pacific Northwest Laboratories, Field Investigation of a Flue Gas Desulfurization (FGD) Sludge Disposal Site. EPRI Project 2485-8, Final Report, February 1989, Richland, Washington.
- Battelle, Pacific Northwest Laboratories, Leachate Chemistry at the Montour Fly Ash Test Cell. EPRI Project 2485-8, Interim Report, December 1988, Richland, Washington.
36 ILLINOIS MINING INSTITUTE

- Battelle, Pacific Northwest Laboratories, The Fossil Fuel Combustion Waste Leaching (FOWL) Code: Version 1. EPRI Project 2485-8, Computer Code Manual, July 1988, Richland, Washington.
- Battelle, Pacific Northwest Laboratories, Inorganic and Organic Constituents in Fossil Fuel Combustion Residues. EPRI Project 2485-8, Interim Report, August 1987, Richland, Washington.
- University of Alberta, Mobilization and Attenuation of Trace Elements in an Artificially Weathered Fly Ash. EPRI Project 2485-1, Final Report, August 1986, Edmonton, Alberta, Canada.
- Radian Corporation, Time Variability of Elemental Concentration in Power Plant Ash. EPRI Project 1620, Final Report, July 1984, Austin, Texas.
- Stanford University, Pilot Study of Time Variability of Elemental Concentrations in Power Plant Ash. EPRI Project 1620, Final Report, March 1983, Stanford, California.
- Huck, P. and Y.P. Chugh, 1985, Analysis and Remote Monitoring of the Pumped Backfilling Process. Second Conference on Ground Control Problems in Illinois Basin Coal Mines. Southern Illinois University at Carbondale, IL, p 5-12.
- Huck, P. and Y.P. Chugh, 1982, Subsidence Control in Abandoned Room-and-Pillar Mines. Conference Proceedings Ground Control in Room-and-Pillar Mining. Society of Mining Engineers of AIME, ed. Y.P. Chugh, September.
- Chugh, Y.P. and G. Heidinger, 1980, Size Distribution and Coal Quality of Refuse from Southern Illinois. Coal Mining and Processing, p.84-87.
- Chugh, Y.P., et al., 1990, A Preliminary Environmental Evaluation of Utility Waste Disposal at AMAX's Wabash Underground Mine. Final Report to AMAX Coal Industries, Inc. Feb. p.120.
- Chugh, Y.P. and A.J. Chandwani, 1988, An Annotated Bibliography on Waste Disposal. Final Report to Illinois Department of Mines and Minerals.
- Rubin, L.S., et al., 1981, Disposal of Coal Mine Waste in Active Underground Coal Mining. Information Circular, No. 8857, U.S. Bureau of Mines.

- Gore, J., et al., 1979, Environmental and Economic Aspects of Refuse Disposal in Illinois Underground Coal Mining. Contract No. EW-78-0X-21-S209, U.S. Department of Energy.
- Sciulli, A.G., G.P. Ballcock and K.K. Wu, 1986, Environmental Approach to Coal Refuse Disposal. Mining Engineering, p.181-186.
- Devantier, Bruce A. and B.T. Ray, Development of a Predictive Soil-Water Exchange Model. National Mine Land Reclamation Center-Midwestern Region, Final Report, October, 1990.
- Dreher, G.B., W.R. Roy, and J.D. Steele, 1991, Leaching Behavior of Fine-Coal Cleaning Waste Solids. J. Coal Quality, Vol. 10, p. 29-36.
- Chou, C.-L., I. Demir, R.A. Cahill, C. Chaven, B.E. Phillips, and R.F. Sotomayor, 1987, Distribution of Sodium, Chloride, and Sulfur in Illinois Coal, Removal by Physical Cleaning, and their Behavior During Combustion. Final report to the Center for Research on Sulfur in Coal of research conducted September 1, 1986 - August 31, 1987, 24 p.
- Dreher, G.B. and D.R. Pevear, 1985, Water Leachability of Rundle Spent Oil Shales. Final report; Exxon Production Research Co., proprietary report, May 1985, 39 p.
- Gluskoter, H.J., R.R. Ruch, W.G. Miller, R.A. Cahill, G.B. Dreher, and J.K. Kuhn, 1977, Trace Elements in Coal: Occurrence and Distribution. Illinois State Geological Survey, Circular 499, 154 p.
- Rostam-Abadi, M. and D.L. Moran, 1990, Evaluation of High Surface Area Hydrated Lime for SO₂ Control; Final Report to the Center for Research on Sulfur in Coal of the research conducted from January 1, 1995 through August 31, 90 p.
- Dreher, G.B. and R.B. Finkelman, 1986, Factors Affecting Ground Water Quality in the Caballo Mine Backfill. Final report; Exxon Production Research Co., Exploration Research Report EPR.50EX.86, May 1986 ix + 135 p.
- Rostam-Abadi, M. and W.-T. Chen, 1989, Sorbent Evaluation for Pressurized Fludized-Bed Combustors. Final report to the Center for Research of Sulfur in Coal of research conducted from September 1, 1988 through August 31, 1989.

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38 ILLINOIS MINING INSTITUTE

- Roy, W.R., S.C. Mravik, I.G. Krapac, D.R. Dickerson, and R.A. Griffin, 1988, Geochemical Interactions of Hazardous Wastes with Geological Formations in Deep-Well System. Illinois State Geological Survey, Environmental Geology Notes 130, 52 p.
- Peters, G.G., G.B Dreher, D.E. Hamilton, R.J. Mitro, and T.J. Cannon, 1982, Highland Uranium Tailings Impoundment Seepage Study. Exxon Production Research Co., Proprietary report, February 1982
- Roy, W.R., and R.A. Griffin, 1982, A Proposed Classification System for Each Fly Ash in Multidisciplinary Research. Journal of Environmental Quality, Vol. 11, p. 563-568.
- Cobb, J.C., J.M. Master, and C.G. Treworgy, 1979, Abundance and Recovery of Sphalerite and Fine Coal from Mine Waste in Illinois. Illinois State Geological Survey, Illinois Mineral Notes 71, 11 p.
- Steele, J.D. and B.R. Cline, 1989, Investigations of the Origin of Domestic Well Water Contamination by Saline Water, *in* Hensel, B.R. and D. P. McKenna, eds., Environmental Impacts of Oil Field Brines in Southeastern Clay County, Illinois. Illinois State Geological Survey, Open File Series 1989-3, 303 p.
- Krapac, I.G., C.A Smyth, and R.A. Griffin, 1984, Collection of Representative Coal Refuse Samples for Leachate Generation Studies. Illinois State Geological Survey, Environmental Geology Notes 106, 68 p.
- Bradford, S.C., D. Berggren and P.B. DuMontelle, 1983, Geologic Study of Longwall Mine Sites in Northern Illinois. Abandoned Mined Lands Reclamation Council, ISGS Contract Report, 237 p.
- Krausse, H.F., H.H. Damberger, W.J. Nelson, S.R. Hunt, C.T. Ledvina, C.G. Treworgy, and W.A. White, 1979, Engineering Study of Structural Geologic Features of the Herrin (No. 6) Coal and Associated Rock in Illinois. Final Report, Contract No. H0242017, U.S. Bureau of Mines, 205 p.
- Bauer, R.A. and S.R. Hunt, 1982, Profile, Strain and Time Characteristic of Subsidence Due to Underground Mining: *in* Proceedings, Workshop on Surface Subsidence Due to Underground Mining. S.S. Peng and M. Harthill, eds., Morgantown, WV, p. 207-217.

- DuMontelle, P.B., E.D. McKay, and R.D. Gibson, 1980, Geology and Subsidence Monitoring of Backfilling Projects in Southwestern Illinois - Television Probes of Injection Borings. Proceedings Conference on Ground Control in Room-and-Pillar Mining, Southern Illinois University at Carbondale, Aug. 6-8, 1980. SME-AIME, New York, Y. P. Chugh, ed., 1982, p. 155-157.
- Killey, M.M., J.K. Hines, and P.B. DuMontelle, 1985, Landslide Inventory of Illinois. Illinois State Geological Survey, Circular 534, 28 p.
 - 47. Stohr, C. and W.J. Su, 1991, Interpretation of Landslides Along the Ohio and Mississippi Rivers Using Small and Medium-Scale Aerial Photography and SLAR Imagery. Presented and distributed at the 8th Thematic Conference on Geologic Remote Sensing, April 28 - May 2, 1991, Denver, Colorado, USA, 13 p.
 - Herzog, B.L., R.A. Griffin, C.J. Stohr, L.R. Follmer, W.J. Morse, and W.J. Su, 1989, Investigations of Failure Mechanisms and Migration or Organic Chemical at Wilsonville, Illinois. Ground Water Monitoring Review, Vol. 9, No. 2, p. 82-89.
- Davis, P.K., 1987, Disposal of Scrubber Sludge in Old Abandoned Mine Shafts: *in* Processing and Utilization of High Sulfur Coals II, Y.P. Chugh and R.D. Caudle, eds., Elsevier Publishers, Inc., p. 444-445.
- Davis, P.K., 1987, Pumping Characteristics of Scrubber Sludge Slurries for Pipeline Transport and Subsequent Deposit in Old Abandoned Mine. Final Report, U.S. Department of Energy, Pittsburgh, Pennsylvania.
- Sami, S., J. G. Smith, and P. K. Davis, 1989, Electro-Osmotic Dewatering of Ultrafine Coal. Proceeding of the Fourteenth International Conference on Coal and Slurry Technology, Coal and Slurry Technology Association, p. 577-590.
- Davis, P.K., 1989, Model Studies for Optimum Hydraulic Backfilling of Underground Coal Mines Through Boreholes for Subsidence Protection. Illinois Mining and Mineral Resources Research Institute, Final Report, Southern Illinois University at Carbondale.

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- 53. Dick, W.A., J. Beeghly, and R. Satomayor, 1991, Land Application Uses of Dry Scrubber By-Products Materials: Agricultural, Highway Construction, and Mine Construction. Paper presented at the Ohio Alliance for the Environmental Conference on Management options for Coal Combustion By-Products: Waste or Asset, Columbus, Ohio, June 11-12.
- Puri, V.K., B. M. Das, and B. C. Devkota, 1990, Geotechnical Properties of Coal Mine Slurry Waste. Proceeding of the First Midwestern Region Reclamation Conference, SIUC, p. 11-1 to 11-10.
- Devkota, Bimal C., 1990, Geotechnical Properties of Coal Mine Refuse. M.S. Thesis, Department of Civil Engineering and Mechanics, SIUC.
- Chong, Jun Hock, 1991, Geotechnical Properties of FGD Sludge. M.S. Thesis, Department of Civil Engineering and Mechanics, SIUC.
- 57. Puri, V. and Y. Yu, 1991, Evaluation of the Feasibility of Using Mixtures of Fluidized Bed Combustion Waste and Coal Refuse in Mine Reclamation and as Construction Material for Embankments and Road Beds in Mining Areas. Ongoing Research, National Mine Land Reclamation Center - Midwestern Region.
- Sevim, H. and S.N. Sharma, 1990, A Comparative Economic Study of Alternative Coal Waste Disposal Systems. First Midwestern Region Reclamation Conference, Southern Illinois University at Carbondale, IL, August.
- Sevim, H., 1991, Development of Guidelines in Selecting an Underground Waste Disposal Technology for the Midwest. Research Project, National Mine Land Reclamation Project-Midwestern Region.
- Electric Power Research Institute, Atmospheric Fluidized-Bed Combustion Waste Management Design and Guidelines. Report No. CS-6053. Prepared by Baker/TSA, Inc. and ICF Technology Inc., 1988.
- Yaverbaum, L., 1987, Fluidized Bed Combustion of Coal and Waste Materials. Noyes Data Corporation, 268 p.
- Jones, E., A, Bland, and J. Rose, 1987, Utilization of Pulverized Fuel Ash and Fluidized Bed Combustion Ash in AFBC Concretes. EPRI CS-5363, Vol. 2, Project 2422, p. 55-1 - 55-12.

 Harness, J.L., and Y. C. Chung, 1987, Shawnee AFBC Demonstration Project Ash Utilization Program. Proceedings of International Conference on Fluidized Bed Combustion, Boston, MA. p. 916-926.

Question: Are there any studies on NOx removal?

Paul Chugh: There is some research going on on low-temperature burners. There is some research going on on demagnification; just as you use scrubbers to take out SOx, there is some research going on to remove NOx also. It is too early to tell. To the best of my knowledge, there is no demonstration study in that area.

David Webb: Our next paper, put together by John Nelson, Geologist, and Robert Bauer, Senior Geologist, for the Illinois State Geological Survey, is on "Mining Problems Caused by Tectonic Stress in the Illinois Basin." I am pleased to present John Nelson.

MINING PROBLEMS CAUSED BY TECTONIC STRESS IN THE ILLINOIS BASIN

W. JOHN NELSON Geologist, and ROBERT A. BAUER, Senior Geologist Illinois State Geological Survey

Champaign, Illinois



The Illinois Basin coalfield is subject to a contemporary tectonic stress field in which the principal stress axis is horizontal and strikes N60°E to east-west.

ABSTRACT

This east-west compression is responsible for widespread development of "kink zones" and preferential roof failures in mine headings driven north-south. Also, small north-trending thrust faults and east-trending joints which are probably related to the same stress field, weaken the mine roof and occasionally admit water and

gas to workings, depending upon geologic setting.

The direction and magnitude of stress have been identified by a variety of techniques that can be applied both prior to mining and during mine development. Mining experience shows that the best method of minimizing stress-related problems is to drive mine headings at about 45° to the main stress direction.

Two recently published articles, cited below, contain the material upon which this talk and abstract were based.

REFERENCES

Nelson, W. John and Robert A. Bauer, 1987, Thrust faults in southern Illinois basin—Result of contemporary stress? Geological Society of America Bulletin, vol. 98, p. 302-307, March 1987. (Reprinted by Illinois State Geological Survey, Reprint 1987G).

Nelson, W. John and Robert A. Bauer, 1991, Coping with tectonic stress in the Illinois Basin Coal Field: *in* Douglas C. Peters, editor, Geology in coal resource utilization: American Association of Petroleum Geologists, p. 322-334. Question: What are effects of an earthquake underground?

John Nelson: It is my understanding that the noticeable effects are much less underground than they would be at the surface, because much of the damage in an earthquake is caused by surface waves.

Question: What about the horsebacks of the Springfield Coal. Any thoughts on that?

John Nelson: Well, those horsebacks are clastic dykes that were formed very early during coalification, and the stress regime was probably very much different then than it is today. The minor stress regime may have acted throughout the Tertiary since this westward drift was established, but those clastic dykes were formed during the Pennsylvanian period. In some areas of Pennsylvania, the Bureau of Mines has found that the clastic dykes in coal were oriented parallel and perpendicular to coal cleats, so apparently there was a direct stress, and those clastic dykes may align with it.

David Webb: Thank you very much, John. That concludes our technical session for this morning. We have another one tomorrow, and I hope we get another turnout like we had this morning. I thank all the speakers for some very interesting talks. I hope that everyone can join us for the All-Institute Luncheon in the La Salle Room.

LUNCHEON MEETING

The Annual Institute Luncheon convened at 12:00 Noon Thursday, September 26, in the La Salle Room of the Gateway Center. Approximately 250 members and guests were in attendance. President Danny G. Wooton presided.

Danny Wooton: Welcome to the Institute Luncheon. Mr. Wilbur Franklin will give our blessing for this meal.

Wilbur Franklin: In the interest of those who have passed away this year, I would like to take a few moments of silent prayer for those members and others we may have lost.



Wilbur Franklin gives invocation at the All-Institute Luncheon

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Danny Wooton: Good afternoon. I would like to introduce all the special guests that we have here today. As I introduce these individuals, please hold your applause until I introduce everyone at the head table. Starting at the far left, Robert Shanks, President of Arch of Illinois and Chairman of the IMI Scholarship Committee. Next is Bob Danko of Peabody Coal Company; Bob is Chairman of the Honorary Membership Committee this year. Next to Bob is Mary Lee Shockley. I've never met her before today, but I guarantee she has to be a very patient lady. Next to her is her fine husband and my favorite mining engineer, Dick Shockley, formerly Director of Mines and Minerals and past president of IMI. Next to him is Ronald Wolk, our speaker for today, and I'll be speaking more about him in a few minutes. At my far right are four speakers from this morning's technical session: John Nelson, a geologist with the State Geological Survey; David Kuck, of Iceberg Cribs in Arizona, who presented a most interesting paper on ice pillars; Dr. Paul Chugh, who is the Chairman of the Mining Program at SIU and also presented a paper this morning; David Webb, General Superintendent of the Crown Mine Complex for Freeman United and our program chairman; Doc Harrell, retired from Freeman United Coal Mining Company, chairman of our Centennial Meeting Committee planning the big event for next year; Paul Ehret, Supervisor of the Land Reclamation Division for the Department of Mines and Minerals, and he has a presentation to make in a little bit; and Michael Reilly, President of Zeigler Coal Company, who will be the president at the Centennial of the IMI. Let's give all these folks a warm welcome.

There are some other special guests I would like to recognize. Would all the past presidents and honorary members of the IMI please stand. Let's give these men a hand. These are the guys who put IMI where it is today.

We have some people who work hard behind the scenes all year long. I know you've heard behind every good man there is a good woman. Behind a good organization there is a terrific woman, and this organization's terrific woman is Phyllis Godwin. She works on this thing year around. She puts together the Proceedings, she deals with the Advertising Committee; she just does a tremendous amount of work for this organization. She has her husband, David; her helpers, Jim and Pam Sisco and Irma Samson with her. Please stand and be recognized for the good job that you all do. Along with that, I'd like to thank the State Geological Survey for all the technical assistance they give us here with taping, projectors, overheads and so on.

We have a special moment here, and I'd like to have Lanny Bell to come up. Lanny is retired from Roberts and Schaefer Co. Nate Perrine passed away in March, and Lanny would like to share with us a few remarks about Nate.

TRIBUTE TO NATE PERRINE

Lanny Bell: As a member of the Advertising Committee, I've been asked to say a few words in memory of one our members, Mr. Nate Perrine. Everybody who was anybody must have met Nate at one time or another as members of the Institute.

Nate became a card-carrying member of the Institute in 1951. He was awarded Honorary Membership in 1976 and passed away in March, 1990. Hooked up some earlier Proceedings and saw that Nate was chairman of the Committee in 1976. I first met Nate in 1977, when I became a member.

For many years, Nate was chief purchasing officer for Peabody Coal Company. He was a loyal, tireless, devoted member of our community. As a member he was responsible for contacting manufacturers' representatives for ads in our Proceedings. In his position, he could have delegated this work to other people, but he did not. He made personal contacts to the advertisers.

I don't know whether Nate ever worked in the mines, but I do know that he was familiar with every operation of the mine itself. Nate once laughingly said he had come to work for Peabody because his dad couldn't get him in the National Guard and had thereby given up any chance he might have had of ever becoming the Vice President.

After retiring from Peabody, he opened his own business, became a manufacturers' representative and became more widely known. At his death, he had probably met every purchasing agent at every coal mine in the State of Illinois.

I will personally remember Nate because of his love for piano music. I have a God-given talent for playing the piano; if you can sing it, I can play it. Most people call this playing by ear, but it is a little more involved than that. I would meet with him at every Institute and play the songs he selected



Lanny Bell

from his generation, and I will never forget how pleased he looked while I was playing.

Nate fought cancer for many years, never giving up. At first meeting, many people might have classified Nate as a tenacious bulldog. But underneath it all, he was a pussy cat. Nothing was too much work for Nate; he was a tireless worker. We at the Institute, and especialy the Advertising Committee, will miss him sorely. I would like you now to bow your heads for a few minutes to mark his passing,

secure in the knowledge that Nate is in heaven with his God and all is well with him. Thank you all.

Danny Wooton: Thank you, Lanny. At this time I would like to ask Bob Shanks, Chairman of the Scholarship Committee, to come up and recognize those young people who were awarded IMI scholarships this year.

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Robert Shanks: Thank you, Danny. First, I would like to ask the representative from each of the four institutions that are receiving scholarships today to stand up and be recognized along with any other students that they brought with them today. I would ask George Woods and his students from John A . Logan and Wabash Valley College to stand up. The University of Missouri at Rolla: Kahn Powell, Craig Sorensen and Daron Hunt. Rend Lake College. Dr. Paul Chugh, Southern Illinois University. As I understand it, Paul, we have Sandra Reimer and Patricia Lockett here today; they will receive scholarships. Please have them come up. [Dr. Chugh introduced other students and faculty from Southern Illinois University].



Scholarship winners Lonnie Mitchell (left), John A. Logan College and Paul Spicer (right), Southeastern Illinois College, with Professor George Woods.



Scholarship winners from the University of Missouri-Rolla. Left to Right: Khan Powell, Daron Hunt and Craig Sorensen.

LUNCHEON MEETING



Professor D. J. Johnson (center) with Rend Lake College scholarship winners Bobby Wildermuth (left) and Gerald Irvin (right).



Seated: Y. Paul Chugh, SIU (left), Robert Shanks, Chairman of the IMI Scholarship Committee (center) and Mike White, SIU (left). Other staff and students from SIU standing (left to right): Rick Honaker, Jeremy Worley, Dennis Connor, Stanley Reeder*, Brian Hoyt*, M. K. Mohanty, and Praveen Saluta.

*Scholarship winners. Other winners not shown: Mary Evans, Patricia Lockett, and Richard Robben.

Danny Wooton: Thank you, Bob. At a time when the coal industry has slowed down, and the mining enrollments are dropping accordingly, the support that the Institute gives these mining schools is especially important at this time. I would like to express my appreciation to all you, especially the vendors, whose rented exhibit space helps pay for these scholarships. Thank you very much.

At this time I would like to introduce Paul Ehret of the Land Reclamation Department of the Department of Mines and Minerals. He has a very special award to give today. Paul.

LAND RECLAMATION AWARD

Paul Ehret: One thing nice about not having your boss here is getting to sit up at the head table. Director Morse apologizes for not being at the IMI this year. He is trying to sell some coal down in Georgia, Alabama and Florida with a task force appointed by the Governor to try to help Illinois coal. This is actually the fun part of the job. As a regulator, I don't get a lot of laughs, and not that this is a laugh, but it is fun. This is Illinois' Excellence in Surface Mining Award which we have given away now for several years. This is the third year in which we have presented the award at the IMI. It gives me a lot of pleasure.

Part of the process is that we usually send out notices to the operators about the award process with an application. The application is a lot less complicated than one you usually get from us for permits, so it is not so frightening to fill out. When we get those applications from operators, we have departmental staff sit down and go through the submittals, and from that we select the winners. We then submit the winner from Illinois along to the Interstate Mining Compact, which has eighteen state members. The compact has an awards committee that then selects a national award winner and honorable mention award winners.

This year, the State of Illinois Department of Mines and Minerals has selected Arch of Illinois as its winner. Arch received this award primarily for innovative accomplishments in drainage control; they been have implemented at Captain, Horse Creek, Denmark, and Streamline coal mines. This reclamation planning has developed and applied an innovative technique for drainage control on reclaimed steep slopes using concrete geoweb, which is a geometrically shaped material downdrain developed for watersheds in excess of 15 acres. It is the result of three years of design, testing and refinement. The successful development of these structures for conveying runoff down relatively steep slopes has resulted in the implementation of long-term drainage control systems requiring little maintenance, which reduces revegetation costs on slope areas and meets the requirements of state and federal regulation laws. Arch of Illinois, dedicated to research, development and implementation of innovative reclamation techniques during times of tight environmental regulations and increasing costs, exemplifies their commitment to excellence. I would like to give these three awards to Bob Shanks of Arch of Illinois.





Robert Shanks: Thank you, Paul. When you have as large an area of reclaimed land to deal with as we do, the projects that our engineering staff and reclamation staff worked on to accomplish resulted in a great deal of cost savings to our company. So I'd like to accept these on behalf of our engineering staff and our reclamation staff, who worked so hard to develop and perfect this technique and reduce our operating costs.

Danny Wooton: At this time I would like to have Bob Danko come up. He has a very special presentation to make.

HONORARY MEMBERSHIP AWARD

Robert Danko: I was Chairman of the Honorary Membership Committee this year. Also on the committee were Joseph Spivey and Joe Williams. Each year there is a committee appointed to select an individual that is worthy for a lifetime honorary membership in the IMI. We select a name and submit it to the Executive Board for approval. The person who was selected this year was born in the State of Virginia. He received a bachelor degree in mining engineering from Virginia Polytechnic State University in 1952. He served with the Army Corps of Engineers in Korea for two years. He is a Registered Professional Engineer in Kentucky, Illinois, and Pennsylvania. He has always been active in his local church and civic organizations in his community. He is a big supporter of mine rescue and is an active member of the Board of Directors of the Illinois and national mine rescue associations. He is a past president of the IMI, past chairman of the Coal Division and presently on the Board of Directors for the SME-AIME. He was employed by Inland Steel Coal Company for 35 years in Kentucky and Illinois in all levels of engineering and production management. He retired from Inland Steel in 1986 as manager of administration. From 1987 to 1990, he served as Director of the Department of Mines and Minerals for the State of Illinois. Presently, he is Director of the Center for Research on Sulfur in Coal, located in Carterville, Illinois. By now, I would say most all of you have figured out who I'm talking about. I would like to introduce Mr. and Mrs. Dick Shockley. Congratulations.



Robert Danko presents Honorary Membership certificate to Richard R. Shockley.

Richard Shockley: I thought last year would be my last year up here. But I am pleased to be here today. Thank you Bob and President Wooton. Need I say that I am thrilled and honored to be considered worthy to have my name placed on that list of previously honored members of this Institute. I accept this award this morning, not just for myself, but for many of you here in this room who have been instrumental or involved in the success that I might have had in the mining industry. Some of you have been my supervisors, others have been my peers and some of you have been trainees—young men who wanted to grow and be mining engineers. There is one other here that has been very instrumental in my success and that is my wife, and for 38 years she has been patient, Danny Wooton, putting up with my lies that I would be home at 5 o'clock and wouldn't get there until 7:30 or something like that. She has stuck with me, and, Mary Lee, I want you to know that I am not admitting to anyone here that you were the one that put this knot on the side of my head. To prove that she believes in the good book, I turned the other cheek and she didn't swat that side, so she had a change of heart. She is a pearl of great value. And to have a wife to stand beside you giving her support through all of this—well, if you have one, you need to tell her more about it. In closing, I would like to say that you are a great group of people, and I'm pleased to have had the privilege of being associated with you. Thank you for considering me and for the recognition you have shared with me today.

Danny Wooton: Thank you, Dick. A great honor to a great man and a fine gentleman on top of that. I have the honor of introducing our featured speaker for today. With us, today from Palo Alto, California, a long way to come, is Ronald Wolk. Ron is with the Electric Power Research Institute, and what makes this unique is that the utilities that are our customers are also customers of Ron's. He represents an organization that gets its funding from the utilities. Ron is originally from Brooklyn. He is a chemical engineer and has been active in coal conversion research since the sixties, when I doubt that many of us in this room had even thought about coal conversion. So Ron has been around our product for about 30 years. He has been with Electric Power Research Institute for 17 years, where he is currently the director of Advanced Fossil Power Systems. What that means is, systems such as coal gasification, fluidized bed combustion, fuel cells, and coal upgrading. I asked him if I could introduce him as the savior for high-sulfur coal, he wouldn't let me do that. I think you will all agree, that the subject Ron is most qualified to speak on today is of very important interest to all of us in the high-sulfur Illinois coal industry. So would you please welcome Ronald Wolk.

Ronald Wolk: Thank you, Danny. It is a real pleasure to be here. You might wonder how a fellow from California arrived here. Your secretary, Heinz Damberger, called me one day and said, "Iread this article in the EPRI Journal about advanced systems for making electricity, and I would really like to hear more about it, so I'd like to invite you for lunch." What he didn't tell me was that lunch was in Collinsville, Illinois and I would be the luncheon speaker. So, thank you anyway.

BEYOND STEAM: COAL POWER PLANTS BREAKING THROUGH PERFORMANCE LIMITS

RONALD WOLK

Director, Advanced Fossil Power Systems Department Generation and Storage Division Electric Power Research Institute Palo Alto, California

INTRODUCTION



The electricity industry in the United States is facing momentous changes. Until the 1970s, a steady seven percent per year growth in demand for electricity was met by the installation of new units of increasing size and efficiency. The incremental cost of electricity generated in those new plants was lower than electricity from existing plants. As a result, the average cost of electricity to the consumer decreased. Consumers, regulators, regulated utility companies, and investors

were all content.

Over the last two decades, sharp increases in world oil prices, ever increasingly severe environmental laws, and much higher costs for nuclear plants than had been predicted, have all caused the incremental cost of electricity from new plants to be higher than that from existing plants. In response, regulators have made institutional changes which have opened the generation market to new companies. The premise has been that competition would result in lower electricity costs for consumers.

Existing technologies based upon the Rankine cycle, with post combustion cleanup of gaseous effluents, can meet existing requirements for sulfur and nitrogen oxide emissions but cannot economically deal with more severe future requirements which are likely to be imposed. These may include new regulations for toxic emissions that may require additional cleanup. The issue of limiting CO_2 emissions has received widespread attention. Higher efficiency systems that reduce the amount of fuel required to generate a kilowatt hour of electricity are the key to reducing CO_2 emissions resulting from power generation.

Another complication that U.S. utilities must face is the cap on total sulfur dioxide emissions that they will be allowed to emit after 2001. That level is about 8.9 million tons per year and is about half of current levels. This poses a major dilemma to an industry that generates more than half of its electricity with coal and expects to grow over the next decade. Under these new rules, utility systems will not be allowed to emit any additional sulfur oxides above the average emitted annually during 1985 to 1987. If the utility industry wants to maintain or increase its dependence on coal, gasification based technologies, which can reduce sulfur emissions by more than 99 percent, could become one of the technologies of choice. There is competition from scrubbing technology which is also improving and can achieve sulfur emission reductions of 95 to 98 percent, although at higher cost than for 90 percent removal.

Is there a role for new technology in providing better solutions to the problems of meeting much more severe environmental rules while maintaining or reducing the delivered cost of electricity? EPRI thinks that advanced technology can meet these challenges and is maintaining significant research development and demonstration programs that are focused on bringing a number of higher efficiency, lower emission and potentially lower cost technologies to commercialization. These include Integrated Gasification Combined Cycle (IGCC), Integrated Gasification Humid Air Turbine (IGHAT), Molten Carbonate Fuel Cell (IGFC) and Pressurized Fluidized Bed Combustion systems (PFBC).

All of these technologies have the potential to improve efficiency and reduce emissions, as shown below in table 1.

	Fuel Requirements	SO ₂ Emissions	Capital Cost	Technical Readiness for Commercialization at 250 MW scale
PFBC	5-10% lower	50-80% lower	5-10% lower	5 years needed
IGCC	10-20% lower	90-95% lower	Same-10% lower	In construction
IGFC	24-40% lower	95-99% lower	5-10% higher	10 years needed

Table 1. Comparisons of new technology relative to today's pulverized coal plant equipped with flue gas desulfurization.

The impediments to broad commercialization of these technologies at this time are the current low price of natural gas in the United States, projected capital investments per kilowatt of capacity which are still too high to provide a strong enough incentive to reduce electricity costs more than about 10 percent and, finally, absence of a regulatory system that rewards utilities for taking the risks inherent in projects involving new technologies and reimburses them for the extra costs associated with firstof-a-kind plants. The most likely route to commercialization of these technologies will involve regulatory acknowledgement of the value of superior environmental performance of these new systems. Some states have begun to incorporate environmental externalities into the evaluation procedure. This change requires that each pollutant be assigned a cost/ton which must be multiplied by the tons emitted over the life of the plant. The total represents a cost which must be added to the computed cost of electricity.

GROWTH IN U.S. GENERATING CAPACITY

In 1989, the United States had 684,000 megawatts (MW) of installed electrical generating capacity. Three recent studies have predicted a net increase over the next decade of about 80,000 MW. There is some degree of variation in these forecasts. In its 1990 report, the U.S. Energy Information Agency projected that total net capacity in the year 2000 will increase to somewhere in the range of 742,000 to 768,000 MW. The National Electric Reliability Council in it's 1990 Electricity Supply and Demand report predicted a capacity of 761,000 MW in 2000. These can be compared with the prediction of the Utility Data Institute that summarized planned capacity additions from 1990-2000 of 83,000 MW. The latter information, presented in figure 1, shows that non-utility generators will provide an increasing fraction of new generation. In fact, in 1990, non-utility generators provided about 50 percent of 12,000 MW of new capacity that was installed.



Figure 1. Capacity by fuel of new electric power plants in the United States 1990-2000.

The 1990 NERC report predicts that almost 110,000 MW of new capacity will be required to provide the 80,000 MW of increased net capacity. Obviously, the difference takes account of unit retirements anticipated in this period. The details are presented in table 2. There is great diversity in the types of generating capacity that will be added. Because of the current low price of natural gas, a large fraction of new capacity will be combustion turbine and combined cycle units. The information presented contains essentially no commitments for PFBC, IGCC or IGFC power plants. Toward the end of the decade, some of the approximately 20,000 MW of steam turbine plants and 20,000 MW of unspecified plants listed in table 2 will likely be provided by these new technologies if demonstration programs currently planned are successfully completed.

FUEL FOR NEW ELECTRICITY GENERATION

At this time in the United States, the economically and environmentally preferred approach to adding generating capacity is natural gas-fired, combined cycle units. The newly available models of 2,300°F 200+ MW combined cycle units have a capital cost of about \$600/kW and a heat rate of about 7,500 Btu/kWh. The electricity produced is lower in cost than that from any new coal-fired generating unit. At this time, it appears that gas can be obtained in the United States for contract periods and prices for these combined cycle plants that allow plant owners to offer to sell electricity to regulated companies at lower prices than the avoided costs of those utilities. Many cogenerators and Independent Power Producers (IPP) are taking the risk of finding markets for the electricity produced in these plants. Several utilities' commissions have instituted bidding processes for the addition of new capacity. Regulated utilities are required to seek bids for new capacity which are evaluated competitively against its own offerings. Frequently, utilities who chose to rely on coal as a secure long-term fuel for their power plants cannot provide electricity at prices that compete with natural gasfired plants in the early years of a project.

Several years ago, EPRI developed a series of screening curves useful in comparing break-even capacity factors for gas-fired and coal-fired power plants. One of these curves (figure 2) shows that coal-fired generation, with coal at \$1.55/MMBtu, is more expensive than gas-fired combined cycle generation at gas prices lower than \$4/MMBtu, below 70 percent capacity factor.

Traditionally, as shown in figure 3, the U.S. electricity industry has depended on coal as its preferred fuel. The United States consumes more than 800 million tons of coal per year to generate more than half of its electricity. Unfortunately, and mistakenly, public perception of coal-fired power generation is that it is a dirty business. Emission control systems have been added, at capital costs often exceeding the initial dollar cost of many of these plants, to reduce the outflow of particulates, sulfur oxides,

	1990	1991	1992	1993	1994	1995	1996	1661	1998	1999	Total
Nuclear	5,117	2,051	2,031	0	1,170	0	0	1,212	0	1,212	12,793
Hydro	1,021	2,012	2,171	1,043	1,844	1,624	2,122	802	1,758	816	15,213
Steam Turbine	1.901	5,070	1,676	67	1,155	1,936	2,908	1,547	2,401	572	20,133
Unspecified	373	1,688	1,853	1,942	1,854	2,290	2,546	2,001	2,844	2,255	19,646
Comb. Turbine	1.372	1.324	1,727	1,223	1,852	3,044	3,136	2,265	3,652	2,744	22,339
Comb. Cycle	1.794	1,816	1,204	926	1,160	1,955	1,893	1,012	849	1,742	14,351
Cogeneration	810	563	546	293	255	602	56	141	9	1	3.279
Renewable	190	41	-	119	5	38	0	0	00	0	399
Fluidized Bed Combustion	61	130	255	80	0	0	32	0	0	0	558
Totals	12,639	14,695	11,464	6,593	9,292	11,489	12,693	8,980	11,518	9,348	108,711

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and nitrogen oxides. Modern coal-fired generation can be relatively clean, but the loss of thermal efficiency required by these emission controls systems is significant. The thermodynamic efficiency of the Rankine (steam) Cycle used in these plants reached its practical upper limit in the 1960s.



Figure 2. Phased IGCC plants.





PROJECTED CAPITAL COSTS OF NEW GENERATING CAPACITY

The Integrated Energy Systems Division of EPRI is responsible for calculating the relative cost of electricity for different technologies. They use a standardized methodology described in the EPRI Technical Assessment Guide. Figures 4 and 5 present simplified summary cost charts that are useful for comparing various technologies. Total electricity costs are presented in terms of fuel costs, operating and maintenance costs and capital costs for a number of technologies:

Pulverized Coal-Steam without Flue Gas Desulfurization
Pulverized Coal-Steam with 90% Flue Gas Desulfurization
State-of-the-Art Pulverized Coal-Steam with Control of Effluent Streams
Atmospheric Fluidized Bed Combustion - 90% Sulfur Reduction
Pressurized Fluidized Bed Combustion
Integrated Gasification Combined Cycle
Highly Integrated Gasification Humid Air Turbine
Advanced Gasification Molten Carbonate Fuel Cell
2300°F Natural Gas Fired Combined Cycle

The major point that we are attempting to make with these charts is to provide information on the relative cost of electricity from a variety of systems. Standard values were chosen for the cost of fuel, labor and capital. Other choices for these values may have altered the relative position of the technologies. Overall, it puts into perspective the opportunities that can be realized with new technologies.

Some further explanation of these systems is necessary to understand the key technical issues for each of these systems. For example, the pulverized coal plant, without stack-gas scrubbing, is included to put the power costs from advanced systems into perspective. For environmental reasons, no new plants of this type can be built in the United States. The pulverized coal plant, with stack-gas scrubbing to achieving 90 percent desulfurization, is a benchmark plant in that it can meet all existing environmental rules. The SOAPP incorporates all known improvements for conventional coal-fired plants and incorporates them into a single plant design. Many of these improvements have been fully demonstrated in units today, but no plant has as yet been built that takes full advantage of what is commercially available today. Circulating fluidized bed technology is used as the basis for the AFBC cases, while bubbling bed technology is used for the PFBC cases. EPRI investigations of IGCC technology have focused on oxygen-blown systems with cold gas cleanup. The cost and performance numbers used are typical of 1990 designs for Shell, Dow, Texaco and BGL

systems. Tight plant integration, optimized plant design, and use of 2,300°F+ gas turbines have been used to estimate the Advanced IGCC cases. The AGMCFC cases are based on the projected use of moderate methane yield gasifiers such as the developmental High Pressure BGL gasifier.

The GCC, AGCC, IGHAT, AGMCFC, and PFBC power plants will be described in detail latter.

In figure 4, the relative costs of electricity from these kinds of plants are presented. If the cost of natural gas were \$2.25/MMBtu rather than the \$3.35/MMBtu used in the calculation, the cost of electricity (\$0.04/kWh) would be equal, at 40 mills/kWh to the cost of power from AGCC and IGHAT power plants fueled with \$1.31/MMBtu coal.



Figure 4. Cost of electricity from fossil power technologies (assumes startup in year 2000.

A set of arbitrary penalties, or environmental externalities were added to the cost calculations to illustrate what state regulators could require to be added to the cost of generation for emissions. The values arbitrarily selected were 25/ton of CO₂, 2,500/ton of NOx, 500/ton of SOx and 10/ton of additional solid waste. The marked changes in the relative costs of electricity are illustrated in figure 5 and shows the value that could be attributed to several of the new technologies. The conclusion is that new technologies can be cost effective.

The value of very high efficiency in terms of reduced CO₂ emissions is apparent as one proceeds from left to right across figure 5. In particular, the AGMCFC system with a heat rate of 6,000 Btu/kWh, in spite of its high capital cost, becomes economically competitive.



cost calculations.

Figure 5. Cost of electricity from fossil power technologies with *externality costs (assumes start-up in year 2000).

TECHNOLOGY STATUS AND FUTURE DEVELOPMENT PATHS

It is anticipated by many in the United States that within the next decade the price of natural gas will rise to a level that makes coal-fired plants economically competitive. While new technologies can be selected for new generation projects because of their environmental superiority, a major impediment to their acceptance by U.S. utilities will remain until the initial capital cost for these projects is reduced below that of mature pulverized coal plants equipped with extensive effluent cleanup systems. Utilities need an incentive to compensate for the risk inherent with first-of-a-kind plants.

IGCC

Although the technical success of the 100 MW Cool Water and 160 MW Dow IGCC projects in the United States has clearly demonstrated that the technology is technically viable, no U. S. utility has made a commitment for an IGCC unit. The reasons for this are many, but the key one is that capital costs are too high, even though projections of levelized electricity costs are lower. Because the technology is unfamiliar and there is no current reward for lesser emissions, utility managers are reluctant to take the risk of new technologies. Utility commissions can, after the fact, decide that a management decision was imprudent, and utility stockholders may then have to bear the cost of technical failures. The imbalance between utility risk and reward inhibits decisions in favor of new technology. Gasification based technology can penetrate this market if capital costs are reduced and efficiency rises. The latter point is important. Increased efficiency lowers capital investment because more megawatts are generated per dollar of gasification plant investment. We foresee a steady increase in efficiency as new power generating systems are utilized, including gas turbines optimized for syngas and molten carbonate fuel cells.

EPRI sponsored, site-specific IGCC plant studies have shown that most plants fall in a relatively narrow investment band of about \$1,500±200/kW (1989\$). Several vendors have been funding their own studies, resulting in projected capital costs which are about \$100/kW lower because of improved engineering approaches.

EPRI has been sponsoring work to identify areas for future cost reduction. One of the most promising projects involves redesigning the turbine section of the new 2,300°F gas turbines currently entering the market. Our early IGCC studies indicated that coal to busbar heat rates of 9,000 Btu/kWh would be available with 2,300°F gas turbines. As a result of studies to modify the turbine expander to accommodate the increased gas flows resulting from syngas combustion, we now project reductions of 350 Btu/ kWh and capital cost reductions (figure 6).



Figure 6. GE MS 700 1F performance estimates with medium Btu gas (MBG).

The exhaust gas from syngas combustion has two essential differences from that of natural gas: (1) greater gas flow due to the lower Btu/lb of the syngas, and (2) a higher Cp leading to less temperature drop through the

turbine expansion, which tends to put a greater thermal load on the downstream stages. The aim has been to take advantage of these characteristics for power and heat rate improvement while alleviating potential problems of compressor surge and blading thermal stress. The essential approach is to (a) take advantage of the excess compressor-surge margin by raising the pressure ratio to the maximum allowable, which helps put more mass flow through the turbine and lowers the temperature in the downstream turbine sections; (b) open up the first stage turbine vanes increasing the controlling flow area thus allowing the total desired gas flow; and (c) minor opening of the intermediate stage angles, if required, to get more pressure drop across the first stage in order to lower the gas temperature in the intermediate region of the turbine.

Another promising area for efficiency improvement involves better integration of the gas turbine with the air separation plant. This is particularly important in Europe because European coal costs are higher than in the United States. The capitalization and taxation philosophy in Europe also provides an increased incentive for capital investment for efficiency improvements over that provided under current U.S. rules. Consistent with this philosophy, European countries have developed more highly integrated GCC designs which promise heat rates of about 8,000 Btu/kWh (HHV basis) with 2,300°F gas turbines.

A prominent feature of many such designs has been to take the air for the Air Separation Unit (ASU) as a bleed from the gas turbine air compressor. Gaseous oxygen from the ASU is fed to the gasifier, and gaseous nitrogen from the ASU is compressed and sent to the gas turbine to provide additional motive force and to reduce thermal NOx. This arrangement eliminates the need for a separate air compressor for the ASU.

In our earlier U.S. studies, it was already recognized that heat recovered through the use of lower stack temperatures could be used for saturation of the fuel gas; however, the use of low level heat recovered in this manner was limited by the fuel gas minimum heating value (190 Btu/SCF HHV basis) set by GE at that time for their 7001F gas turbines. In contrast, the European gas turbines from Siemens-KWU and ABB have large refractory-lined silo combustors able to accept fuel gases down to 100 Btu/SCF. Accordingly, with such gas turbine combustors, more low level heat can be used to saturate the fuel gas. In addition, nitrogen from the ASU can be added to the fuel gas prior to saturation so that even more hot water can be evaporated providing yet more motive flow to the gas turbine.

The world's next IGCC project and one that demonstrates many of the cost reduction features noted above is now under construction. In May, 1989, the consortium of Dutch utilities, SEP (NV Samenwerkende Electriciteits Produktiebedrijven) announced that they would build a 250 MWe GCC plant at Buggenum, The Netherlands. This plant will use a single Shell gasifier train of 2,000 tpd capacity linked to a single Siemens-

KWU V 94.2 gas turbine combined cycle (turbine inlet temperature 2,000°F). Stringent environmental standards, including zero water discharge from the gasification facilities, are required. The high efficiency integration features of recent European IGCC designs described above are included in the SEP 250 MWe design. The design heat rate is 8,240 Btu/kWh (HHV basis) or 41.4 percent efficiency. Construction has begun and a mid-1993 startup is planned.

It is likely that the next plant after the Netherlands project will be built in Germany. RWE (Rheinisch-Westfalische Electricitatswerke), the largest electric utility in Germany, has also announced a GCC project. The feedstock is to be Rhenish brown coal, and the gasification technology is to be the High Temperature (HT) Winkler fluid bed. An 800 tpd (10 bar pressure) HT Winkler unit has been operating successfully since 1986, producing gas for methanol synthesis. A 150 tpd (25 bar pressure) pilot plant is currently being operated by Rheinbraun (a RWE subsidiary). EPRI is currently funding work with Rheinbraun to explore the application of this process to U.S. bituminous coals. The gas turbine for this GCC project is to be a Siemens-KWU V94.3, which will have a turbine inlet temperature of about 2,300°F and deliver about 200 MWe. An efficiency over 43 percent is forecast for this 300 MW plant, which is scheduled for a 1995 start-up. A decision on air or oxygen blowing is planned for late 1991.

The future for new IGCC projects in the United States is not as clear. Three major projects were submitted to DOE in response to its fourth round of Clean Coal Technology solicitations (table 3).

Proposer	Technology	Size	Financing Millions Total/DOE	Comments
Wabash River Coal Gasification Destec/PSI Energ	Dow Sy	250 MW	592/243	Repowering one of six boilers at West Terre Haute
TVA	Shell or Texaco	250 MW+ fertilizer	686/180	Coproduction of electricity and fertilizer
Freetown Energy Texaco/GE/Com wealth Electricity Subsidiary	Texaco mon- '	450MW	845/150	Grassroots IGCC

Table 3. Proposed IGCC projects submitted to U. S. DOE.

IGHAT

The integrated Gasification Humid Air Turbine power plant represents an approach by EPRI and others to provide the industry with a new cycle based on the synergy that can be found in the integration of gasification plants with a turbine deriving power from firing a highly humidified fuel gas. Figure 7 depicts coal gasification-based power plants integrated with the HAT cycle (IGHAT) and Combined Cycle (IGCC) power blocks. The clean syngas from gasification, after cool-down and cleanup to remove particulate matter and sulfur, is combusted in a gas turbine in either plant. The two plants, however, differ significantly in the method in which the syngas is cooled in the gasification plant and the mode in which the power is generated. The distinguishing characteristics of IGHAT are:

- All power is generated by a more efficient, high temperature Brayton cycle.
- Efficiency is improved through the reduction of parasitic compression load.
- Expensive high temperature heat recovery exchangers are eliminated.



Figure 7. HAT cycle and combined cycle gasification.

In a combined cycle, two turbines are required; a steam turbine in addition to the gas turbine. Steam is produced by heat from the gas turbine exhaust and only a portion of its heat content is converted to power in the steam turbine with the remainder being lost through the surface condenser. To achieve optimum plant efficiency, high pressure steam is also produced in the gasification plant thereby cooling the hot gas leaving the gasifier before cleanup. The steam is also used for power generation in the steam turbine. The energy flows in the HAT cycle, and the combined cycle may be visualized by comparing the Sinke diagrams for the two cycles as presented in figure 8.



Figure 8. Sinke diagrams for IGHAT and IGCC.

In a HAT cycle, a single gas turbine replaces the gas and steam turbines of a combined cycle. The unique feature of the HAT cycle is its ability to reduce the compressor load by a very effective approach to low level heat recovery. Low level heat from the stack, the compressor intercooler, aftercooler, and from the gasification process is used to warm water. This warm water (at about 400°F) is fed to the top of a saturator, and the compressor discharge air is fed to the bottom. In the counter current contact between the air and water which takes place in the saturator, the air is heated and humidified, and the water is cooled, and part of it is evaporated. The air leaving the top of the saturator contains between 20 percent and 40 percent water vapor. This water vapor directly reduces the amount of air that must be delivered by the compressor to moderate the turbine's combustion temperature. In a conventional gas turbine, the compressor consumes about 50 percent of the turbine's shaft work. In a HAT turbine, because of the water vapor added to the combustion air, the compressor requires only about 30 percent of the turbine's shaft work, making the difference available for power generation.

The humid air produced in the saturator is preheated against the gas turbine exhaust, thus recycling the high level exhaust heat back to the combustor of the turbine. Note that every Btu recovered in this manner is equivalent to a Btu saved in fuel. In contrast, the high level heat in a combined cycle is used for steam generation, a fair portion of this heat being used as latent heat for vaporization of the water. The latent heat remains mostly unconverted to power and is rejected to the surroundings through the surface condenser. This heat rejection step furthermore requires additional energy and equipment.

A large portion of the capital cost savings for IGHAT versus IGCC is due to the fact that the heat from the syngas leaving the gasifier can be utilized in the HAT cycle as low-level heat in warm water. This means that an inexpensive quench gasifier and conventional heat exchangers can be used for syngas cooling in IGHAT plants. In many IGCC plants, however, expensive waste heat boilers are used to cool the syngas while generating steam for the steam-bottoming cycle.

Table 4 summarizes the key plant performance and cost characteristics for the IGHAT and the IGCC plants. A pulverized coal-fired boiler plant equipped with flue gas desulfurization is also included in this comparison.

	Integrated gasification humid air turbine cycle	Integrated gasification combined cycle	Pulverized coal with flue gas desulfurization
Plant facilities investment (12/88, \$/kW, 500 MW size)	1,080	1,320	1,120
Nominal full load heat rate (Btu/kWh)	8,700	8,900	9,600
Levelized constant cost of electricity (mills/kWh)	40	45	45
Sulfur removal (%)	96-99	96-99	90-95
NOx emissions (lb/MBtu without SCR)	.0207	0.217	.45

Table 4.	Comparison of IGHAT	plant	with oth	her coa	il-fired	power	generation	Ļ
	systems.							

Work is now underway by Fluor Daniel, Texaco, EPRI and TPM as part of a three-phase program for commercializing the HAT cycle. The overall objectives of the program are: a) to design, develop, test, and commercialize an aeroderivative gas turbine suitable for use in the HAT cycle; and b) to optimize the combination of the gas turbine and the HAT cycle. The program phases can be defined as follows:

- Phase I Investigation of the technical feasibility, cost, and schedule for the gas turbine development and assessment of overall HAT cycle system economics based on the projected performance of the new machine.
- Phase II Prototype design, development, and testing of a complete HAT cycle.

Phase III Commercial deployment.

The entire commercial development program is expected to take approximately five years, leading to an integrated demonstration at full scale in the 1995-96 time frame. The Phase I work began in November, 1990, and will be a nominal one-year effort. In addition to quantifying the development cost and schedule for the prototype machine, Phase I investigation will include:

win menude:

- Integrated versus non-integrated oxygen study
- HAT cycle performance on natural gas
- Detailed comparisons to IGCC
- Economy of scale investigation
- Operability/off-design analysis

One interesting development in the Phase I work to date is the specific power output of the HAT gas turbine. Specific power is the net power output per unit of air flow through the engine. The HAT gas turbine will have a very high specific power since the air compressor flow is significantly reduced in combination with the addition of water vapor to the expander. While the simple cycle capacity of the engine from which the HAT machine will be based is rated at a nominal 40 MW, the HAT version is expected to be in excess of 200 MW. This five-fold increase in power will be achieved in an engine much less than five times the size or weight of the base machine. The significant economic impact of this relationship is evident. The large size, approximately 200 MW, of a HAT cycle machine presents a major problem in terms of arranging a demonstration. It will not be possible to set up a slipstream test. A fully integrated grass roots test as part of an IGHAT plant will be required to generate the confidence that the utility industry needs to support a positive investment decision. Subsidization of a large first-of-a-kind plant may require that government or utility commission be involved.

EPRI is also planning to begin, in late 1991, studies with GE and Westinghouse to define the cost and development schedule required to develop HAT cycle machines derived from the 1,300°F single shaft series of heavy duty gas turbines now being commercialized.

INTEGRATED GASIFICATION MOLTEN CARBONATE FUEL CELLS

One of the major potential benefits of coal gasification technology is that it can be integrated with molten carbonate fuel cells in the future to generate electricity at very high efficiency with minimal emissions. Combining gasification with molten carbonate fuel cells provide systems that can have efficiencies in the 50 to 55 percent range. The use of molten carbonate fuel cells, which require more extensive flue gas cleanup to protect catalysts and therefore have almost zero emissions, offers a system that should never have additional cleanup requirements imposed upon it.

The most thorough studies completed to date, which have been sponsored by U.S. DOE, have considered molten carbonate fuel-cell systems to be almost direct replacements for combustion turbines in gasification-based power plants. This leads to plant heat rates about 7,500 Btu/kWh, substantially lower than for systems using combustion turbines, since fuel cells are more efficient power generators.

In current configurations of the fuel-cell system, the high pressure syngas is first reduced to low pressure through an expansion turbine and is then fed to the fuel cell where the gas' heating value is converted electrochemically into electricity. Unconverted fuel from the cell is combusted, and this heat, along with the heat generated from cell inefficiencies and the gasification process, is recovered in the steam bottoming cycle which produces about 40 percent of the plant's power.

The fuel cell operates at nominally 1,200°F. NOx is not generated at this low temperature. All sulfur must be removed from the fuel gas, since it poisons the fuel cell. Consequently, the HRSG stack contains no SO₂. The plant's only SOx and NOx emissions are from the sulfur recovery system and are negligible.

Fuel cells have other significant advantages over turbines besides their higher efficiency and extremely low emissions. Fuel-cell efficiency barely changes over the entire 25 to 110 percent load range, and they suffer no derating at high summer ambient temperature. Also, the inverters, which convert the fuel cell's DC power to AC power, provide superior power conditioning (VAR control). These should provide considerable economic benefit to most utilities using the technology.

Fuel cells are more efficient on natural gas than coal-derived gas. This has led to two encouraging developments. First, Pacific Gas and Electric will operate a commercial size stack (100 kW) on natural gas in a utility environment beginning in 1991. Construction is in progress. Second, the American Public Power Association (APPA) is working with a fuel cell manufacturer (ERC) on a commercialization program that could lead to a significant market and a manufacturing capability for 400 MW/yr of fuel cells. APPA has long been interested in small dispersed generation based on natural gas. The technology development is proceeding. A demonstration of a 2 MW unit is planned for the City of Santa Clara in California with startup anticipated in 1993.

The key uncertainty, which may limit the adoption of fuel-cell technology for central station power generation, is the cost of the fuel-cell systems. One important element is the cost of the fuel-cell stacks themselves. This is primarily a manufacturing question. Currently, fuel-cell stacks are being built by hand in laboratories at a rate of a few hundred kilowatts per year at costs estimated at about \$25,000/kW. EPRI has been sponsoring work at two vendors, M-C Power and ERC, who have started prototypical manufacturing operations that we anticipate will reduce costs by about a factor of ten. Full scale manufacturing plants have been designed that promise another tenfold reduction in the per kilowatt stack cost.

M-C Power has begun operation of the required equipment in a facility near Chicago. The first one meter full commercial area cells have been manufactured. This plant will have a total production capability of about 3MW/yr. ERC began construction in 1991 on a similar sized facility. The first full area six square foot cells are scheduled for production in late 1991.

Full scale fuel-cell production plants can come on line in the mid 1990s, if the market for dispersed natural gas-fueled generators in the 2 to 20 MW range emerges. Successful field experience with these units would provide the technical confidence required to refuel these units with coal-derived gas, if natural gas prices go to a level where refueling is economically favorable.

EPRI is working with DOW and ERC to place, in 1991, a small 20 to 100 kW molten carbonate stack that will operate on a coal-derived gas slipstream at their 160 MW Plaquemine, Louisiana, IGCC plant. We hope to acquire information about any important technical issues that may result from feeding coal-derived gas to the cell. For example, trace quantities of various elements are present in the coal-derived gas. Currently, there is no experience available to predict any deleterious effects on fuel-cell life.

Our strategy is to arrange for the installation of MCFC stacks in IGCC plants around the world. These stacks will operate as slipstream units. As bigger stacks become available from the prototypical manufacturing facili-

ties, we hope to place stacks of one to three MW in several locations prior to 1995. After that, when the first true commercial size production plants come on line, it is hoped that slipstream units in the range of 10 to 50 MW can be put into operation in IGCC plants. An alternative is to place these units in other locations where coal-derived syngas is available as a feedstock for chemical production. The key information to be gained from this program will help in optimizing fuel-cell packaging, piping arrangements and the design of the balance-of-plant systems.

Commercial acceptance of the IGFC concept will require significant demonstration to be successful. As has been stated several times before, the utility industry needs a basis for assessing risks of new technology and working out a satisfactory arrangement to compensate them for that risk.

Two factors mentioned above suggest ways that the IGMCFC might be improved. First, it was noted that MCFCs are much more efficient on natural gas (methane) than on syngas. The difference is significant. As stand-alone converters of fuel to electricity, fuel-cell systems approach 40 percent efficiency in IGMCFC plants on typical syngas without a steambottoming cycle. However, MCFCs approach 55 percent efficiency on low pressure natural gas fuel. The cell internally converts methane to useful fuel (hydrogen) through the steam reforming reaction which absorbs heat. In this way, the cell transforms its waste heat into chemical fuel which it uses directly for power production.

Second, it was noted that in the IGMCFC plant, unconverted fuel from the fuel cell is combusted and the heat utilized in the steam-bottoming cycle. This increases dependence on the less efficient bottoming cycle and is in conflict with minimizing the heat delivered to the bottoming-steam cycle. The objective, then, is to maximize the amount of methane delivered to the fuel cell and recover the chemical heat of the cell's unconverted fuel for more efficient utilization.

Advanced gasification processes might provide an answer. Several gasification processes were tested on the pilot plant level in the 1970s in an effort to produce a syngas with high methane content that could more easily be converted to a pipeline natural gas replacement. These gasification systems all require or perform best with a hydrogen recycle to the gasifier and are broadly referred to as either hydrogasification or catalytic gasification. If the unconverted fuel is recovered as hydrogen and recycled to one of these advanced gasifiers (chemical integration of the gasifier and fuel cell), the steam cycle could be eliminated entirely and electricity could be produced from coal at a heat rate approaching 6,000 Btu/kWh. As an added incentive, these gasifiers require no oxygen plant.

Obviously, several long-term developments would be required to make this concept an economically viable reality. Work on the fuel cells is in progress, and it can be viewed as an evolutionary development of existing technology. Revolutionary developments, however, will be required to move gasification and gas cleanup forward to where we can reach overall system heat rates of 6,000 Btu/kWh (total elimination of the steam cycle) at competitive capital costs.

Three new processes may have to be developed to make this concept an economically viable reality: gasification, hot-gas cleanup, and an advanced system for recovery of the unconverted fuel-cell fuel. System evaluations by EPRI and the Department of Energy are the first steps now underway to determine which are the preferred combinations of these systems. In this work, flowsheets are being generated and costs estimated for a number of the more promising and well-developed processes and configurations. This work has already confirmed the potential efficiency gains for this general concept. However, there are a number of key developmental issues that must be resolved. Perhaps the most significant one involves the gasification system which must produce a high concentration of methane in its product gas.

In a series of recent EPRI sponsored studies, Fluor calculated investment and performance values for IGMCFC plants based upon the projected performance of Illinois No. 6 coal in a 1,000 psig BGL gasifier. This gasifier was selected because of its relatively high-methane yield and modest further development requirements. In the study, hydrogen was separated and recycled to the fuel cell. While the overall system heat rate was calculated to be about 6,500 Btu/kWh (coal to busbar), the system cost was estimated at about \$2,000/kW. Additional studies are underway to reduce the required investment so that a more attractive IGFC flowsheet can be developed.

One potentially interesting combination is the use of solid oxide fuel cells fueled by syngas. Because only oxygen permeates through the electrolyte, the resulting products of electrochemical oxidation of syngas consist only of CO_2 and water. This would allow a concentrated CO_2 stream to be rejected from the power-generating section of an IGSOFC power plant. Solid oxide fuel-cell development is being spearheaded in the United States by Westinghouse under DOE sponsorship. Although somewhat less efficient than molten carbonate fuel cells, the inherent cost of the materials used is lower. The ultimate cost of the fuel cell, as with all others, will depend on significant progress in reducing manufacturing costs.

INTEGRATED ENERGY FACILITIES

Integrated Energy Facilities (IEFs) based on coal gasification-based power plants may offer the United States utility industry a number of new business opportunities. Integrated complexes can produce electricity, heating and cooling, fuels, chemicals and other marketable commodities. Such potential coproducts include synthesis gas, SNG, hydrogen, ammonia, carbon dioxide, chemicals, methanol and other oxygenated fuels, gasoline and fuel oil.
One of the major issues facing the electricity industry is that electricity demand varies by time of day, day of the week, and month of the year. As a result, much of the generating capacity that a utility requires to meet peak loads is unutilized through much of the year. Gasification-based technology allows a large portion of that capital to be used continuously to generate clean gas, which can be converted into storable liquid fuel to be used during peak demand periods or by producing chemical products for sale.

In this manner, Integrated Energy Facilities offer the potential for the utilities to recover some of the energy markets that have been lost to the direct use of oil and gas over the past two decades. Previous EPRI studies have indicated that modern multitrain GCC plants can be designed for high equivalent availability (typically 85 percent). If the gasification plant can be utilized to full availability at reduced power demand through increased production of fuels and chemicals from the synthesis gas, better capital utilization would result. The efficiency of coal utilization can be improved, and the emissions per kWh or per unit of useful energy can be minimized. IEFs may thereby provide the potential for reduced electricity costs.

A number of EPRI studies have indicated that methanol coproduction in this manner would lower utility rates. We have recently initiated studies with Houston Lighting and Power, Tennessee Valley Authority and Public Service Electric & Gas to evaluate methanol, ammonia and other chemicals as coproduction opportunities.

One interesting conclusion of a study cosponsored by EPRI and Florida Power & Light on electricity methanol coproduction was the increase in equivalent availability and lower cost of electricity that resulted. The addition of a spare gasifier, which could not be economically justified in a stand-alone IGCC plant, was in fact justified when the spare gasifier was kept on line to produce methanol and used to fuel the gas turbines during periods of gasifier downtime.

While the coproduction of other liquid fuels and chemicals offers many new business opportunities, it is the coproduction of steam or hot water for district heating and cooling or process uses that can accomplish the greatest gains in overall efficiency for fossil-fuel utilization. As the drive towards higher efficiency and reduced environmental impacts continues, much more attention should be given to identifying such opportunities both in the vicinity of existing industrial locations (refinery, petrochemical and metals production facilities) and in new growth areas.

The combined heat and power concept is practiced to some extent in many European countries. More recently, several European governments (e.g., UK, Denmark, Germany, Sweden) have made policy statements specifically encouraging such CHP projects. In the United States, this concept has had only limited application. There are many U.S. cogeneration projects with some coproduction of steam, but district heating and cooling is scarcely practiced. This is undoubtedly partly related to the lower fossil energy costs in the United States versus those in Europe.

Gasification-based plants have several features that can be of benefit in potential IEF and CHP opportunities. Since the power is mostly made in the gas turbine (or fuel cell), smaller amounts of low-level heat are available, and it may be easier to find potential applications. Gasification can also potentially use other low-value feedstocks, such as petroleum, coke, oil field, refinery and chemical wastes, sewage sludge solids and perhaps MSW.

One particular concept of future interest is a GCC power plant coproducing methanol which is then supplied to multiple fuel cells in urban locations. The several advantages of such a scheme include the reduction of distribution costs and the accompanying aesthetic and environmental intrusions. Furthermore, the urban located fuel cells can undoubtedly find many smaller cogeneration and CHP applications for schools, colleges, public buildings, office buildings, shopping malls, supermarkets, district heating and cooling, etc.

PRESSURIZED FLUIDIZED BED COMBUSTION

Pressurized Fluidized Bed Combustion (PFBC) is an advanced combined cycle technology that offers utilities the ability to achieve net heat rates that can approach 8,500 Btu/kWh while continuing to practice coal combustion because these systems use air as the oxidant and generate steam by absorption of heat across pipe walls. As a result, they are more likely to achieve near-term utility market acceptance, since many utilities are not comfortable with the thought of having to operate chemical and oxygen plants as part of their power generating facilities.

Several major developments are underway in this field with technology provided to the U.S. market by European vendors. The DOE Clean Coal Technology program has been the vehicle the vendors have used to move into this market. ABB, Ahlstrom, and Deutsche Babcock have received or applied for Clean Coal awards. Their projects are listed in table 5.

Recent EPRI studies, summarized in table 6, indicate that costs projected for ABB bubbling bed PFBC systems are competitive with conventional pulverized coal plants with stack-gas scrubbers and with atmospheric fluidized bed combustion power plants. The PFBC units have the potential for higher thermal efficiency and better environmental performance than either of the commercially available AFBC or pulverized coal plants.

Significant field experience is being generated with the 80 MW ABB units now in service at the Vartan station in Sweden (2 units), the Escatron unit in Spain and the Tidd unit in Ohio in the United States. The differences in these projects are summarized below:

Vartan	Stockholm	-Power generation plus district heating -1% sulfur coal, paste feed -Dolomite or limestone sorbent		
Tidd	American Electric Power	-Power generation only -4% sulfur coal, paste feed -Dolomite or limestone sorbent		
Escatron Endesa		-Power generation only -7% sulfur lignite, dry feed -Limestone sorbent		

Table 5. U. S. PFBC projects.

Vendor	Project	Status		
ABB	70 MW repowering of Tidd Station of AEP	Clean Coal I award in startup operation		
ABB	320 MW repowering of Sporn Station of AEP or grass Roots project	Clean Coal II award deferred until after 2000		
Ahlstrom	70 MW repowering at Des Moines Energy Center of Iowa Power	Clean Coal III award under development		
Ahlstrom	150 MW repowering at Des Moines Energy Center of Iowa Power	Clean Coal IV proposal, September 17, 1991 decision		
Deutsche Babcock	Air Products/ International Paper cogeneration project	Clean Coal IV proposal, September 17, 1991 decision		

Table 6. Pressurized fluidized bed combustion performance and cost summary.

	Case 1	Case 2	Case 3
Configuration	1xP200	4xP200	1xP800
Steam cycle conditions	Reheat 1,800 psi	Non-Reheat 1,800 psi	Reheat 3,600 psi
Net heat rate*, Btu/kWh	9,250	9,290	8,975
Total capital req., \$/kW	1,790	1.360	1,275

*Performance based on 60°F ambient temperature.

The wide diversity in coal feedstock noted supports the claim that the technology can handle a broad variety of coals.

Both Ahlstrom and Deutsche Babcock have significant pilot plant scale efforts underway to advance the status of their circulating PFBC technology. EPRI is interested in these developments since there is a reasonable probability that the cost of electricity will be lower than that from a bubbling bed system and that environmental performance will be better. These premises are based upon the use of higher velocities in the circulating bed system which allow higher throughputs of coal per unit of bed cross sectional area and the application of staged combustion.

One of the major development questions faced by each of the vendors is the integration of the gas-cleaning system with the gas turbine plant. ABB depends on a system of cyclones to accomplish sufficient particulate removal to protect a ruggedized gas turbine. Baghouse technology is used after the gas turbine to clean the gas before its release into the atmosphere. Both Ahlstrom and Deutsche Babcock have chosen positive high temperature filtration systems to clean the gas before it enters the turbine. EPRI understands that both vendors have discussions underway with potential gas turbine vendors.

Both ABB and Ahlstrom have proposed projects of approximately 150 MW to DOE under Clean Coal IV. The scaleup of this technology to the 300 MW level is required for competitive economics. As with the other advanced technologies discussed previously, the scaleup step is likely to require subsidization.

Several programs are underway in the United States and Europe to increase the efficiency of PFBC systems which involve a frontend pyrolysis or partial gasification step. The gas from this step is fired in the combustion turbine to raise the turbine inlet temperature from nominally 1,600°F to levels above 2,000°F. Different developers burn the unconverted char either in an atmospheric CFB or a PFBC. The overall heat rate of such a system is on the order of 7,500 Btu/kWh. Obviously, the added efficiency of such a system must be evaluated in terms of the added complexity, cost and changes in reliability.

The key issue is whether PFBC technology will be able to meet future environmental requirements. At this time, it is able to meet existing requirements. However, additional backup cleanup systems to meet ultra severe SOx and NOx emission standards may negatively impact its ability to compete on an economic basis with gasification-based systems.

CONCLUSION

Several alternate approaches for higher efficiency, cleaner power generation are under development in the United States and in many other countries. These include IGCC, IGHAT, IGFC and PFBC systems. These systems can also be used to produce chemicals and heat energy and marketed if the proper economic incentives exist. The ability of these systems to enter the competitive market in the United States are impeded by the low price of natural gas relative to coal and the need to find a way for utility companies to be compensated for the extra costs of first-of-a-kind plants. New attitudes on the part of regulatory commissions towards the perceived cost to society of emissions of SOx, NOx, particulates, toxics and CO₂ may provide a major economic basis for market penetration of these technologies. Major demonstration programs will be required to develop utility acceptance of the reliability, operability and maintainability of the technologies in a utility environment. No firm plan exists to fund these demonstrations. A concerted effort is required for governments, utilities, vendors and other interested organizations to work together to assist these new technologies in becoming commercially available alternatives for power generation.

Danny Wooton: Thank you, Ron, for those encouraging displays of where we are headed in the future and hopefully the future potential of high-sulfur coal. If anyone has any questions, feel free to ask Ron.

Question: Inaudible.

Ron Wolk: Some people have looked at what the cost of cleanup technology is: \$500 a ton for SO₂ removal is a number that has been in the literature as a cost of SO₂ removal. Same thing with NOx. CO₂ is just kind of pulled out of the air. But people do this, and it is part of the formal bidding process of many states now. Whether it is arbitrary or not really doesn't matter. Its imposed by legislation. So people have to deal with this. It is a real cost; whether you want to do this or not is another question. But that is a policy question that has been resolved. There are external forces on power generation, and people ought to look at that when they make decisions about new power.

Question: Inaudible.

Ron Wolk: Its disadvantaged relative to natural gas. Natural gas has a higher fraction of hydrogen than coal does, so you burn natural gas you make less CO₂, more of water, and that is the way it is disadvantaged.

Danny Wooton: Thanks again, Ron. I have three or four quick announcements. There is a message center in the lobby here at the Gateway Center, and all the messages that come in from your office are posted on the board in the lobby, so please check that before you leave. The exhibits are open and we encourage everyone to go visit and support the vendors who are supporting the IMI.

Charlie Woolbright and Mike Mitchell, would you please stand up. Charlie and Mike represent our membership committee, which has been an underutilized committee over the past several years. This is a new format for the 99th Annual Meeting; they are seeking your ideas and your input on how you feel this meeting was conducted and what we can do differently in the years to come. If you would, make your opinions known to Mike and Charlie.

This is the point in the luncheon when we pass the gavel from the President to the incoming President. It has been an interesting year, to say the least, with all the changes in the industry. But as the President of IMI, I have been privileged to be in contact with a lot of people across a wide spectrum of the Illinois coal industry that I ordinarily would not have had. It is very encouraging and gives me reason for great optimism about our future in Illinois when I run into these people who are so highly qualified, talented, and certainly have the enthusiasm for our future years to come. So, with all that in mind, I think the Illinois coal industry is going to have it tough, but I think we are going to survive; we are going to do well and it is because of you folks. Thank you for all your help you've given me the past year. The incoming President is Mike Reilly of Zeigler Coal Company. If not being the President of Zeigler Coal Company, the acquisition of Old Ben, and Chairman of BCOA is not enough, Mike's consented to be the president of the Illinois Mining Institute during its centennial year. Doc's Centennial Meeting Committee has some great plans for a large event next year for our 100th meeting. So, at this time I would like to pass the gavel to the next President of the Illinois Mining Institute, Mike Reilly.

Mike Reilly: Thanks very much. It is a little different this year than it has been in the past. Normally, our luncheon is the finale for our meeting. Danny's work is not over and mine has not yet started. Danny is going to finish out this meeting, so I will not officially begin my duties until the end of the meeting tomorrow. With that, I would like to pass the gavel on to Danny. I'm sure it must be a great deal of work. You don't realize there is so much work prior to this meeting getting everything together, and you've done a great job. Here is something to remember all the hard work that you have had. [Mike Reilly presented the souvenir gavel to outgoing President Danny Wooton].

Danny Wooton: Thanks, Mike. With that, the luncheon is complete, and Ilook forward to seeing you at the fellowship hour tonight from 5:00 to 7:00. Thank you.



1992 IMI President Mike Reilly presents souvenir gavel to outgoing President Danny Wooton.

FRIDAY MORNING

The Friday morning Business Meeting and Technical Session convened in the La Salle Room of the Gateway Center, Collinsville, Illinois, at 8:00 A.M., September 27, 1991. President Danny G. Wooton presided.

BUSINESS MEETING

Danny Wooton: Welcome to the business meeting this morning. The first thing I would like to do this morning is go through the Secretary-Treasurer's report by Heinz Damberger.

SECRETARY-TREASURER'S REPORT



Heinz Damberger: Good morning. Thanks for coming, I don't feel so lonely up here. First, the attendance figure everybody is asking about, is pretty much as it has been over the last several years, about 700. There are some people who had preregistered who have not shown up yet. I assume most of those will show up this morning, so I think we will be well over 700 [registered students–22], when it is all said and done.

The financial situation of the Institute, I am happy to report, has improved significantly because of our move to Collinsville. The prime reason for that is we have substantially increased the number of exhibits. Last year we had 32 or 33

exhibitors; we have 65 here. In addition, we have the hospitalities, and there are some spaces rented on a square-foot basis. So, overall, this means a very significant increase in our income. The bottom line, which is probably what you are most interested in, shows an increase of over \$5,000. We are ending our fiscal year with a cash balance of \$27,700*. Last year, we had a cash balance at the end of the year of \$24,697. So that is a significant improvement. We are projecting an improvement down the road as well. The main thing down the road that I see is that we make sure our exhibitors feel good about this meeting. That you people in the industry show an interest in what they are doing and that way they will come back in future years. We still have room for expansion, and we certainly hope next year during the Centennial Meeting that we will be filling this exhibition hall. There is space for about 100 booths in there. I think we will do some rearranging of the entire setup based on this year's experience, but certainly we expect next year to have a significantly increased income. I might mention that the potential for increase in income from exhibits is in the order of magnitude of \$6,000 to \$8,000, and if we fill the room, it is even more.

Yesterday, the Board approved some new expenditures related to how we operate. One is that we will be purchasing a facsimile (FAX) machine. Everyone wants to use "FAXs" these days, and we are not set up at this point; we definitely need one. We also want to improve our computer facilities so Phyllis can do the camera-ready copy of our Proceedings herself, rather than having to depend on others. Overall, an expenditure of \$2,800

^{*} Note correction of this statement on page 84.

has been approved by the Board for the coming fiscal year. The Board also talked about some other extra expenditures relative to the Centennial Meeting and relative to our scholarship program, and you will be hearing about that further. As far as advertising in our Proceedings is concerned, we are holding our own, but just barely. We have been close to the same level for several years now. The Advertising Committee met on Wednesday and came up with some new ideas. We think that we will be able to at least hold our own and hopefully improve our income from advertising. Those are the two principal sources of income, the exhibits and the advertising. The other important income is the dues, which is at around \$17,000 to \$18,000 now. We have some other new expenditures. We have to pay rent for this facility, which is something we did not have to do at the hotel in Mt. Vernon or when we were in Springfield. We need insurance here, which is some \$600 to \$700, and we have added the continental breakfast on Friday morning in the exhibit area, to attract people to the exhibits.

The auditing committee has approved the financial report. I have a copy here for anybody who wants to look at it, and if anybody wants a copy, I'll be happy to send them one. If there are any questions, I'll be glad to answer them. Thank you.

FINANCIAL STATEMENT SUMMARY

Cash Balance Beginning		Cas	sh Balance Ending	
9/1/90	\$24,697		8/31/91	22,346
Advortiging	20.240	Co	EXPENSES	17 424
Annual Duos	17 400	An	neral Monting Expense	21 706
Luncheon Receipts	1 776	Pul	lication Expenses	21,790
DinnerDance Receipts	3 020	Pr	oceedings	11 837
Exhibit Fees	16 565	Sch	olarshins*	16.031
Registration Fees	3,850	Jei	ioiarships	10,001
Interest	1,105	Su	btotal Expense	67 098
Miscellaneous	182	Ju	biolar Expense	01,050
Convention Cash	600			
Subtotal Income	64,747			
TOTALS	\$89,444			\$89,444
Pour August	Assets as	of A	ugust 31, 1991	
Fixed Assets	61	101	Liquid Assets	00.046
Computer	8,0	084	Cash	22,346
Office Equipment	2,0	567	Bonds	500
& Furniture	1/	156		
ELEVE VELOVELLAN	1. 12 A			
TOTAL ASSETS ON 8/3	31/91		\$34,753	
TOTAL ASSETS ON 9/1	1/90		\$36,900	
1000-011055			\$ -2 147	

*Both 1990 and 1991 Scholarship payments were made in this fiscal year.

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Danny Wooton: As Heinz mentioned, the auditing committee, chaired by Bill Hake, has reviewed these records and approved them, and at this time, I would entertain a motion from the floor to adopt the financial report as presented and audited. [Motion was made to approve the 1990-91 Financial Report. The motion was seconded and approved by a vote of the membership].

The next committee report is the Advertising Committee report by Chairman, Jerry Watkins.

ADVERTISING COMMITTEE REPORT



Jerry Watkins: Good morning. The Advertising Committee met Wednesday night and went over what we have done the past year and the plans for next year. So far, we are running 82 ads, compared to102 last year. However, our mailings were about two weeks late; taking that into consideration, we are probably running about level with last year. Total receipts for advertising in 1989-90 were \$20,700; for 1990-91 they were \$20,240. On the exhibit side, we have really good news, as Heinz alluded to. If you get

a chance, visit our exhibitors, talk to them, thank them for their participation in support of IMI, because they do a lot to keep this organization alive. If anyone has any questions, please bring them up now. If not, we would like to thank all of the members that attend and support the IMI. I really thank Phyllis Godwin, and a special thanks to the Board; they took a lot of chances with the move, and some of these things are "unknowns." They took the chance on this place last year, and I think they deserve a lot of gratitude from all of us. It has been a good move.

Danny Wooton: Thank you, Jerry. We appreciate the work of the Advertising Committee members and especially the chairman.

Now, the Scholarship Committee report by Chairman Bob Shanks.

SCHOLARSHIP COMMITTEE REPORT

Robert Shanks: The Committee consisted of Jim Gill, Vice President of Operations from MAPCO Coal; George Woods, Dean of Mining Technology at Wabash Valley College; Dr. Paul Chugh, Professor and Chair of the Department of Mining Engineering at SIU-Carbondale, and myself. Our committee met in August and developed our recommendations for the IMI scholarship program for the 1992-93 school year. This plan was presented to the Executive Board during yesterday's meeting. It included increasing the level of scholarships from \$8,000 this year to \$10,000 next year. The Board thoroughly discussed the proposal and voted to defer approval of the committee's recommendation until the winter Board meeting. It was felt at that time that the financial condition of the Institute would be a little clearer, with respect to special expenses related to the Centennial meeting. So, at this time, I would like for the schools that were included in this year's scholarship program to step up to the microphone and talk a little bit about what is going on at their school and also introduce any students that they have with them today. Paul, would you like to take the lead, please?

Paul Chugh: Thank you, Mr. Chairman, for the opportunity to briefly talk about the Department of Mining Engineering and IMI's sponsored scholarship program. The department is alive and kicking and growing as fast as it possibly can within the constraints of available resources. In spring 1991, we hired a person to coordinate the undergraduate student program. His name is Lyle Cline. Because of his efforts, the undergraduate enrollment this fall is 20 students and we have an additional 10 students taking classes at John A. Logan College who will move into our program next year. Our goal for next year is to increase our undergraduate enrollment to 30 students. The Department is highly appreciative of the efforts of Lyle Cline, and we are really pleased to have him with us. Our graduate student enrollment this fall is 18 students; 15 in the masters program and three in the doctoral program. We graduated one student with a B.S. degree and eight with M.S. degrees. The B.S. graduate is working in Illinois. This summer we placed five students with four coal companies and one limestone company. And one of our students is co-oping with a coal company in western Kentucky. Based on input from our advisory board, and the aggregate industry in Illinois, we have initiated an undergraduate program in mining engineering with an emphasis on aggregate industry. The details of the program are available at our exhibit booth number 86. We have one student interested in the aggregate program this year. One of the faculty members retired and we were successful in replacing him with a person from Virginia Polytechnic Institute and State University, specializing in coal processing. His name is R. Q. Honaker. He has done a lot of work in the area of column flotation. During his short tenure at SIU, he has established beyond a doubt that he is a competent instructor and a competent researcher. We are really excited about having him in our department. During this past year, we were also successful in developing a universityindustry-government cooperative research program on disposal and utilization of coal combustion residues, and we hope to implement it within the next couple of weeks. We have developed an M.S. degree program for working engineers in the coal industry who are interested in environmental problems associated with surface and underground mining. Again, the details of program are available at our booth in the exhibit hall. Our advisory board has recommended that we emphasize three things during the next year: to enhance our undergraduate enrollment, to significantly increase our outreach programs for the mining industry, and to involve more industry people in our graduate programs. I'll be reporting to you on these subjects at next year's meeting.

Let me quickly report on the scholarship program. Last year we were given \$3,500 for the scholarship program. We awarded a total of five scholarships. Their names are: Patricia Lockett, she is co-oping in western Kentucky; Richard Robben graduated and is working in the state of Illinois; Mary Evans is taking off a semester or two; she got married and is settling down; Stanley Reeder and Brian Hoyt. In addition to these students, I have a few other students from SIU; if you would like to stand up. Dennis Connor is a junior in the Department of Mining Engineering and is doing dual degrees in EE and mining. Jeremy Worley is a freshman in the Department of Mining Engineering and very keen to learn about mining. Charles White, an M.S. student in mining engineering, has a lot of experience in the mining area; we were really happy to attract him to our department. Mr. Ahner is effectively on loan from Coal India, specializing in the coal problems. Mr. Saluta is also on loan from Coal India and is specializing in the area of metal economics.

On behalf of Southern Illinois University, the College of Engineering and Technology and the Department of Mining Engineering, I sincerely appreciate the support of IMI for attracting high-quality students. I also want to take this opportunity to congratulate all the scholarship winners for a job well done. Thank you.

Robert Shanks: Thank you, Paul. Do we have a representative from the University of Missouri at Rolla here today?

Norman Smith: Good morning. I must pass regrets from our Department Chairman, John Wilson; he had a command performance up in Columbia today. I certainly do want to thank the Illinois Mining Institute for the three scholarships that were provided to our students this year. They are: Daron Hunt from East Alton, Craig Sorensen from Kansas; and Khan Powell, who is also from Kansas.

I'd like to give you a few statistics on the department. To begin with we had a pretty successful year. Our new department head is quite aggressive and has done a fine job. We have 70 mining students right now, eight are graduate students and 62 are undergraduates. That is quite good, considering that this semester we brought in 35 new mining students. Things are looking up! The mining industry has helped tremendously with scholarships. We have over \$100,000 worth of scholarships for these students, and although we will probably lose a few of them, we feel we are pretty confident that once we get them into the program, even though they don't know much about what they are doing at the beginning, they pretty well

hang with us as time goes on. Last year, we graduated nine students. They went to a variety of locations: one went into the Navy; one went to Round Mountain, Nevada; two to Consol, one with coal, one with ASARCO; one to Smith Quarries in Louisiana, Missouri; one to China and one to Arch Minerals. Our prospect for this year is for only about five students. We had a lull several years ago where we didn't get any freshmen. In the summer, for any student that wanted a job, there was one out there for him. We even had students who did not show up at UMR that got mining jobs. I want to thank you again for your support.

Robert Shanks: Thank you, Norman. Is there a representative from Wabash Valley College?

John Howard: Thank you. I am George Woods' assistant. Mr. Woods could not be here today. This year we awarded IMI scholarships to three students: Charles Lodge, from our cooperative program with John A. Logan College in Carterville, Paul Spicer and Lonnie Mitchell from our cooperative program at Southeastern Illinois College in Harrisburg. On behalf of all of our students, faculty, and administration, I want to thank you for your continued support.

Robert Shanks: Now, a representative from Rend Lake College?

D. J. Johnson: We apologize; one of our students is from Hamilton County and we had to wake the chickens up this morning to get an egg for breakfast, so we were running late. We at Rend Lake College do appreciate the support of the Illinois Mining Institute. I have two students here with me today that received IMI scholarships: The way we do it at Rend Lake College is we accept letters or applications from high schools in our district. Then our faculty look the letters over and decide who deserves the money the most: Gerald Irvin and Bobby Wildermuth. Bobby is from Pinckneyville. Two fine young men, thank you.

Robert Shanks: That concludes our Scholarship Committee Report.

Danny Wooton: Thank you, Bob. Generally, we hear from the committee that selects the honorary member, but due to the format change, with our luncheon yesterday, most of you know that Dick Shockley received the award this year. The committee was chaired by Robert Danko. Thank you for the work of that committee; you certainly picked a fine candidate in Dick Shockley.

NOMINATING COMMITTEE REPORT

Danny Wooton: Dick Shockley, chairman of the Nominating Committee is not here today, so I would like to read the names of the slate that they have selected for nomination to the Board. Executive Board terms for Robert Danko, Bill Hake, Tom Lippencott and Spike Schonthal expired this year. We appreciate the work they put forth. To replace them for next year are Randy Britton, National Mine Service; Neil Martin, R & H Service and Supply; Tom Austin, Freeman United, and Robert Gullic, Sahara. Nominated for Secretary-Treasurer, Heinz Damberger; First Vice President, Bob Danko, Peabody Coal; Second Vice President, Bob Shanks, Arch of Illinois; and President Elect for the 100th year, Michael Reilly, President of Zeigler Coal. This is the slate the Nominating Committee brought before the Executive Board yesterday. Are there any nominations from the floor? [Pause] At this time, I would entertain a motion to accept the slate as presented by the Nominating Committee. [Motion was made, seconded and approved by the membership present].

Is there a representative of the Centennial Meeting Committee here this morning? [No Response] The Committee is meeting this morning. They have great plans for next year.

Is there any new business from the floor?

Heinz Damberger: I must make a correction of my financial report. The figure \$27,700 is the projected balance. Our actual current balance on hand for this year is \$22,346. Our projections are pretty solid, however, because most of the income items we already have on hand, so I'm quite confident that we will reach that balance of \$27,700 at the end of our fiscal year in August, 1992.

Danny Wooton: Are there any other items to be brought up during this Business Meeting? [Pause] I appreciate the work of all the committees. The reports you see here today are just a small fraction of all the hard work they have done over the past months. I would also like to say that the IMI is very fortunate to have an Executive Board with such quality people on it. I've been going to these Board meetings for several years now, and there are lively discussions on just about every topic. I think that is a tribute to the quality of people on the Board. So, I would like to recognize them and express my gratitude for the effort they put forth and the sacrifice of their time that they make.

At this time, I would like to adjourn the Business Meeting of the 99th Annual Meeting of the Illinois Mining Institute. Ilook foward to seeing you at the continental breakfast and the technical session later this morning, thank you.

FRIDAY MORNING TECHNICAL SESSION

Dave Webb: Good morning ladies and gentlemen. Welcome to our session this morning. Our first speaker is Paul Barber, Preparation Plant Manager of the Captain Mine at Arch of Illinois. The title of his paper is "Managing Change: Coal Preparation at Arch of Illinois."

Paul Barber: Thank you, Dave. Good morning.

[Mr. Barber's paper was not available for publication]

Dave Webb: Our next speaker is Dale Norris, Preparation Plant Manager at the Galatia Mine, Kerr-McGee Coal Company. He will speak on "Coal Preparation at the Galatia Mine."

COAL PREPARATION AT THE GALATIA MINE

DALE W. NORRIS

Manager Preparation Plant, Galatia Mine Kerr-McGee Coal Corporation Galatia, Illinois



BACKGROUND

Galatia is an underground dual seam mine, mining both the Herrin (No. 6) and Springfield (formerly Harrisburg) (No. 5) seams. Plant operations commenced in late December, 1983, with the first shipment going to Union Electric in January, 1984. Due to quality differences between the two seams, each coal is transported to its own breaker station and stored separately prior to processing in the plant.

COAL PROCESSING

The No. 6 seam is of a more uniform quality and is stored in the stacker pile. The No. 5 seam is stored in twin 12,500-ton raw coal silos and separated by sulfur contents. Raw coal is brought into the plant via a 48-inch conveyor at the design feed rate of 1,000 tons per hour. Galatia is a heavy media, spiral and froth flotation plant. This concept was chosen to allow cleaning at a wide variation of separating gravities (figure 1).

Coal is processed in a 22-foot Weir Daniels heavy medium stainless steel vessel. Double deck drain and rinse screens (10 feet by 16 feet) are utilized on clean coal with two single deck screens (6 feet by 16 feet) on refuse The coarse coal drain and rinse top deck product is crushed to a 2inch top size and the 1 1/4-inch by 1/2-inch coal is dried in V.C. No. 48 centrifuges. The intermediate section of the plant cleans the 1/2-inch by 28mesh portion of the plant feed.

Raw coal is pumped to four 7-feet, 10-inch desliming sieves that feed 10 feet by 20 feet single deck screens. The large amount of sieve and screen surface allows for minimal misplaced material in the heavy media cyclone circuit, typically, two or three percent minus 28 mesh. There are four 26-inch Krebs cyclones in the plant, divided into two circuits. Each circuit has two 10 feet by 16 feet single deck drain and rinse screens and two V. C. 48s for clean coal dewatering. Each circuit has two 6 feet by 16 feet refuse drain and rinse screens and a single refuse dewatering centrifuge. This machine is necessary to obtain the proper surface moisture for impoundment construction.



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The final and most changed circuit in the plant is the one for fine coal cleaning. Raw coal (28 mesh by 0) is pumped to two banks of six Krebs 15inch classifying cyclones. In the original flow, the 28 by 100-mesh cyclone underflow was fed to four Derrick high frequency desliming screens prior to flotation in Denver Sub A cells. The premise was that any misplaced material would either be high ash or liberated pyrite. Therefore, the Derricks could screen out this waste material prior to flotation.

Although this approach was somewhat successful, extensive testing showed that a higher-quality, lower-sulfur product could be attained using coal washing spirals. In fact, an additional 28 tons per hour of material is being recovered and the impact on total plant SO₂ runs from .05 pounds to .15 pounds per million Btu reduction. The spiral clean coal is repulped and sieved to eliminate additional misplaced product.

Overflow from the 100-mesh by 0 classifying cyclone is processed through two banks of four 500 cubic feet Denver DR cells. The bank of five 300 cubic feet Sub A cells is used to process spiral middlings, as required. All 28 mesh by 0 clean coal is dewatered in three 44-inch by 132-inch Bird screen bowl centrifuges.

Two Linatex thickening separators are used to thicken spiral rejects and refuse centrifuge effluents prior to feeding. Two vacuum-assisted Derrick high frequency dewatering screens allow the 28 by 100-mesh waste to be placed in the landfill rather than pumped to the impoundment. The combined 4-inch by 100-mesh refuse is conveyed to a 300-ton refuse bin where it is loaded into 75-ton haul trucks for disposal in the refuse area. The minus 100- mesh tailings from fine coal flotation are settled in a Denver 150-feet diameter static thickener. From the thickener, the solids are then pumped to the slurry impoundment—this is an engineered facility that is inside the refuse pile itself. A series of clarifiers and sediment ponds not only capture run-off and mine water, but provide the largest share of plant make-up water.

At Galatia, there are four clean coal silos each with a 12,500-ton capacity. Currently, two each are being used for the No. 5 and No. 6 seams. This arrangement allows for custom blending if required. From the silos, coal is withdrawn at a rate of 4,500 tons per hour and transported to the loadout tower on a 60-inch belt.

Galatia uses a batch weighing system that receives the lightweight of the car from a certified track scale and allows for maximum loading without overloading the cars. This system runs at +350 to 500 pounds of the 263,000pound target.

Also in the loadout tower is a three-stage ASTM sampling system.

Galatia coal is currently being shipped to our primary customer, Union Electric and the export market.

CONCLUSION

Galatia continues to be involved in emerging technologies, and we are currently involved with the Illinois State Geological Survey in a research program on column flotation; a 30-inch by 35-feet Deister column has been installed in our plant.

At Kerr-McGee and at the Galatia mine, we truly believe that uniform quality and sound coal preparation methods are two very important building blocks for a successful operation.

Dave Webb: Thank you, Dale. Our third speaker this morning is Carl Reidelberger, Mine Superintendent for the Spartan Mine, Zeigler Coal Company. Carl has been involved in mining for 20 years with Zeigler. He has worked at all different levels of operations. His paper today is on "Productivity Gains at Zeigler Coal Company's Spartan Mine." Carl.

PRODUCTIVITY GAINS AT ZEIGLER COAL COMPANY'S SPARTAN MINE

BYFORD C. REIDELBERGER

Mine Superintendent, Spartan Mine Zeigler Coal Co. Sparta, Illinois



BACKGROUND

The Spartan Mine started producing coal in 1953. At that time, it was known as the Bradbury Mine and utilized conventional type equipment, using compressed air to break the coal. The mine was purchased in 1956 by Zeigler Coal Company.

The Spartan Mine is a three-shift operation with three operating units. We schedule nineunit-shifts a day and average running seven

and one-half a day. We have 118 hourly employees and 30 salaried employees.

Our mining sections have all the same type of equipment, Joy 12CM-7 continuous miners with 44-inch drums, Joy 10SC22 shuttle cars, Lee Norse twin boom roof bolters and Long Airdox feeder breakers. However, it is not our equipment nor our mining methods that make us different—it is our commitment to safety and maintenance and our standards.

OPERATING PROCEDURES

Our slogan, or creed, is: "Safety - Maintenance - Production." With this in mind, we designed our sections and set the standards with safety, ventilation and roof support as our primary goals. We adopted some standard operating procedures that were no more than good coal mining practices, keeping in mind that we were committed to safety first, maintenance second and production third. Our goal was a mine free of accidents and violations.

To insure that the safety of our employees remains our primary objective, the following standard operating procedures have been implemented over the past several years. First, we defined these procedures and policies. Then, we provided adequate training of our employees, allowing the use of overtime. The accomplishment of these tasks, such that it became second nature to perform, has provided Zeigler Coal Company with an additional dividend of increased productivity (table 1). Table 1. Productivity of Spartan Mine.

	1985	1986	1987	1988	1989	1990	1991
Tons*/Unit-Shift	498	569	620	635	634	627	637
Tons*/Man-Shift	17.0	22.5	24.3	25.8	26.4	26.2	28.9

*clean coal tonnage

EXAMPLES OF COMPANY POLICIES

To explain what we do, several examples of typical company policies are discussed below relative to their most important intent. One of our first policies concerns the continuous miner and is designed to prevent electrical hazards in handling our miner cables.

Policy: Continuous Mining Machine Cable. Due to the downtime on fixing the cable and eventually having to enter the cable into the machine, we would save time and increase productivity if we would enter the cable into the machine when the damage to the cable happens. Zeigler policy will be that any damaged place of the cable within 25 feet of the machine will be re-entered.

Our intention is to insure that our operators handle the safest cable we can provide. The added benefits are reduced downtime and an extended life of the miner cables.

Policy: Trailing Cables. The second policy on miner cables concerns splices in the cables. There shall be no permanent or temporary splice or damaged place on the trailing cable of continuous mining machines at the start of each week. Only vulcanized splices will be accepted.

Again, our intention is to assure that our employees will handle the safest cable that we can provide. Our machines are 950 volt, as are those of many others. The added benefits are: reduced downtime; no cable violations, thus more runtime; not loading any faster, just longer. At the same time we standardized the splices we use.

Policy: Number of Splices in Trailing Cables. We have one more policy concerning trailing cables on our shuttle cars and roof bolters.

There will be no more than five taped splices in cables of our shuttle cars and roof bolters. When we reach five splices, the cable will be changed, or one or more of the permanently taped splices must be vulcanized, replacing the taped splice(s).

This policy has worked very well. It is not unusual to have five or six cars out of nine without a splice in the cable, or three or four roof bolters without a splice in the cable. The added benefits are: no violations of Code of Federal Regulations (CFR), Title XXX, Section 75.604, less downtime and a safe cable.

Policy: Continuous Miner Bits. Bits must be checked and replaced after each cut. We do not lose much time; only one or two bits, and sometimes none need to be replaced. Our intent in implementing this policy was to have our cutter head in top shape at all times. The benefits were decreased cost in replacing tri-tites and bit lugs and, by not having to replace bit lugs, less downtime. Each bit is designed to cut or shear a portion of the coal face. If one bit is missing, then it adds to the amount of cutting the next bit in sequence has to do, adding to the wear on the bit holder and the tri-tite.

Policy: Disciplinary Action. All disciplinary action should be wisely used for the sole purpose of making better employees out of the persons disciplined. Discipline or discharge shall be in accordance with the Bituminous Coal Operators Association (BCOA) contract and with company policy.

Part of the intent of the disciplinary action policy was to establish a procedure whereby we hold people responsible for their job performance. If we receive a violation for an opening in the panel, we hold responsible the section repairman who was in the shuttle car last. His file would be checked and he would be disciplined appropriately. The employee must bear a portion of the responsibility for a safe, efficient coal mine. This also benefits our cable policy mentioned earlier. When a cable is damaged, and it is obvious it was due to operator error or negligence, the operator or helper, or both, will be disciplined.

Policy: Alcohol and Drugs. Random urinalysis and testing for drugs and alcohol is performed several times during the year and on any individuals involved in a mine accident. Positive results from testing can result in a fiveday suspension or dismissal, depending on the amount of drug or alcohol found in the individual.

The intent of this policy is the commitment by Zeigler Coal Company to provide its employees with their moral and legal right to the safest possible environment in which to work and to protect each employee from the increased hazards associated with the adverse effects of drugs and alcohol in the work place.

PROCEDURES TO MINE INDIVIDUAL SECTIONS

In 1986, special care was given to train company personnel in the proper procedures for mining the individual sections, maintaining trailing cables, initiating procedures for belt move up and power moves, standards for fresh water line, and to set goals and budgets for production.

Policy: Water Lines. When a steel water line serves more than one unit, a line no less than four or six inches in diameter shall be installed in the belt entry, and water outlets shall be at intervals of no more than 300 feet.

We use four-inch steel water lines throughout the mine mainlines, as well as in panels, rooms, etc. Such lines take more labor to install initially, but we avoid downtime from a rock falling and breaking the line. By going with four-inch lines, we assure adequate water volume to maintain the required pressure for the miner sprays. Policy: Overcast Construction. Overcasts are to be constructed of substantial, fireproof materials in a well-designed manner consistent with company policy and federal safety standards to minimize air leakage and excessive costs and manpower usage for maintaining their effectiveness. All main entry and submain entry overcasts used for major air splits and ventilating more than one unit shall be constructed according to diagrams and procedures provided by the company. Prefabricated steel overcasts may be used for single splits of air serving one unit only.

The idea was to build overcasts that will provide the proper amount of ventilation at all times and to avoid having to go back for repairs that tie up valuable manpower. We do not use any steel overcasts at the Spartan Mine. We shoot the top down from the roof to get needed height rather than from the floor. We construct our overcasts using solid concrete blocks, railroad iron and a concrete floor.

Policy: Belt Haulage. The feeder car and the belt tailpiece shall not be more than four open crosscuts from the face. When belt moves are required, moves shall be for two breaks.

Our intent was to avoid long pulls, to maintain haulage at an optimum level, to reduce wear on cars, to contain the amount of section area that must be maintained and to set a standard that supervisors prepare for and adhere to when they move the belt or power. We also outlined the steps and events that should take place in the shift prior to a belt move, as well as the steps and the normal order of events during a belt move.

Policy: Power Moves. The power center for a section must be moved up when the roof bolting machine cannot bolt the farthest outside place to be mined.

Over time, the power move has been integrated in the belt move, and the steps have also been outlined in chronological order. Thus, the power is moved up in the same shift as the belt. Our regular coal crew performs these two jobs. We do not have an idle shift when it is time to lay belt or move power; we shut down and make the move.

Policy: Shuttle Car Usage. Two shuttle cars shall be utilized on fully manned working sections scheduled for coal production. Units shall be budgeted for no less than 500 tons of clean coal. A third shuttle car shall be available for maintenance and breakdowns.

We have three cars on each section, but we only man two. We also have two roof bolters on each section, but man only one. The extra shuttle car and extra roof bolter are used for breakdowns and to allow the shuttle cars and roof bolters to be switched out for service and cleaning. Our policy is to service each piece of equipment each shift, regardless of the amount of tonnage it mined the previous shift.

Policy: Equipment Maintenance and Housekeeping. This policy supercedes all other policies and programs on servicing mine equipment, surface and underground. All equipment to be used must be fueled and greased each

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shift according to the manufacturer's specifications and recommendations. All lights and brakes must be in safe operating condition. All electric cables must be hung properly where required and must be protected. Trailing cables must be kept out of roadways and protected from damage. An adequate maintenance program that is approved by the mine superintendent or facility manager must be instituted on electric motors and brushes on electric motors. An adequate housekeeping program must be implemented at each property and complied with.

We established procedures for cleaning and rock dusting that gave responsibility to each employee on the section. Each supervisor draws in on his section report each cut he makes on his shift so that we have a record to check and determine which crew cut which place. We hold the section supervisor responsible for his section, the number of injuries, violations, the condition and the housekeeping of his unit, etc. John Grimaldi and Rollin H. Simond say, and I agree, that each supervisor must accept responsibility for all safety failures under his jurisdiction.

Policy: Ventilation of Working Face. Section foremen shall assure that a minimum of 5,000 cf/min. of natural air currents are being delivered to the inby end of the line curtain with the scrubber off, before the miner commences penetrating the face of each working place. Once the scrubber is turned on, then the cushion should guarantee that the ventilation is more than adequate for efficient mining and complies with the law.

Policy: Roof Bolt Installation. In an effort to further reduce exposure of the employees to unsupported roof under normal roof conditions, bolts shall be installed in the following manner:

- 1. Each row of bolts will be installed in a straight line, parallel to the face.
- Each bolt will be equal distance from the face and be spaced no further than two and a half feet from the deepest penetration of squared faces.
- Rib bolts will be spaced no further than four inches from the rib. No bolt shorter than five feet will be used.

Policy: Face Advancement. On coal-producing units, the cycle of cuts developed to mine entries or rooms will be worked in sequence to assure that all faces are kept even (Fig. 1). If the standard mining sequence is altered for any reason, the development cut sequence will be re-established during the next cycle to even up the faces. This procedure must be followed to assure systematic mining of crosscut openings and face advancement.

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PERIMETER MINING

Figures 2 and 3 show how we utilize our sections to recover as much coal as we can at limited cost. We cut 20 feet and 18 feet wide and leave 10foot pillars between each cut. We instruct our operators to only take coal; it is better to leave a little top coal. We get about 85 to 90 tons of coal out of each cut, and the only reject is the inherent reject in the coal. An average panel has 28 cuts, so we pick up 2,380 tons of coal without bolting.



Figure 2. Retreat mining sequence of rooms.



Figure 3. Retreat mining procedures.

CONCLUSION

These changes were not made without problems. We experienced skepticism from the salaried employees and resistance from the hourly employees because in the past, employees had not been held responsible for their performance.

As I said earlier, our goal is to be a coal mine free of accidents and violations. We have not reached our goal in accidents, but we are making progress. In 1991, we have had one quarter with only one violation; in the third quarter we had no violations during regular inspections. Our policy is to investigate every time we have an accident and to devise a plan to prevent this type of accident from happening again. I am not just talking about injuries to our employees; any type of accident that occurs in the work place, such as a roof fall, is investigated. The result is an efficient three-unit coal mine that has gone for over two years without a violation on the belt line, mining 1.3 million tons of clean coal a year.

Dave Webb: Thank you, Carl. Our final speaker this morning is Curtis Wagner. Curt is Project Engineer at Monterey Coal Company's No. 1 Mine in Carlinville, Illinois. The topic of his presentation this morning is "Pneumatic Backfilling of Arched Roof Support in the East Hornsby Development Area of the Monterey No. 1 Mine".

PNEUMATIC BACKFILLING OF ARCHED ROOF SUPPORT IN THE EAST HORNSBY DEVELOPMENT AREA OF MONETERY NO. 1 MINE

CURTIS WAGNER

Project Engineer Monterey Coal Company Carlinville, Illinois



BACKGROUND

During the late 1960s, Monterey Coal Company began development of the No. 1 Mine. Production began in 1970. One of the initial areas of development was the Main East Submain. As the submain progressed, panel units were developed to both the north and south. Prior to 1973, the Main East Submain enjoyed a predominantly limestone or black shale roof. However, during 1973, the Main East Submain reached the Energy Shale

roof that typifies the western edge of the East Hornsby Block. Further development of the Main East Submain was halted due to massive roof failures in this area. The remaining panels were mined out by year-end, 1979, and the submain was subsequently abandoned and sealed from the No. 1 Mine ventilation system. At that time, the reserves to the east of the submain development, known as the East Hornsby Block, were generally considered unminable due to roof control problems, and the western edge of the Energy Shale roof became the accepted eastern boundary of the No. 1 Mine Block.

In 1982, plans were developed for a project in which one mining unit from the Monterey No. 1 Mine would mine into the East Hornsby Area to determine the mineability of the adjacent low sulfur East Hornsby Block. The key objectives of the project were to assess the roof control requirements of the Energy Shale roof and to determine the productivity, mining costs, and coal quality of these reserves by using firsthand exploratory mining experience.

On May 6, 1983, the Main East Submain seals were broken and ventilation was systematically reestablished within the submain. Initial plans called for extending the Main East Submain into the East Hornsby Reserves and then mining a probe area. Poor roof conditions were expected when this area was reached; the roof fall problems were encountered significantly more frequently than anticipated, and they were more difficult to resupport.

The roof falls in this area were renovated in one entry for a 200-foot distance under the Energy Shale roof to assess the extent of the roof failures. Based on this experience, it was determined that renovation of the Main East Submain roof falls was feasible given the proper equipment, materials, and timetable. However, for an exploratory mining project this route was no longer attractive and a revised access route was developed using the eighth South Panel off the Main East Submain. The East Hornsby Reserves were evaluated from this location, and the Main East Submain was resealed in June of 1986.

RECENT DEVELOPMENTS

More recently, the passage of clean air regulations has prompted a renewed interest in mining "East Hornsby" quality coal. In November of 1990, and again in January of 1991, Main East Submain seals were removed and, again, the Main East Submain was systematically reventilated, cleaned up, and generally renovated. Plans were developed for providing access to the East Hornsby Reserves. These plans included cleaning up and securing at least one of the original Main East Submain entries through the massive fall area located inby the 8S/ME Panel.

Plans for the renovation of Entry No. 3 off the Main East Submain, the belt entry, initially estimated that approximately 7,000 cubic yards of material would have to be removed from the area during the arching process. This material was to be either permanently stored in the eighth South Panel or removed from the mine. As it turned out, the quantity of material to be moved was underestimated.

Rather than attempting to roof-bolt the area, Monterey Coal Company opted to install permanent arched roof supports as the fallen material was removed. However, the area above the arches was of some concern. This area was unbolted and, as such, exposed the arches and the lagging used between the individual arches to impact loading caused by material that could fall in the future. Early on, it was recognized that filling a portion of this void would protect the arches from impact loading while also providing stabilization to the arch set.

Identifying the most suitable material for filling the voids was the first hurdle. Three types of materials were evaluated. First, a cement-based foam was investigated. This material would have been effective, but the difficulty in handling the bagged cement product, mixing the materials properly, and the cost of the material itself made this material less than desirable. Second, Monterey Coal Company considered filling the voids with fly ash which would be bagged into geotextile bags and stowed above the arches. Transportation of the fly ash material, the bagging of the fly ash, and the methods of placing the bags in the area above the arches created several areas of concern. The third material considered, and the one that Monterey Coal Company chose to accept, was the fallen material itself. Using this material to refill the voids proved to be the most cost-effective means of protecting and stabilizing the arches. This approach also reduced the amount of material that would have to be either permanently stored in the eighth South Panel off the Main East Submain or removed from the mine.

TYPICAL OPERATIONS CYCLE

The typical procedure the Monterey Coal Company has employed can be summarized as follows:

- A continuous miner and shuttle car are used to remove the fallen material and transport it to a temporary storage site located in Entry No. 6 of the Main East Submain.
- The arched roof support is advanced into the area that has just been cleaned up.
- An eight-inch diameter pipe is advanced and standpipe reinstalled so that the arches can be backstowed.
- The voids above the arched roof support are backstowed using material located at the temporary storage site.
- Any material that remains at the temporary storage location after the backstowing cycle is complete is transferred, via diesel ram car, into the 8S/ME Panel for long-term storage.
- The standpipe is removed in preparation for loading.

At this time, I would like to focus on the equipment that Monterey Coal Company, in cooperation with Frontier-Kemper Construction, Inc., has utilized in backstowing material within the Main East Submain.

THE PNEUMATIC BACKSTOWING EQUIPMENT The system that Monterey Coal Company is currently using consists of the following equipment:

 A Stamler feeder equipped with a chunk breaker is used to reduce the size of the feed stock. The feeder is typical of the belt conveyor feeders

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that the No. 1 Mine uses in its production units. It operates on 575 volts AC power and is the only component of the backstowing operation that was provided by Monterey Coal Company. The remainder of the equipment was leased from the Frontier-Kemper Construction, Inc.

- A 75-foot long, 30-inch wide belt conveyor moves the material from the Stamler feeder discharge to a grizzly which is located at the discharge end of the conveyor.
- A grizzly culls out material greater than three-inch by six-inch. This
 material is either recycled through the system or moved to the
 permanent storage location in the 8S/ME Panel.
- A Brieden KZ-30-E Pneumatic Stowing Machine feeds the material into a high velocity air stream. This piece of equipment is the key to the whole operation. It is specifically designed for stowing operations which employ high air velocities.
- The Brieden KZ-30-E is a rotary airlock feeder rated for 35 cubic meters of material per hour. It is typical of most rotary airlock feeders in that it has a horizontal rotor with six cellular pockets that transport material from the inlet at atmospheric pressure to the outlet where it is injected into a stream of pressurized air.
- This stowing machine is classified as having medium capacity. It is
 operated by a 7.5 kW motor. It can be linked with a Brieden crushing
 unit to assist in sizing of the feedstock. The machine is also available
 with wheels, so it can be easily moved when being used.
- A Gardner-Denver Blower creates the air currents which transport the material into the voids above the arches. These air currents commonly approach 80 miles per hour. The blower is powered by a 400 horsepower motor and displaces 4,500 to 5,000 cubic feet per minute. The maximum blowing pressure is 22 PSI with a normal operating pressure of 17.5 PSI. The blower has the capacity to move 30 to 40 cubic yards of material per hour.
- An eight-inch diameter pipe is used to transfer the material from the stowing machine location to the inby end of the arched roof support where the material is discharged above and behind the inby arch set. During the initial removal of fallen material and extension of the arched roof support, the standpipe and elbows, located at the inby

end of the piping system, are removed. Prior to backstowing, the piping is extended and the elbows and standpipe are reinstalled. As this project reaches its conclusion, there will be approximately 900 linear feet of piping installed along Entry No. 3 of the Main East Submain.

A pneumatic control panel controls the air flow within the system.

SUMMARY OF RESULTS

While this project was the first in which fallen roof material has been used as the backstowing materials, the operations at the No. 1 Mine have proven successful. There were instances in which the backstowed material reached an estimated depth of 16 feet above the arched roof supports. The backstowing operations greatly reduced the volume of material that had to be transported into permanent storage while also protecting and stabilizing the arches. The Brieden Pneumatic Backstowing machine, coupled with the Gardner-Denver blower, consistently proved capable of transferring 30 to 40 cubic yards of material per hour of operation.

Although Monterey Coal Company does not anticipate projects of this sort in the future, we have considered ways to improve the system. While the equipment employed had little or no trouble handling material that was approximately 3-inch by 6-inch in size, material that was larger than this would lodge in the elbows located at the inby end of the piping. With this in mind, and if entry-size limitations permit, a small roller crusher would prove very useful in properly sizing the material.

OTHER USES

As I mentioned before, this was the first project to use fallen roof material as the backfilling agent. However, the principle of pneumatic transfer of materials has been used in mining applications. Two examples of other applications are:

- Backfilling fly ash into a mined-out area is a European application. Because of its grainsize, the fly ash can be backfilled using pressures of up to 65 PSI. This is significantly greater than the pressures used in the No. 1 Mine operations. Higher pressures translate into higher air current velocities and greater transportation lengths.
- Raise-boring a shaft is another situation in which pneumatic transfer of materials has been used successfully. As an alternative to storing raise-boring cuttings underground, the material has been pneumati-

cally transferred to the surface. Typically, a borehole is installed near the future shaft site. Then, as the raise-boring cuttings drop into the mine, they are loaded into a backstowing machine and "blown" to the surface where they can be permanently disposed of.

ACKNOWLEDGEMENT

Any questions should be directed to the two individuals who have accompanied me to the IMI and have worked closely during this operation and are very familiar with the equipment used. Mr. Paul Mihalec is a mining engineer with Monterey Coal Company and is currently on special assignment associated with the renovation of the Main East Submain. Mr. Ed Holman is a Supervisory Representative with Frontier-Kemper Construction, Inc., and has been at the work site whenever backstowing operations were taking place. Ed has proved to be very knowledgeable about backstowing operations.

Dave Webb: Thank you, Curt. That concludes our technical session this morning. I want to thank our speakers for their presentations and the information they shared with us.

ADJOURNMENT

Danny Wooton: Thank you, Dave, for your work as program chairman, and thanks to all the speakers for their fine presentations. I would like to thank all of you for your attendance this morning. We appreciate your continued support of the IMI. Usually, we would all go have lunch together, but with this year's format, this technical session ends our meeting. With that, I adjourn this 99th Annual Meeting of the Illinois Mining Institute. I'll see you all next year for our 100th Annual Meeting. Drive safely.

CONSTITUTION AND BY-LAWS*

ARTICLE I.

Name and Purpose

The Illinois Mining Institute has for its object the advancement of the mining industry by encouraging and promoting the study and investigation of mining problems, by encouraging education in practical and scientific mining, and by diffusing information in regard to mining that would be of benefit to its members.

ARTICLE II.

Membership

Section 1. Any person directly engaged or interested in any branch of mining, mining supplies, mining appliances, or mining machinery may become an active member of the Institute. Any persons desiring to become a member of the Institute shall fill out a blank for that purpose giving name, residence, age and occupation. This application shall be accompanied by the current year's dues as established by the Executive Board.

Section 2. Honorary Member—Annually, one or more members recommended by a committee and approved by the Executive Board who has rendered outstanding service to the Illinois Mining Institute, and thereby to the coal industry of the state may be elected as an Honorary Member with dues being waived.

Section 3. The annual dues for active members and registration fees for the annual meeting shall be determined by action of the Executive Board. Any person in arrears on October 1, of the current year, after having been sent two notifications of dues, shall be dropped from membership. Members in arrears for dues will not receive the printed proceedings of the Institute.

Section 4. Any active member may become a life member by the payment of twelve times annual dues and shall be exempt from further payment of dues.

^{*}Last changed during 97th annual meeting, September, 1989. Previously amended at Annual Meetings of 1926, 1929, 1935, 1938, 1964, 1970, 1971, 1975, 1980 and 1983.

ARTICLE III.

Officers and Executive Board

Section 1. The officers shall consist of a President, First Vice-President, Second Vice-President, and Secretary-Treasurer. The services of all officers shall be without compensation.

Section 2. Nominations for officers and the Executive Board shall be made by a nominating committee of three (3) appointed by the President at least thirty days before the annual meeting, provided that anyone can be nominated on the floor of the meeting for any office for which an election is being held.

Section 3. The President, First Vice-President, Second Vice-President and Secretary-Treasurer shall be elected annually by the members present at the business meeting of the regular annual meeting and shall hold office for the ensuing year.

Four Executive Board members shall also be elected and shall hold office for the ensuing three years.

Section 4. In case of death, resignation, or expulsion of any officer, the Executive Board may fill the vacancy by appointment until the next regular meeting, when the vacancy shall be filled by regular election. In case of a vacancy in the office of President, the duties shall devolve upon the First Vice-President.

Section 5. The Executive Board shall consist of the officers, the 12 elected Board members, and three ex-officio members. The three ex-officio Board members are the current director of the State of Illinois Department of Mines and Minerals, the President of the Illinois Coal Association and the retiring President of the Institute.

ARTICLE IV.

Duties of Officers and Executive Board

Section 1. The President shall perform the duties commonly performed by the presiding officer and chairman and shall, with the Executive Board, exercise a general supervision over the affairs of the Institute between sessions.

Section 2. The First Vice-President shall preside in the absence of the President and perform all the duties of the President. The Second Vice-President shall perform all duties of the First Vice-President in the absence of the First Vice-President.

Section 3. The Secretary-Treasurer shall keep a record of each meeting, shall read and file all resolutions and papers that come before the Institute, sign all orders for money, and shall purchase necessary supplies.

The Secretary-Treasurer shall keep a true record of all money received and payments made on account of the Institute; shall pay out no money except on personally signed order, and shall retain these orders as vouchers; shall give bond in such sum as the Institute may provide, the premium on said bond being paid by the Institute.

The Secretary-Treasurer shall act as editor-in-chief for the Institute and may furnish the newspapers and other periodicals such accounts of our transactions and discussions as are proper to be published. The Secretary-Treasurer's own judgment is to prevail in such matters unless objection is lodged at a regular meeting or by the Executive Board.

Section 4. The President shall appoint an auditing committee annually to audit the accounts of the Secretary-Treasurer, and said audit shall be submitted to the annual meeting of the Institute.

Section 5. The Executive Board shall perform the duties specifically prescribed by this constitution; it shall supervise the expenditures and disbursements of all money of the Institute, and no expenditure other than current expenses shall be authorized without first having the approval of the Executive Board, and shall perform such other duties as may be referred to them by regular or special meeting of the Institute.

Section 6. The Executive Board may delegate work responsibility to Institute committees, appointed by the President, for conducting selected business of the Institute, but with all actions being subject to Executive Board approval.

ARTICLE V.

Meetings

Section 1. The annual meeting shall be held in the fall of each year and on such days and in such places as may be determined by the Executive Board of the Institute. Notice of all meetings shall be given at least thirty days in advance of such meetings.

Section 2. Meetings of the Executive Board shall be held on the call of the President, or at the request of three members of the Executive Board, the President shall call a meeting of the board.

ARTICEL VI.

Amendments

Section 1. This Constitution may be altered or amended at any regularly called meeting by a majority vote of the members present, provided notice in writing has been given at a previous annual meeting of said proposed change of amendment.
ARTICLE VII.

Order of Business

(6)

At all meetings, the following shall be the order of business:

- (1) Reading of minutes.
- (2) Report of Executive Board.
- (3) Report of officers.

(4)

(7) New business.(8) Election of officers.

Adjournment.

Unfinished business.

- Report of committees.
- (9) Program.

(5) Election of new members. (10)

ARTICLE VIII.

Dissolution

In the event of complete dissolution of the Institute, the cash assets of the Institute will be distributed to universities where the Institute has provided past scholarships, on an equal basis, for support of scholarships in Mining Engineering. Equipment will be donated to any not-for-profit organization that the Executive Board may determine to be worthy recipients.

Illinois Mining Institute Active Members

ABBA, MICHAEL S., Indus. Services Engr., Central IL Public Service Co., 1800 W. Main, Marion, IL 62959

ABERNATHY, BILL, Environ. Geologist, BDAT Environmental, Inc., 173 Chesterfield Indus. Blvd., St. Louis, MO 63005

ACTON, WILLIAMA., Sr. Project Engr., Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896

AHNER, ROBERT, Dragline Training Spec. Southern Illinois University, Southern Illinois University, Coal Research Center, Carbondale, IL 62901

AHRENS, WILLIS, Sales, Joy Technologies, Inc., Box 1269, Mt. Vernon, IL 62864

ALEXANDER, RON, District Mgr., Berry Bearing Co., 1250 N. Michigan Ave., Danville, IL 61832

ALLAN, TOM, Safety Analyst-Insp. at Large, IL Dept. of Mines & Minerals, 511 E. Walnut St., Gillespie, IL 62033-1559

AMBERG, TOM, Pres., Aaron D. Cushman & Assoc., Inc., 7777 Bonhomme Ave., Suite 900, St. Louis, MO 63105

AMBLER, ROBERT R., Warehouse Mgr., Mine #10, Peabody Coal Co., #6 Holly Court, Taylorville, IL 62568

AMICK, CAROL, Bus. Develop. Mgr., Celtite Technik, 150 Carley Court, Georgetown, KY 40324

AMOS, JOHN W., Vice Pres., Deister Concentrator Co., P.O. Box 1, Fort Wayne, IN 46801

ANDERSON, A. DALE, Dir. Res. Acquistion & Dev., A.D. Anderson & Assoc., Box 2488, Mt. Vernon, IL 62864

ANDERSON, BARRY, Terr. Sales Mgr., Cummins Gateway, Inc., 7210 Hall Street, St. Louis, MO 63147

ANDERSON, LYNN, General Mgr., Mining Div., Schroeder Brothers Corp., P.O. Box 72, Nichol Ave., McKees Rocks, PA 15136

ANDERSON, PHILIP, Purchasing Agent, Pyro Mining Co., P.O. Box 289, Sturgis, KY 42459 ARMOUR, MICHAEL K., Consultant, 1414 S. Fifth St., Springfield, IL 62703

ARN, DALE, Branch Mgr., Rudd Equipment Co., P.O. Box 290039, St. Louis, MO 63129-0039 ARNESON, N. ARNE, Pres., Ameson Timber Co., Rt. 1, Box 487, Steelville, MO 65565

ARNOLD, JAMES A., Surveyor, Crown III, Freeman United Coal Mining Co., P.O. Box 259, Farmersville, IL 62533

ARTH, ED, Service Mgr., Cummins Gateway, Inc., 7210 Hall St., St. Louis, MO 63147 ASBURY, JERRY, Sales Mgr., J&R Manufacturing Co., Rt. 2, Box 173F, Bluefield, VA 24605 ASHBY, MILTON, Pres., Ashby Electric Co., Inc., P.O. Box 55, Sebree, KY 42455 ASHBY, W. CLARK, Prof., Southern IL University, Dept. of Botany, Carbondale, IL 62901

ASHLEY, MARILYN, Inside Sales, Brake Supply Co., Inc., P.O. Box 447, Evansville, IN 47703-0447

ATTERBERRY, JIM, Gen. Mgr., Woodruff Supply Co., Inc., P.O. Box 626, Benton, IL 62812

AULL, JOSEPH M., Pres., TRIAD Mining Inc., P.O. Box 349, Rushville, IL 62681

AULL, TIMOTHY R., Vice Pres., TRIAD Mining Inc., P.O. Box 349, Rushville, IL 62681

AUSTIN, THOMAS J., Safety Admin., Freeman United Coal Mining Co., PO Box 100, West Frankfort, IL 62896

BABCOCK, BUCK, Mine Mgr., Black Creek Mine, Rogers Group, Inc., P.O. Box 849, Bloomington, IN 47402-0849 BACH, KENNETH J., Sales, Mine Safety Appliances Co., Rt. 1, Box 480, MaKanda, IL 62958 BADE, HAROLD, Pres., A.S.P. Enterprises, Inc., 1546 Fenpark Dr., Fenton, MO 63026

BAHR, E. WAYNE, Mgr. Coal Research & Dev., IL DENR, 325 W. Adams St., Springfield, IL 62704

BAINE, TOM, Shop Supt., Lebco, Inc., P.O. Box 656, Benton, IL 62812

BAKER, JON W., Relay Engr., Central IL Public Service Co., 10 Cottonwood Lane, Carterville, IL 62918

BAKER, TIM, Pres., Baker-Bohnert/Service Group, P.O. Box 169003, Louisville, KY 40256-9003

BAKER, WOODY, Sales Rep., Goodman Equipment Corp., Rt. 1, Box 31, Winslow, IN 47598 BARBER, PAUL B., Prep. Plant Supt.-Captain Mine, Arch of Illinois, R.R. 1, Percy, IL 62272

BARBOUR, DEWAYNE D., Branch Mgr., National Mine Service Co., P.O. Box 1766, Mt. Vernon, IL 62864

BARKLEY, DANIEL W., Subsidence Spec., IL Dept. of Mines & Minerals, P.O. Box 10197, Springfield, IL 62791-0197

BARNETT, ROBERT, Supv., John Ross Plant, Zeigler Coal Co., Box 123, Rt. 4, Marion, IL 62959

BARNHART, DICK, District Sales Mgr., Union Wire Rope, 8218 Spry Rd., Evansville, IN 47715

BAUCH, FREDERICK M., Vice Pres., Advanced Mining Technology, Inc., 295 Meadowlands Blvd., Washington, PA 15301

BAUER, FRED, Purchasing Mgr., Zeigler Coal Co., 50 Jerome Lane, Fairview Hts., IL 62208

BAUER, ROBERT A. (BOB), Head, Earth Hazards/Engr. Geol. Section, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

BAWEL, FRED, Prep. Engr., Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896

BEACHY, TIMOTHY A., Staff Geologist, Dunn Geoscience Corp., 1333 Butterfield Rd., Suite 540, Downers Grove, IL 60515-5610

BEAL, LARRY, Sales Supv., Century Lubricating Oils, Inc., P. O. Box 161, Marion, IL 62959

BEATTY, R. O., Sales Mgr., Capitol Machinery Co., Inc., P.O. Box 2008, Springfield, IL 62705 BEAUMONT, DANA, Pres., G. L. Beaumont Lumber Co., 216 N. Chestnut, Shelbyville, IL

62565

BEAVER, GARY, Pres., Lebco, Inc., PO Box 656, Benton, IL 62812

BECK, ROBERT E., Prof. of Law, Southern IL University, Law School, Carbondale, IL 62901

BEERKIRCHER, MARK, Operations Analyst, Monterey Coal Co., P.O. Box 496, Carlinville, IL 62626

BELCHER, JAY, Pres., Treasco Industries, Inc., P.O. Box 552, Madisonville, KY 42431

BELL, JERRY, Sales Rep., Flanders Electric of Illinois, 1000 N. Court St., Marion, IL 62959

*BELL, LANNY, (Retired), Roberts & Schaefer Co. (Retired), 5712 Brookbank, Downers Grove, IL 60516

*BENNETT, JOHN C., Peabody Coal Co., (Retired), 301 Greenhaven Dr., Belleville, IL 62221 BENNETT, PHILLIP E., Vice Pres. Sales & Marketing, Simmons-Rand Co., 4201 Lee Highway, Bristol, VA 24201-8499

BENSON, JOHN H., Pres., John Benson Electric Co., 1708 N. 8th St., St. Louis, MO 63102 BERRI, JR., ROBERT, RPG, Berri Exploration Services, 2807 Bremerton Rd., St. Louis, MO

63144 BERRY, L. REAB, Vice Pres. Mining & Dredging, GIW Industries, Inc., 5000 Wrightsboro Rd.,

Grovetown, GA 30813

BETZ, FRED, Vice Pres., Baker-Bohnert/Service Group, P.O. Box 169003, 1311 Bernheim Ln., Louisville, KY 40256-9003

BEVERIDGE, T. SCOTT, Director, Materials Mgmt., Arch Mineral Corp., City Place One, St. Louis, MO 63141

BHAGWAT, SUBHASH B., Head, Mineral Econ. Sect., IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

- BIEREI, GREGG, Mgr. of Engr. & Environ. Affairs, Arch of Illinois, P.O. Box 308, Percy, IL 62272
- BIRD, CURT, Pres., Acetylene Gas Co., 3500 Bernard St., St. Louis, MO 63103

BIRKETT, JAMES, Mgr. Purchasing & Stores, Central IL Public Service Co., 607 E. adams, Springfield, IL 62739

- BISHOFF, STEVEN M., Mgr. Environ. Engr., Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896
- BISHOP, MARY JO, State Mine Inspector, IL Dept. of Mines & Minerals, P.O. Box 899, Harrisburg, IL 62946-0899
- BISHOP, NICKI, Administrative Asst., Zeigler Coal Co., R.R. 4, Box 343, Benton, IL 62812
- BLACKBURN, JAMES, Vice Pres.-Land, Peabody Development Co., 200 N. Broadway, St. Louis, MO 63102
- BLAIS, RUSSELL A., Vice Pres., Marketing, Naylor Pipe Co., 1230 E. 92nd St., Chicago, IL 60619

BLAYLOCK, BOB, Supv. of Safety & Training, Cutler Mining Co., P.O. Box 1119, Sesser, IL 62884

- BLEVINS, TOM, Account Rep., FASLOC, E. I. DuPont DeNemours & Co., 14 White Oak, Bluford, IL 62814
- BLOSS, DONALD J. (DON), Sales Mgr., Midco Sales & Service, 11475 Page Service Dr., St. Louis, MO 63146

BOELTE, SCOTT, Dist. Sales Rep., B-Line System, 509 W. Monroe, Highland, IL 62249

BORDER, WILL, Sales Engr., Joy Technologies, Inc., Box 1269, Mt. Vernon, IL 62864

*BOTTOMLEY, J. A., Consulting Engr., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

BOURLAND, J. B., Technical Sales, Western Kentucky Explosives, P.O. Box 8, Madisonville, KY 42431

BOWLES, JERRY, Sales, Special Mine Services, P. O. Box 188, West Frankfort, IL 62896 †BOWMAN, F. T., Pres., Bowdil Co., Box 20470, Canton, OH 44701-0470

BOWMAN, FRED K., Assistant Dir., IL Dept. of Mines & Minerals, 300 W. Jefferson, P.O. Box 10137, Springfield, IL 62791-0137

BOWMAN, JAMES C. (JIM), Pres., J. Bowman & Assoc., P.O. Box 9186, St. Louis, MO 63117

BOYD, JAMES W., Pres., John T. Boyd Co., 400 Oliver Bldg., Mellon Sq., Pittsburgh, PA 15222

- BOZELL, RONALD R., District Mgr., Berry Bearing Co., Rt. 1, Box 10, Route 50 N., Bourbonnais, IL 60914
- BRADSHAW, JIM, Mgr. Tech. Services, Mt. Vernon Elect., Co., Inc., 1313 Harlan Rd., Mt. Vernon, IL 62864
- BRADY, WILLIAM J., Pres., Brady's Mining & Supply Co., 11793 Lackland Rd., Creve Coeur, MO 63146

BRAMEL, REX A., Maint. Supt., Arclar Co., RR4, Harrisburg, IL 62946

- BRANDLEIN, THOMAS F., Mgr. No., Linatex Corp., 106 Lincoln St., Glenview, IL 60025-4917 BRANDLEIN, WALTER E., (Retired), Roberts & Schaefer Co. (Retired), 985 Vine St., Winnetka, IL 60093
- BRANDT, DICK, Vice Pres., Mfg., Precision National Corp., 1100 Shawnee, Mt. Vernon, IL 62864

BRANDT, JOHN A., Pres., Lafayette Coal Co., 200 Frontage Rd, #200, Burr Ridge, IL 60521

BRANSON, RICHARD R., Sales Mgr., Reaco Battery Service Corp., Rt. 1, Box 48, Johnston City, IL 62951

- BRAUN, BERND, Sr. Engr., Frontier-Kemper Constructors, Inc., P.O. Box 6548, Evansville, IL 47719-0548
- BRAXMEIER SR., THOMAS A., Secy./Treas., Gunther-Nash Mining Construction Co., 2150 Keinlen Ave., St. Louis, MO 63121
- BREEDEN, JOHN, Inside Sales Mgr., Brake Supply Co., Inc., P.O. Box 447, Evansville, IN 47703-0447

BRENDEL, JAMES B., Engr., Gunther-Nash Mining Construction Co., 2150 Kienlen Ave., St. Louis, MO 63121

BRENTZ, STEVEN M., Technical Sales Rep., Exxon Chemical, 1406 Oakhall Manor Ct., St. Louis, MO 63021

BRETZ, MARK, Vice Pres./Group Superv., Aaron D. Cushman & Assoc., Inc., 7777 Bonhomme Ave., St. Louis, MO 63105

BREWSTER, DON, Regional Account Mgr., Lubricon, 350 E. Churchman AVe., Beech Grove, IN 46107

BRINKEER, JOE, Inventory Analyst, Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62208

BRITTON, RANDY, Sales Rep., National Mine Service Co., 77 Kirkley Lane, Springfield, IL 62704

BROCKHAUS, DOUGLAS A., Engr. Advisor, Monterey Coal Co., P.O. BOX 496, Carlinville, IL 62626

*BROECKER, CLETUS A., Consultant, 7253 Dean Rd., Indianapolis, IN 46240

BROWN, ALEX (SANDY), Product Support Mgr., Capitol Machinery Co., Inc., P.O. Box 2008, Springfield, IL 62705

BROWN, DAN, Engr. Tech, Central IL Public Service Co., P.O. Box 7261, Springfield, IL 62791

BROWN, GORDON, Pres., Hillsboro Coal Co., Box 280, 925 S. Main St., Hillsboro, IL 62049 BROWN, JIM, White County Coal Co., P.O. Box 457, Carmi, IL 62821

BROWN, JOHN, Mgr., Drilling & Blasting, AMAX Coal Co., 1 Riverfront Pl., 20 NW First Str., Evansville, IN 47708-1258

BROWN, RANDY D., Customer Service Ctr., Mgr., Fairmont Supply Co., 1525 Herbert Street, Mt. Vernon, IL 62864

BROWN, ROGER, Foreman, Freeman United Coal Mining Co., Rt. 1, Box 306, DuQuoin, IL 62832

BROWN, SCOTT, Sales, Clipper Belt Lacer, 515 Charleston R., Dawson Springs, KY 42408 BROWN, WALLACE, (Retired), 1949 Ramada Blvd., #1, Collinsville, IL 62234

BROWNING, DICK, Pres., Industrial Technologies, Inc., 10284 Page Blvd., St. Louis, MO 63132

BRUCE, GARY, Pres., Eagle Seal Mine Sealant, P.O. Box 112, McLeansboro, IL 62859 BRUCE, JOHN, Sales Rep, CSE Corporation, 7722 Melody Lane, Newburgh, IN 47630

BRUNSON, LAWRENCE E., Pres., Lawrence E. Brunson Co., 300 Brookes Dr., Suite 200, Hazelwood, MO 63042

BUCK, JAMES W., Mgr. Engr. Services, AMAX Coal Co., Inc., 20 N.W. First St., Evansville, IN 47708-1258

BURGGRAF, CHARLES A., Mine Mgr., AMAX Coal Co., Inc., P.O. Box 144, Keensburg, IL 62682

BURKE, JAMES E., Pres., Wescott Steel, Inc., 425 Andrews Rd., Trevose, PA 19047 BURKETT, KEN, Outside Sales, The Mine Supply Co., 1703 Shawnee, Mt. Vernon, IL 62864 BURRIS, MARK, Sales Rep, Rudd Equipment Co., P.O. Box 3935, Evansville, IN 47737 BURTON, ANTHONY, Sales Mgr.-Western Region, Meco International, Inc., 177 Thorn Hill

Rod, Warrendale, PA 15086

BUSSLER, JAY M., Cent. Inv. Mgr., Freeman United Coal Mining Co., R.R. 1, Box 127, West Frankfort, IL 62896

BYROM, ROY, Pres., Coal Industry Consultants, Inc., P.O. Box 4345, Wheaton, IL 60189-4345

CADY, PHIL, Sales, Ford Steel Co., P.O. Box 54, Maryland Heights, MO 63043

CALDWELL, MIKE, Vice Pres. Engr. & Oper. Planning, Freeman United Coal Mining Co., Box 100, West Frankfort, IL 62896

CALLONI, STEVE, Salesman, Lebco, Inc., P.O. Box 656, Benton, IL 62812

CAMPBELL, PAT, State Mine Inspector, IL Dept. of Mines & Minerals, RR 2, Box 412, Pinckneyville, IL 62274

- CARE, DAVID L., Supv. of EE Dept., Freeman United Coal Mining Co., P.O. Box 100, Route 37N, West Frankfort, IL 62896
- CARPENTER, RUSS, Supt., Zeigler Coal Co., 115 E. Daggy, Tuscola, IL 61953

CARR, BILL, Sales, Kiefer Electrical Supply, R.R. 3, Benton, IL 62812

CARR, ROBERT J., Sales Engr., Industrial Process Equipment Co., 2812 Locust St., St. Louis, MO 63103

CARRIL, LARRY, Gen. Sales Mgr., Cummins Gateway, Inc., 7210 Hall St., St. Louis, MO 63147

CARSON, GUY, Vice Pres.-Operations/Sales, CSE Corporation, 600 Seco Road Mont, Monroeville, PA 15146

CARTER, LEE, Prof. Engr., Professional Engr., 622 Belson Ct., Kirkwood, MO 63122

CASON, MICHAEL J., Reg. Sales Mgr., Kanaflex Corp. of IL, 800 Woodlands Parkway, Vernon Hills, IL 60061

CASPER, VICTOR E., Ind. Engine Sales, Fabick Power Systems, #1 Fabick Dr., Fenton, MO 63026

CASTLE, BRIAN R., General Mgr., Scott M. T. S., Inc., HCR 33, Box 36, Rolla, MO 65401

CAUDILL, BEECHER E., Sales Mgr., Brookville Mining Equip. Corp., 20 Pickering St., Brookville, PA 15825

CAUTHEN, WILEY M., Vice Pres., Marketing, Florida Gas Transm. Co., P.O. Box 945100, Maitland, FL 32794-5100

CAVENEY, THOMAS E., (Retired), RR#5, Box 104, Paris, IL 61944

CHADY, JAMES D., 201 W. Park St., Benton, IL 62812-1932

CHASE, DAVID H., Vice Pres., Chase Pump Equipment Co., Inc., P.O. Box 812, 603 S. Main St., Henderson, KY 42420

CHILDERS, MAURICE S., District Mgr., MSHA, 501 Busseron St., Vincennes, IN 47591

CHOU, CHEN-LIN, Geologist, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

CHRISTIAN, TED, Voith Transmissions, Inc., 25 Winship Rd., York, PA 17402

CHRISTOPHERSEN, JOHN A., Pres., Deister Concentrator Co., P.O. Box 1, Fort Wayne, IN 46801

CHUGH, YOGINDER P., Prof. & Chairman, Dept. of Mining Engr., Southern IL University, , Carbondale, IL 62901

CIMA, GREG, Pres., CIMA Electrical & Mine Services, Rt. 2, Box 320, Benton, IL 62812-9588

CLARK, BILL H., District Sales Mgr., Union Wire Rope, 1100 W. Lloyd Expy., Evansville, IN 47708

CLARK, BOB, Reg. Sales Mgr., Boonville Mining Service, P.O. Box 588, Boonville, IN 47601 CLAYTON, DANNY, Mining Engr., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

CLAYTON, JAMES, Store Room Mgr., Lebco, Inc., P.O. Box 656, Benton, IL 62812

CLEGG, KENNETH E., Coal Geologist (Retired), IL State Geological Survey, P.O. Box 112, Urbana, IL 61801

CLEMENS, RICK, Shop Mgr., Rogers Group, Inc., P.O. Box 849, Bloomington, IN 47402-0849

CLENDENIN, GARRY, Maint., Arclar Co., P.O. Box 444, Harrisburg, IL 62946

CLIFFORD, JAMES, Vice Pres., Roberts & Schaefer Co., 120 South Riverside Plaza, Chicago, IL 60606

CLINARD, MIKE, Dist. Sales Rep., Broderick & Bascom Rope Co., Rt. 3 Oak Grove Indus. Park, Sedalia, MO 65301

CLINE, LYLE, Faculty, Illinois Eastern Comm. Colleges, 1029 S. Main St., Harrisburg, IL 62946

CLINTON, JEFF, Dist. Mgr., Penn Machine Co., 204 Castleton Ave., Mt. Vernon, IL 62864

COCKRUM, ROBERT, Assist. Supt. Mine Rescue, IL Dept. of Mines & Minerals, 503 E. Main St., Benton, IL 62812

COFFMAN, DAVE, Service Engr., Morgantown Machine & Hydraulics, P.O. Box 191, Nashville, IL 62263 COLEMAN, RANDALLS., Sales Mgr., Johnston & Chapman Co., 2925 Carroll Ave., Chicago, IL 60612

COLEMAN, ROBERT, Account Specialist, Apache Hose & Belting Co., Inc., 2435 Rock Island Blvd., Maryland Heights, MO 63043

COLLIER, DON, Chief Engr., Secco, Inc., RR4, Box 325, Linton, IN 47441

COLLIER, STEVE, Section Mgr., Old Ben Mine 21, Zeigler Coal Co., 601 Illinois, Christopher, IL 62822

COLLINS, CHUCK, Maint. Supt., Pyro Mining Co., P.O. Box 289, Sturgis, Ky 42459

COLLINS, DON, (Retired), Retired, 9020 Stonebridge Dr., St. Louis, MO 63117

CONAUGHTY, MARTIN, Field Rep., Schroeder Brothers Corp., P.O. Box 72, Nichol Ave., McKees Rocks, PA 15136

CONERTY, BETTY, Admin. Asst. (Retired), IMI, RR, 3, Box 128B, Urbana, IL 61801

CONNOLLY, JAMES D., Pres., Conn-Weld Industries, Inc., PO Box 5329, Princeton, WV 24740

CONRAN, MICHAEL G., Sales, Naylor Pipe Co., 1230 E. 92nd Str., Chicago, IL 60619 *CONWAY, C. C., (Retired), National Mine Service, 1780 12th St., Clermont, FL 34711-2949 COOK, LEON, Plant Supv., Sesser Concrete Products, Inc., P.O. Box 100, Sesser, IL 62884 COOMES, STEVE, Gen. Mgr., Centrifugal Services, Inc., 800 W. Parish, Harrisburg, IL 62946 COON, DOUG, Sales Mgr., Pyott-Boone Electronics, P.O. Box 809, Tazewell, VA 24651 CORNELL, RAY, Chairman & CEO, Sligo, Inc., 140 E. Prairie Avenue, St. Louis, MO 63147

COSTELLO, ALLEN J., Subsidence Mgr., Zeigler Coal Co., 500 N. DuQuoin, Benton, IL 62812

COULTER, DEE, Inside Sales, AMS - Carbondale, Inc., P.O. Box 3100, Carbondale, IL 62902-3100

COURSON, RICHARD, Pres., Courson Coring & Drilling, R.R. 1, Box 38A, St. Peter, IL 62880 COUSINS, MATTHEW, Warehouse Mgr., Long-Airdox Co., P.O. Box 479, Benton, IL 62812 *CRAGGS, JOE, (Retired), Peabody Coal Co., R.R. 3, Box 47A, Taylorville, IL 62568

CRELLING, JOHN C., Prof., Southern IL University, Dept. of Geology, Carbondale, IL 62901 CREMEENS, MICHAEL, Owner, General Belt Service, Inc., RR 2, Box 392, Benton, IL 62812 CREWS, DANIEL, Sales Rep., Mainline Power Div., J. H. Service Co., Inc., P.O. Box 4315,

Evansville, IN 47724

CROSS, CHARLES K., Vice Pres., Simpson Materials Co., P.O. Box 68, Valley Park, MO 63088

CUSHMAN, TOM, Vice Pres., Phillips Machine Service, Inc., P.O. Box 1245, Beckley, WV 25802-1245

CUTSINGER, SCOTT, Parts Salesman, Simmons-Rand Co., P.O. Box 513, Marion, IL 62959 CWIKLOWSKI, TOM, Sales, Sligo, Inc., 140 E. Prairie Ave., St. Louis, MO 63147

DAKICH, BOB, Sales, Sligo, Inc., 140 E. Prairie Ave., St. Louis, MO 63147

DAMBERGER, HEINZ H., Head, Coal Section, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

DAME, JR., CHARLES D., Chief Safety Inspector Orient 6, Freeman United Coal Mining Co., P.O. Box 308, Waltonville, IL 62894

DANKO, J. ROBERT, Supt., Marissa Mine, Peabody Coal Co., RR1, Box 135D, Marissa, IL 62257

DANKO, JOHN, (Retired), Peabody Coal Co., P.O. Box 272, Sparta, IL 62286

DANNER, STEPHEN K., Geologist, Illinois Mine Subsidence Ins. Fund, 4 Executive Dr., Suite 4, Fairview Hghts., IL 62208

DARE, P. DENNIS, Indus. Sales Rep., Illinois Power Co., 500 S. 27th St., Decatur, IL 62525-1805

DARNAY, BOLDIZSAR, Vice-Pres. Engr., Black Beauty Coal Co., P.O. Box 312, Evansville, IN 47702

DAUSMAN, BRUCE R., Mgr. of Engr., Black Beauty Coal Co., P.O. Box 312, Evansville, IN 47702

DAVENPORT, JACK W., Account Consultant, Kiefer Electric Supply Co., R.R. #3, Rend City Rd., Benton, IL 62812 DAVIS, PHILIP K., Prof. Civil Engr. & Mechanics, Southern IL University, R.R. 4, Box 198, Carbondale, IL 62901

*DAWE, RUSSELL T., (Retired), Inland Steel Coal Co., Box R, Valier, IL 62891

DE MARIS, PHILIP, Asst. Geologist, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

DE SALME, DAN, Service Mgr., Cummins Gateway, Inc., 7210 Hall St., St. Louis, MI 63147

DEERING, RICHARD A., Acct. Rep., Mt. Vernon Elect., Co., Inc., 1313 Harlan Rd., Mt. Vernon, IL 62864

DELANEY, TIMOTHY A., Vice Pres. Sales, Sahara Coal Co., Inc., 3 1st National Plaza, Suite 2000, Chicago, IL 60602

DENEAL, GERALD, Sr. Environmental Engr., Kerr-McGee Coal Corp., P.O. Box 272, Harrisburg, IL 62946

DENNY, FRED G., Owner, Equality Mining Co., 10 Dogwood, Harrisburg, IL 62946

DENTON, THOMAS G., Sr. Production Engr., Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62812

DENZER, DAVE, Territory Mgr., Columbus McKinnon, 426 Westglen , Ballwin, MO 63021

DeWITT, THOMAS J., Vice Pres. & Gen. Mgr., Morgantown Machine & Hydraulics, PO Box 986, Morgantown, WV 26505

DICKSON, WILLIAM T., Product Mgr., FMC Corp., CEO Div., P.O. Box 1370, Tupelo, MS 38802

DIETZEL, CHUCK, Prep. Plant. Maint. Mgr., Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946

DIMOND, BOB, Coal Magazine, 29 N. Wacker Dr., Chicago, IL 60606

DIXON, JOSEPH A., Geologist, Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62208

DOBELSTEIN, CHUCK, Vice Pres., Lakeshore Mining Equip. Corp., 4106 Eastmoor Rd., Louisville, KY 40218

DODD, JOHN L., Sales/Service Rep., Joy Technologies, Inc., 508 Halia Crest, Mt. Vernon, IL 62864

DODD, LEE W., Electrical Superv., Monterey Coal Co., 903 W. Monroe, Auburn, IL 62615 DONALDSON, DENNIS J., Indus. Serv. Engr., Central IL Public Service Co., 1800 W. Main

, Marion, IL 62959

DONATO, JIM, Sales Rep., Midwest Steel, P.O. Box 1243, Granite City, IL 62040

DONEY, ED, Mgr. Underground Planning & Econ., Kerr-McGee Coal Corp., P.O. Box 25861, Oklahoma City, OK 73125

DORGAN, DOUGLAS G., Asst. Vice Pres. Marketing, IL Central Railroad, 233 N. Michigan Ave., Chicago, IL 60601

DOTSON, GAIL, Sales & Service Rep., Construction Machinery Corp., 1707 E. DeYoung St. PO Box 97, Marion, IL 62959

DOTSON, JOHN D., Electrical Engr., Freeman United Coal Mining Co., 17 Tanglewood, Chatham, IL 62629

DOWNEN, ROBERT P., Pres., Jader Fuel Co., P.O. Box 620, Shawneetown, IL 62984 DOWNING, DOUG, Dir. Environ. Affairs, Arch of Illinois, P.O. Box 308, Percy, IL 62272 DRAEGER, ERNEST, Pres., PE & C, Inc., 700 E. Jefferston St. #C, Pittsburg, KS 66762-6053 DREYER, RICK, Sales Mgr., T. J. Gundlach Machine Co., P.O. Box 385, Belleville, IL 62222 DRYDEN, J. L. (JOE), 333 Columbus Ave., Galesburg, IL 61401

DUANE, LEN, Northern Sales Coord., Vice R.-Wesson Div., Fansteel, Inc., P.O. Box 511, West Frankfort, IL 62896

DUDZIK, ALBERT J., Shift Mine Mgr., Cutler Mining Co., #3 Coventry Court, Fairview Hills, Fairview Heights, IL 62208

DUGAN, L. B. (DIXIE), Pres., Dixie Dugan, Inc., 7766 Meadow Ln., Newburgh, IN 47630 DUGGER, LARRY, Pres., Woodruff Supply Co., Inc., P.O. Box 426, Madisonville, KY 42431 DUMONTELLE, PAUL, Branch Chief Environ. Geol. & Geochem., IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

DUNCAN, S. W., Pres., Duncan Foundry & Machine Works, Inc., Box 433, Alton, IL 62002

DUNCAN, TERRY, Sales, Treasco Industries, Inc., P.O. Box 552, Madisonville, KY 42431 DUNFORD, JEFFREY L., Sales Rep., Construction Machinery Corp., P.O. Box 97, Marion, IL 62959

DURBIN, TAMI, Optical Sales, M&S Fire & Salety, P.O. Box 4348, Evansville, IN 47724 DURHAM, BILL, Sales Rep., Advanced Drainage Sys., Inc., RR 1, Box 285E, Sparta, IL 62286 DUTCHER, LINDA A.F., Geol. Consultant, P.O. Box 128, Carbondale, IL 62903 DUTCHER, BUSSELL B, Doop, College of Science, Southern II, University, Callege of

DUTCHER, RUSSELL R., Dean, College of Science, Southern IL University, College of Science, Carbondale, IL 62901

- DWOSH, DOUGLAS, Mgr., Tech. Services, Paul Weir Co., 2340 River Rd., Suite 203, Des Plaines, IL 60018
- EASTWOOD, ROGER, General Mgr., K&E Technical, Inc., P.O. Box 165, West Frankfort, IL 62896
- EBERHART, RON, Vice Pres., Goodman Equipment Corp., 5430 W. 70th PI, Chicago, IL 60638-6321
- EDMONDSON, CARROLL, Shift Foreman, White County Coal Co., P.O. Box 457, Carmi, IL 62821

EDWARDS, BRENT, Vice Pres., Ashby Electric Co., Inc., P.O. Box 55, Madison St., Sebree, KY 42455

EDWARDS, DALE, Sales Rep, Centrifugal Services, Inc., 916 Dewey St., Eldorado, IL 62930 EGLI, ERICH, Chief Engr., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

EHRET, PAUL J., Land Reclamation Supv., IL Dept. of Mines & Minerals, P.O. Box 10197, Springfield, IL 62791-0197

EIDEL, JIM, Chief-Mineral Resources & Engr. Branch, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

EISENHAUR, REX, Sales Rep., Centrifugal Services, Inc., 1301 Davis St., Johnston City, IL 62951

EISON, WALTER E. (MONK), Pres., Western Kentucky Energy Equip., Inc., P.O. Box 81, Madisonville, KY 42431

ELLERBUSCH, RON, Pres., Klein Armature Works, Inc., Box 426, Centralia, IL 62801

ELLIOTT, ALCWYN, Sales Mgr., Hauhinco Trading, 510 Keystone Dr., Warrendale, PA 15086

ELLIOTT, DICK, Gen. Mgr., Wallace Diesel Equip., P.O. Box 189, Galatia, IL 62935

ELLIOTT, GARY, Area Rep., A&L Great Lakes Labs, Inc., RR#1, Box 20, Cropsey, IL 61731

ELLIS, GORDON B., Branch Mgr., Bearing Headquarters Co, 329 S. 9th St., Mt. Vernon, IL 62864

ELLIS, JOHN C., Mgr., Materials Handling, Henry A. Petter Supply Co., P.O. Box 2350, Paducah, KY 42001

ENGELKE, PHIL, Sales, B&D Machine Works, 307 Pickneyville Rd., Marissa, IL 62257

ENGRAM, DAVID, UMWA, Brushy Creek Coal Co., Inc., 4270 N. America Rd., Galatia, IL 62935-9694

ERNEST, STEPHEN H., Sr. Landman, Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62208

ERWIN, RON, Prep. Dir., Zeigler Coal Co., 500 N. DuQuoin, Benton, IL 62812

ESTEL, STEVE, Engr. Tech., Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896

ETTER, BRIAN, Sales, Mt. Vernon Elect., Co., Inc., 1313 Harlan Rd., Mt. Vernon, IL 62864

EVANS, MELVIN, Sales Mgr., S. Cohn & Son, Inc., RR #4, Box 353A, Washington, IN 47501

EVANS, WILLIAMH., Sales Rep., Gooding Rubber Co., P.O. Box 729, La Grange (Countryside), IL 60525

EVANS, Jr., DONALD G., Sales Rep., Simmons-Rand Company, PO Box 513, Rt. #13 W, Marion, IL 62959

EVERETT, CURT, Inside Sales Mgr., Anixter Bros., 9449 Aerospace Dr., St. Louis, MO 63134 FANSHIER, MARK, Sales, American Pulverizer Co., 5540 W. Park AVe., St. Louis, MO 63110 FARLAINO, G. RECOLE, France Pulverizer Co., 5540 W. Park AVe., St. Louis, MO 63110

FARLAINO, G. REGGIE, Factory Rep., Jack Kennedy Metal Prods., Inc., P.O. Box 138, Taylorville, IL 62568 FARMER, JERRY, Sales, Centrilugal Services, Inc., Box 137A, Rt.1, Galatia, IL 62935 FARRIS, DONALD R., Reg. Matls. Mgr., Joy Technologies, Inc., P.O. Box 1269, Mt. Vernon, IL 62864

FASTUCA, TONY, Sales Mgr., Alloy Sling Chain Ind. Inc., 1416 W. 175th St., E. Hazelcrest, IL 60429

FEESE, DOUG, Sales Rep., Illinois Bearing Co., 2840 Via Verde, Springfield, IL 62703 FEIG, BILL, Sales/Field Serv. Superv., Long-Airdox Co., PO Box 429, Benton, IL 62812 FERGUSON, WES, Sales, Ulmer Equipment Co., 1554 Fenpark Dr., Fenton, MO 63026 FIELD, GEORGE W., Coal Consultant, 3746 E. 83rd St., S., Tulsa, OK 74137

FIKE, DANIEL L., Product Mgr., Ludiow-Saylor, Inc., P.O. Box 430, Warrenton, MO 63383 FINDLEY, ROGER, Motor Shop Mgr., Mt. Vernon Electric Co., Inc., 1313 Harlan Rd., Mt. Vernon, IL 62864

FINK, JACK C., Mgr. Mining Products, Plymouth Rubber Co., Inc., 120 Bertley Ridge Dr., Coraopolis, PA 15108

FISCHBECK, GROVER, Servic Rep., J. H. Fletcher & Co., P.O. Box 361, Uniontown, KY 42461

FISCOR, STEVE, Technical Editor, Coal Magazine, 29 N. Wacker Dr., Chicago, IL 60606-3298

FLANIGAN, ED, Owner, Centralia Porta Cabana, 337 W. 15th St., Centralia, IL 62801

†FLETCHER, ROBERT, J. H. Fletcher & Co., Box 2143, Huntington, WV 25722

†FLETCHER, WILLIAM, Dir., J. H. Fletcher & Co., 1630 Sheridan Rd., Apt. 10N, Wilmette, IL 60091

FLORETH, BRAD, Vice Pres., Marketing, ILL-MO Welding Products, P.O. Box 788, Jacksonville, IL 62651

FLYNN, JOHN, 6123 McPherson, St. Louis, MO 63112

FORSE, SCOTT E., Sales, JMD Co., 5401 Program Blvd., Bethel Park, PA 15302

FORSE, Jr., HERBERT E., Pres., J-M-D Co., 5401 Progress Vivd., Bethel Park, PA 15102

FOSTER, BRUCE, Sales Mgr., Brake Supply Co., Inc., P.O. Box 447, Evansville, IN 47703-0447

FOSTER, I. O., Retired, 194 Miami, Park Forest, IL 60466

FOWLER, SCOTT , Mgr., Engr. Dept., Turris Coal Co., P.O. Box 21, Elkhart, IL 62634

FOWLKES, W.A. (SANDY), Certified Photogrammetrist, Surdex Corp., 520 Spirit of St. Louis Blvd., Chesterfield, MO 63005

FOX, CHRIS, Salesman, John Sakash Co., PO Box 198, 1350 Grand Ave., Madison, IL 62060

FOX, JAMES M., Engr., Emeritus, Tabor Machine Co., 908 Taylor Ave., Mt. Vernon, IL 62864

FOY, BENNY E., Sales Mgr., American Mine Research, Inc., P.O. Box 234, Rocky Gap, VA 24366

FRANKIE, WAYNE, Geologist, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

FRANKLIN, DANNY, White County Coal Co., P.O. Box 457, Carmi, IL 62821

FRANKLIN, SR., WILBUR M., State Mine Inspector, IL Dept. of Mines & Minerals, P.O. Box 55, Tilden, IL 62292

FREEMAN, J. RICHARD, Pres., Zeigler Coal Sales Co., 50 Jerome Place, Fairview Heights, IL 62208

FRIEDERICK, JAMES V., Sr. Mining Engr., Paul Weir Co., 2340 River Road, #203, Des Plaines, IL 60018

FULLER, LYNDELL, CEO, Secco, Inc., RR #4, Box 325, Linton, IN 47441

GAFFNEY, GEORGE F., Dist. Sales Mgr., F. C. Mencini & Assoc., Inc., 185 Glen Cove, St. Louis, MO 63017

GALATI, JOSEPH D., Product Mgr., National Mine Service Co., 800 N. Bell AVe, Suite 110, Carnegie, PA 15106

GALLAGHEŘ, TERRY, Parts Sales Rep., Lakeshore Mining Equip. Corp., 4106 Eastmoor Rd., Louisville, KY 40218-3002

GALLAHER, DAVID T., Regional Mgr., OB Systems & Mining, Rt. 9, Box 112-C, Beaver, WV 25813

GALLEGOS, PETER, Regional Sales Mgr., Lister-Petter, Inc., P.O. Box 1160, Olathe, KS 66061

GAMSTER, SCOTT K., Pres., Reaco Battery Service Corp., R.R. 1, BOX 48, Johnston City, IL 62951

GANEY, DAN, SR. Staff Engr., Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946 GANN, JIMMIE E., 753 Rozier #18, Ste. GEnevieve, MO 63670

GARCIA, STEPHEN J., Gen. Mgr. Midwest, AMAX Coal Co., Inc., One Riverfront PI. 20 NW 1st. St., Evansville, IN 47708-1258

GARLAND, BILL, Reg. Sales Mgr., MacWhyte Co., 2906 14th Ave., Kenosha, WI 53141

GARLAND, TIM, Mine Mgr., Delta Mine, AMAX Coal Co., Inc., P.O. Box 730, Marion, IL 62959 GARNER, BRUCE, Fuel Operations Admin., Central IL Public Service Co., 607 E. Adams Sp, Springfield, IL 62759

GARRISON, GARY G., Sr. Resident Mine Engr., Peabody Coal Co., 2201 E. Lakeshore Dr., Taylorville, IL 62568

GERMAN, ROGER W., Service Rep., Eastern Electric Apparatus Service, 1565 S. Vanderventer, St. Louis, MO 63110

GESKE JR., FRANK, Gen. Mgr., Mine Service Co., Inc, R.R. 2 Box 416, Anna, IL 62920

GESKE SR., FRANK L., Pres., Mine Service Co., Inc., R.R. 2, Box 416, Anna, IL 62906-9635 GIBBONS, PEARL, Sales Rep., Austin Powder Co., Rt. 3, Box 15A, Carterville, IL 62918

GIBSON, WILLIAM, Product Mgr., Morgantown Machine & Hydraulics, P.O. Box 16590 Gosnen Rd., Morgantown, WV 26507

GILBERT, GUY, Project Engr., IL DENR, 325 W. Adams, Springfield, IL 62704

GILES, WILLIAM E., Chief Mech. Engr., Freeman United Coal Mining Co., P.O. Box 259, Farmersville, IL 62533

GILL, JAMES B., Vice Pres., Operations, MAPCO Coal, Inc., P.O. Box 911, Henderson, KY 42420

GILLAND, VERNON, Sales Rep., Fredonia Valley Quarries, Inc., R.R. 2, Box 23, Fredonia, KY 42411

GILLES, STEVE, Product Mgr., Bixby-Zimmer Div./W.S. Tyler, P.O. Box 248, Elberfeld, IN 47613

GILMARTIN, D. LEO, (Retired), Peabody Coal Co., 210 Rec Area Rd., Marissa, IL 62257

GINNARD, KEN, Geologist, Paul Weir Co., 2340 River Rd., Suite 203, Des Plaines, IL 60018

GLUSKOTER, HAROLD J., Chief Branch Coal Geology, U.S. Geological Survey, Mail Stop 956, Reston, VA 22092

GOAD, BILL, Service Mgr., J. H. Fletcher & Co., P.O., Box 2187, WV 25722

GODDARD, DONALD G., Pres., Mid-Continental Fuels, Inc., P.O. Box 1177, Marion, IL 62959

GODWIN, PHYLLIS, Administrative Asst., Illinois Mining Institute, P.O. Box 20, Pesotum, IL 61863

GOODRICH, JR., JEROME D., Pres., Monterey Coal Co., P.O. Box 496, Carlinville, IL 62626 GORDON, JAMES R., Pres., Gordon Belt Scrapers, Inc., 301 W. Boling St., Benton, IL 62812 GOSS, JAMES F., Sr. Geologist, AMAX Coal Co., Inc., 1990 Wolff Rd., Gillette, WY 82716-

7123 COTT STEVE Sclep Food Strate Sclep B.O. Due 5000 5

GOTT, STEVE, Sales Engr., Straeffer Sales, P.O. Box 5262, Evansville, IN 47716

GOUGH, DENNIS, White County Coal Co., P.O. Box 457, Carmi, IL 62821

GOVAN, CHARLES, Dir. of Marketing, Cummins Gateway, Inc., 7210 Hall St., St. Louis, MO 63147

GRAY, RALPH J., Consultant, Coal,Coked Carbons, Ralph Gray Services, 303 Drexel Dr., Monroeville, PA 15146

GREGG, JAY, UTEX, Inc., P.O. Box 9251, Evansville, IN 47711

GREGORY, WALT, Pres., Freeman United Coal Mining Co., 111 Airway Dr., Marion, IL 62959 GRIESEDIECK, CHRIS, Pres., American Pulverizer Co., 5540 W. Park, St Louis, MO 63110 GRIFFITHS, CARL D., Mine Supt., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946 GRIMES, JIM, Purchasing, Arclar Company, P.O. Box 444, Harrisburg, IL 62946 GRIMM, ERIC S., Sr. Mine Engr., Arch Mineral Corp., City Place One, St. Louis, MO 63141 GROSS, D. JAMES, Sr. Vice Pres., Operations, Roberts & Schaefer Co., 120 S. Riverside Plz., Chicago, IL 60606

GUCCIONE, JOE, Dist. Mgr., Lincoln Lubrication, 1295 Jackson Ln., St. Louis, MO 63031 GUEST, TERRY, Safety Tech., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946 GULLIC, ROBERT C. (BOB), Chief Engr., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

GUNNOE, JIM, Engr. Rep., American Mine Research, Inc., P.O. Box 234, Rocky Gap, VA 24366

GWALTNEY, BILL, Vice Pres., Webb Oil Co., Inc., P.O. Box 112, McLeansboro, IL 62859

HAAS, CHARLES J., Prof. Mng. Engr., University of Missouri, Rolla, Dept. of Mining Engineerng, Rolla, MO 65401

HAENTJENS, R. P., Vice Pres., Barrett, Haentjens & Co., 225 N. Cedar St., Box 488, Hazelton, PA 18201

HAKE, WILLIAM D. (BILL), Mgr. of Engineering, Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946

*HALBERSLEBEN, PAUL, Consultant, Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

HALL, BERT, Gen. Mine Mgr., AMAX Coal Co., Inc., Box 144, Keensburg, IL 62852

HALL, JAMES T., Pres., Specialty Machine & Tool, Inc., P.O. Box 413, Marion, IL 62959

- HAMMOND, JOHN P., State Mine Inspector, Dist. #1, IL Dept. Mines & Minerals, Box 109, Rushville, IL 62681
- HANCOCK JR., DELVIN O., Branch Mgr., Commercial Test. & Engr. Co., P.O. Box 752, Henderson, KY 42420
- HANLEY, CHRISTOPHER D., Reg. Marketing Mgr., Joy Finance Co., One Oxford Centre, Pittsburgh, PA 15219
- HANLEY, TERRY, District Sales Mgr., Simmons-Rand Company, P.O. Box 513, Marion, IL 62959
- HANSON, BERNIE, Controller, AMS Carbondale, Inc., P.O. Box 3100, Carbondale, IL 62902-3100

HARGRAVES, GEORGE E., R.R. 2, Box 176, Marion, IL 62959-9627

HARLAN, KEITH, Parts Mgr., Lakeshore Mining Equip. Corp., 4106 Eastmoor Rd., Louisville, KY 40218-3002

HARMS, DAN, Sales Rep, Schaeffer Mfg. Co., 102 Barton St., St. Louis, MO 63104

HARPER, DARRELL N., Gen. Mgr. Project Engr., 3-H Mining Corp., 75 Woodvale St., Dunbar, PA 15431

*HARRELL, M. V. (DOC), Vice Pres. (Retired), Freeman United Coal Mining Co., Route 2, Mt. Vernon, IL 62864

HARRIS, GRETA, Sr. Buyer, Freeman United Coal Mining Co., 222 N. LaSalle St., Chicago, IL 60601

- HARRIS, JAMES D., Salesman, Special Mine Services, Inc., P.O. Box 188, West Frankfort, IL 62896
- HARRIS, TROY, Supv.-Ex. Mine, University of Missouri, Rolla, 1022 Morrell St., Rolla, MO 65401
- HART, RICK D., Industrial Serv. Engr., Central IL Public Service Co., 104 E. Third St., Beardstown, IL 62618

HART, SUNNY, Sales Rep., Mineweld, Inc., Industrial Park Rd., Benton, IL 62812

HARTING, RICH, Vice Pres., Bearing Headquarters Co., 3689 E. Broadway, Alton, IL 62002

HARTLINE, CURTIS R., Vice Pres., Coal Electric Service, Inc., Box 270, Central City, KY 42330

HARVEY, DONNA, Shop Office Mgr., Mt. Vernon Elect., Co., Inc., 1313 Harlan Rd., Mt. Vernon, IL 62864

HARVEY, R. D. (DICK), Sr. Geologist, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820 HARVEY, STEVE, Air Quality Supv., Central IL Public Service Co., 607 E. Adams St., Springfield, IL 62701

HATTENDORF, WARREN, Dir., Employee Rel., Freeman United Coal Mining Co., PO Box 100, West Frankfort, IL 62896

HAUSER, RICHARD, Sec.-Treas., Sligo, Inc., 140 E. Prairie Ave., St. Louis, MO 63147 HAWKINS, GERALD, Lobbyist, United Mine Workers of Am., R.R. 3, DuQuoin, IL 62832 HAYNES, FRANK C., Sales, Grainger, 2353 Metro Blvd., Maryland Heights, MO 63043 HAYWOOD, GREG, White County Coal Co., P.O. Box 457, Carmi, IL 62821

HAZEL, DENNIS, Vice Pres. Sales, Mt. Vernon Elect., Co., Inc., 1313 Harlan Rd., Mt. Vernon, IL 62864

HEAD, GEORGE, Pres., SAN-CON, Inc., P.O. Box 120, Upper Sandusky, OH 43351

HEAD, P.E., H. JOHN, Assoc. Mining Engr. Cons., Dunn Corp., 1333 Butterfield Rd., Ste. 540. Downers Grove, IL 60515-5610

HEALY, JOHN M., Vice Pres., Partner, Hanson Engineers, Inc., 1525 S. 6th St., Springfield, IL 62703

HEARD, G.G., Sen. Vice Pres., Midcont., Consolidation Coal Co., 12755 Olive Blvd., St. Louis, MO 63141

HEATH, PATRICK, Pres., KRH Co./Bowman & Assocs., P.O. Box 9186, St. Louis, MO 63117 HEDRICK, JOHN B., Vice Pres., Phillips Machine Service, Inc., P.O. Box 1245, Beckley, WV 25802-1245

HEIDINGER, GEORGE H., DESCOM, R.R. 1, Box 299, Sparta, IL 62286

HELFRICH, GEORGE, Salesman, Ashby Electric Co., Inc., P.O. Box 55, Sebree, KY 42455 HEMMERICH, WAYNE, Safety Director, Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

HENSHAW, T. W., Maint. Foreman, White County Coal Co., P.O. Box 457, Carmi, IL 62821

HERMAN, DR. RICHARD G., Research Fellow, Lehigh University, Sinclair Lab., Bldg. #7, Bethlehem, PA 18015

HESSE, FRED E., Executive Vice Pres., Advanced Mining Technology, Inc., 295 Meadowlands Blvd., Washington, PA 15301

HIGGINS, GEORGE, Ashby Electric Co., Inc., P.O. Box 55, Sebree, KY 42455

HILDON, MICHAEL A., Pres. & CEO, Commercial Test. & Engr. Co., 1919 S. Highland Ave., 210B, Lombard, IL 60148

HILL, ROBERT, Supt., Arclar Co., P.O. Box 444, Harrisburg, IL 62946

HILLIARD, CHARLES F., Aero-Metric Engineering, 1415 E. Central Rd. #319-C, Arlington Heights, IL 60005-3321

HIMES, BILL, Mgr. Operations, Ayshire Mine, AMAX Coal Industries, Inc., P.O. Box 40, Chandler, IN 47610-0040

HINCHEE, BETTY, Sales, Minesafe Electronics, P.O. Box 281, Sturgis, KY 42459

HINDERT, GEORGE L., Sales Mgr., Young Sales Corp., St. Louis Blow Pipe Div., P.O. Box. 5504, St. Louis, MO 63147

HOEMAN, JOHN M., Mgr.-Purchasing, Peabody Coal Co., 1951 Barrett Ct., Henderson, KY 42420

HOFFERT, MARK J., Electrical Sales, Berry Bearing Co., 3113 N. Main St., E. Peoria, IL 61611

HOFFMANN, RON, Vice Pres., Surdex Corp., 520 Spirit of St. Louis Blvd., Chesterfield, MO 63005

HOFFMANN, RUSSELL D., Vice Pres., Surdex Corp., 520 Spirit of St. Louis Blvd., Chesterfield, MO 63005

HOFMANN, RAY, Sales Mgr., Gooding Rubber , P.O. Box 487, Benton, IL 62812

HOLDERFIELD, JOE, Parts Mgr., Fabick Machinery Co., P.O. Box 760, Marion, IL 62959 HOLLAN, JACK, Vice Pres./Sales, Treasco Industries, Inc., P.O. Box 552, Madisonville, KY

42431 HOLLAND, LEE, District Mgr., Hauhinco Trading, R. 5, Box 21, Marion, IL 62959

HOLLOWAY, ROBERT W., Pres., Holloway Deep Till, Inc., Route 1, Sparta, IL 62286

HOLMES, RON, Sales, Mine Equip. & Mill Supply Co., R.R. 1, Box 79, Dawson Springs, KY 42408

HONAKER, RICKY, Instructor, Southern IL University, Mining Engr. Dept., Carbondale, IL 62901

HOOKS, CHARLES, Agronomist, University of Illinois, RR1, Box 534, Percy, IL 62272

*HOPKINS, M. E., Dir., Geology, Coal Services Corp., P.O. Box 66746, St. Louis, MO 63166 HORTON, MARVIN B., Director of Purchasing, Sahara Coal Co., Inc., P.O. Box 330,

Harrisburg, IL 62946

HOUSER, ROBERT A., (Retired), 18532 Lyn Ct., Homewood, IL 60430

HOWARD, JOHN L., Assoc. Dean, Mining Tech., Illinois Eastern Comm. Colleges , 2201 Toronto Rd., Springfield, IL 62707

HOWARD, JOHN MICHAEL, Dist. Sales Mgr., U.S.T. Inc., 311 Laura, Farmington, MO 63640

HOWELL, DYKE, Pres., Frontier-Kemper Constructors, Inc., P.O. Box 6548, Evansville, IN 47711

HOYT, BRIAN, Student, Southern IL University, RR2, Box 115, Ava, IL 62907

HUELSMANN, ARNOLD, CEO, Arnold Distributing Co., 104 N. Walnut, Trenton, IL 62293 HUFFER, WILLIAM D., Sales Mgr, Fans & Spec. Accts., Peabody ABC Corp., P.O. Box 77, Warsaw, IN 46580

HUFFMAN, LISA, Purchasing Mgr., TRIAD Mining Inc., P.O. Box 349, Rushville, IL 62681

HUGHES, CEIRIOG, Vice Pres., Sales & Service, Halbach & Braun Ind., 90 W. Chestnut St., Washington, PA 15301

HUGHES, WILLIAM W., Service Engr., Contintental Conveyor & Equip. Co., P.O. Box 184, Waltonville, IL 62894

HUNT, GUY, Engr. Dept., Turris Coal Co., P.O. Box 21, Elkhart, IL 62634

HUNTER, DANIEL S., General Mine Mgr., Beech Coal Co., RR #2, Box 160B, Clay City, IN 47841

HUNTER, DAVID, General Mgr., Fansteel VR/Wesson, Box 11399, Lexington, KY 40575

HUNTER, JOHN, Parts & Service Mgr.-Hazelwood, Roland Machinery Co., P.O. Box 2879, Springfield, IL 62708

HUNTSMAN, LES, Pres., Special Mine Services, Inc., P.O. Box 188, West Frankfort, IL 62896

HURLEY, JACK, Pres., Centrilugal & Mechanical Industries, Inc., 11140 S. Towne Sq., Suite 204, St. Louis, MO 63123

HURST, ROBERT J., Pres., Geo-Con, Inc., R.R. 4, 305 Fifth Ave., Princeton, IN 47670

HURTTE, JAMES E., Safety Mgr., Peabody Coal Co., 1108 W. Poplar, Taylorville, IL 62568 HUTCHCRAFT, JIM, Owner, H & H Consulting, 707 S. Monroe, P.O. Box 481, West Frankfort, IL 62896

ISAACS, L. WAYNE, Mine Supt., #5, Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946

IWASYSZYN, TED, Vice Pres., Sales West, C.M.I., Inc., 11140 S. Town Sq., Suite 204, St. Louis, MO 63123

JACKSON, AARON D., Mine Mgr., Kerr-McGee Coal Corp., R.R. 3, Eldorado, IL 62930

JACKSON, DUANE, Engr., A. L. Lee Corporation, P.O. Box 2370, Mt. Vernon, IL 62864

JACKSON, NORM, Vice Pres. Operations, Rogers Group, Inc., P.O. Box 849, Bloomington, IN 47402-0849

JACKSON, ROYCE, Sales, Rees Mine Supply Sales, Inc., Box 296, Du Quoin, IL 62832 JAENKE, C.T. (TED), Pres., Pro-Mark, P.O. Box 12759, St. Louis, MO 63141

JANKOUSKY, CHARLES, 702 Sheridan Dr., Benton, IL 62812

JENKINS, JACK D., Electrical Engr., C.L. Maddox, Inc., PO Box 1205, Marion, IL 62959

JENKINS, JON C., Pres., Coal Corporation of America, Inc., 811 Corporate Dr., Suite 204, Lexington, KY 40503

JOCKISCH, LEE W., Reclamation Mgr., AMAX Coal Co., Inc., R.R. 1, Box 109, Lewistown, IL 61542

JOHNS, DAVE, Foreman, Coal Age Service Corp., P.O. Box 250, West Frankfort, IL 62896 JOHNSON, BOB, Mine Supt., White County Coal Co., P.O. Box 457, Carmi, IL 62821 JOHNSON, RICHARD LEE, Driver/Sales, Joy Technologies, Inc., 322 N. 5th St., Mt. Vernon, IL 62864

JOHNSON, SAM, Mgr., Dooley Bros., Inc., 609 N. McLeansboro St., Benton, IL 62812

JOHNSON, STEVE, Deputy Chief Engr., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

JOINER, LARRY, Dist. Mgr., Lakeshore Mining Equip. Corp., 4106 Eastmoor Rd., Louisville, KY 40218-3002

JOKERST, JERRY, Pres., Farrar Pump & Machinery Co., 1701 S. Big Bend Blvd., St. Louis, MO 63117

JONES, BARRY, Inventory Control Mgr., Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62208

JONES, DON, 804 S. 34th St., Mt. Vernon, IL 62864

JONES, JACKIE W., Salesman, Kerco, Inc., 548 S. Main St., Madisonville, KY 42455

JONES, RANDY, Maint. Supv., Conant Mine, Cutler Mining Co. AOI, R.R. #2, Box 376, Mulkeytown, IL 62865

JORGENSON, JOHN D., Staff Engr., Monterey Coal Co., P.O. Box 94, Albers, II 62215

JOSENDALE, JOHN, Reg. Field Sales Mgr., Wire Rope Corp. of America, Inc., P.O. Box 288, St. Joseph, MO 64502

JOYCE, KEVIN, Vice Pres. Sales, Naylor Pipe Co., 1230 E. 92nd St., Chicago, IL 60619-7997 JUST, ZBIGNIEW, Sales Mgr., Kloeckner Becorit, RR 2, Box 228, Herrin, IL 62948

JUSTICE, HENRY B., Pres., Du Quoin Iron & Supply Co., P.O. Box 181, Du Quoin, IL 62832 JUSTICE, JAMES H. (JIM), Vice Pres., Du Quoin Iron & Supply Co., P.O. Box 181, Du Quoin, IL 62832

JUSTICE, LARRY, Rock Mechanics Supv., Standard Laboraties, Inc., P.O. Box 39, Freeburg, IL 62243

KACHIK, DAVID J., Assoc., Coal Industry Consultants, Inc., P.O. Box 4345, Wheaton, IL 60189-4345

KAELIN, ROY, Director, EXILL Trading Co., 321 N. Clark St., Suite 550, Chicago, IL 60610 KALESIA, WALTER L., Sales Rep., Evansville Electric & Mfg. Co., Inc., P.O. Box 4717,

Evansville, IN 47724

†KALIA, HEMENDRA N., 6425 W. Coley Ave., Las Vegas, NV 89102

†KARNES, RALPH E., Maintenance Foreman, Consolidation Coal Co., 309 W. Helen Ave., Christopher, IL 62822-1021

KASHMERICK, RICHARD D., Territory Mgr., Donaldson Co., Inc., 800 Ruth Dr., St. Charles, MO 63301

KASKY, JOHN, Sales Rep, R & H Service & Supply Co., P.O. Box 250, Carterville, IL 62918 KEASLING, SHIRLEY, Sales Rep., Midwest Steel, P.O. Box 1243, Granite City, IL 62040

KEE, GEORGE B., Vice Pres., Special Mine Services, Inc., P.O. Box 188, Country Club Rd., West Frankfort, IL 62896

KEE, VERNON, Sales Rep., Special Mine Services, Inc., P.O. Box 188, West Frankfort, IL 62896

KELL, THOMAS M., Gen. Mine Mgr., Freeman United Coal Mining Co., RR #1, Box C-74, Virden, IL 62690-9511

KELLEHER, JAY, Asst. Staff Geologist, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

KELLER, ROBERT T., Pres., J. H. Service Co., Inc., P.O. Box 4315, Evansville, IN 47724

KELLEY, JAY HILARY, Pres., Kelastic Mine Beam Company, 307 S. Pennsylvania Ave., Greensburg, PA 15601

KELLY, JOSEPH M., Staff Engr., ARDL, Inc., 1801 Forest Ave., Mt. Vernon, IL 62864

KELM, GEORGE, Pres., Sahara Coal Co., Inc., 3 1st National Plz., Suite 2000, Chicago, IL 60602

KELTON, GERALD P., Sales Mgr., Krebs Engineers, 1205 Chrysler Dr., Menlo Park, CA 94025-9928

KEMPER, BILL, Sales Rep., Grainger, 2535 Metro Blvd., Maryland Heights, MO 63043

KEMPER, JOHN B., Sales, Line Power Mfg. Corp., 4904 Pollack Ave., Evansville, IN 47715 KENDORSKI, FRANCISS., Reg. Div. Dir., Dunn Geoscience Corp., 1333 Butterfield Rd. Ste. 540, Downers Grove, IL 60515-6610

KENNEDY, JACK, Vice Pres., Jack Kennedy Metal Prods., Inc., P.O. Box 138, Taylorville, IL 62568

KENNEDY, WILLIAM, Pres., Jack Kennedy Metal Prods., Inc., P.O. Box 138, Taylorville, IL 62568

KENT, DAVID, Surveyor's Helper, Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896

KERN, ALAN, White County Coal Co., P.O. Box 457, Carmi, IL 62821

KERR, BOB, EPE III, Mine Pollution Control, IL EPA, P.O. Box 19276, Springfield, IL 62794-9276

KIMELTON, DWIGHT, Sales, R & H Service & Supply Co., P.O. Box 250, Carterville, IL 62918 KIMELTON, JAMES E., 805 Copperleaf Lane, Bartow, FL 33830

KING, GARY, Acetylene Gas Co., 3500 Bernard Str., St. Louis, MO 63103

KING, HAROLD, Branch Mgr., Illinois Bearing Co., 2840 Via Verde, Springfield, IL 62703

KING, JEAN ANN, Pres., King Miles & Associates, Inc., 527 State Street, Newburgh, IN 47630

KING, W. C. (BILL), Vice Pres., King, Miles & Assoc., Inc., 527 State Str., Newburgh, IN 47630

KINNELL, HERB, Sr. Sales, Quality Engr., Joy Technologies, Inc., 6160 Cochran Rd., Colon , OH 44139

KIRKPATRICK, BILLY, Sales Engr., Joy Technologies, Inc., R.R. 6, Box 343, Mt. Vernon, IL 62864

KISER, ROBERT W., Gen. Mgr., Western Kentucky Explosives, P.O. Box 8, Madisonville, KY 42431

KISSING, BILL, Owner, Ace Equipment Co., P.O. Box 40, Pittsburgh, IL 62974

KISSING, TAMMY, Sales Rep, Ace Equipment Company, P.O. Box 40, Pittsburg, IL 62974

KITCHEN, MARK, Shift Foreman, White County Coal Co., P.O. Box 457, Carmi, IL 62821

KLEMM, FRANK, Mgr.-Coal, Illinois Central Railroad, 233 N. Michigan Ave., Chicago, IL 60601-5799

KLINE, DANNY, Sales Rep., Ashby Electric Co., Inc., P.O. Box 55, Sebree, KY 42455

KNIGHT, DAVID, Operator-Black Creek Mine, Rogers Group, Inc., P.O. Box 849, Bloomington, IN 47402-0849

KNIGHT, JOAN, Office Mgr., Rogers Group, Inc., P. O. Box 849, Bloomington, IN 47402-0849

KNIGHT, KATHY, Adminis. Coord.-S. Region, Rogers Group, Inc., P.O. Box 849, Bloomington, IN 47402-0849

KNIGHT, RAY, Mgr., Owl Prairie Mine, Rogers Group, Inc., P. O. Box 849, Bloomington, IN 47402-0849

KOENITZER, JEFFERY D., Vice Pres. Engr., Helwig Carbon Products, Inc., 8900 W. Tower Ave., Milwaukee, WI 53224-0400

KOESTERER, M. (MIKE), Regional Sales Mgr., Joy Technologies, Inc., P.O. Box 1269, Mt. Vernon, IL 62864

KOPEC, JOHN, Pres., K & E Technical, Inc., P.O. Box 165, West Frankfort, IL 62896

KOSTBADE, KEN, Sales, Bearings Service Co., Highway 13, East, Marion, IL 62959

KOSTBADE, RICHARD, Dist. Mgr., Bearings Service Co., Highway 13, East, Marion, IL 62959

KOVACK, MIKE, Sales/Serv. Engr., Jack Kennedy Metal Prods., Inc., P.O. Box 138, Taylorville, IL 62568

KOVARIK, MIKE, Sales, Gooding Rubber Co., P.O. 487, Benton, IL 62812

KRAMER, ED, Sales Engr., American Pulverizer Co., 5540 W. Park Ave., St. Louis, MO 63110

KRIETEMEYER, NORMAN, Marketing Rep. Evansville Electric & Mlg. Co., Inc., P.O. Box 4717, Evansville, IN 47724

KRITZBERGER, GENE, Product Mgr., Voith Transmissions, Inc., 25 Winship Road, York, PA 17402

KRUSE, CARL W., Sr. Research Scientist, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820 KUDLAWIEC, ROBERT P., Midwest Reg. Mgr., Jeffrey Service Ctr., Dresser Industries, Inc., P.O. Box C, Norris City, IL 62869

KUEHNE, KEVIN H., Central Sales Engr., GIW Industries, Inc., 5000 Wrightsboro Rd., Grovetown, GA 30813

LAFFEY, MIKE, Sales Rep., Laffey Equipment Co., P.O. Box 16285, St. Louis, MO 63105

LAINE, DAVID, Reg. Sales Mgr., Prince Manuf. Co., 6024 Twickingham Dr., Evansville, IN 47711

LAMBERT, KEITH, Sales, Minesafe Electronics, P.O. Box 281, Sturgis, KY 42459

LAND, GEORGE W., Coal Technology Cons. (Retired), AMAX Coal Co., Inc., 727 Leisure Lane, Greenwood, IN 46142

LANGE, ULRICH O., Pres., Hemscheidt America Corp., P.O. Box 500, Pittsburgh, PA 15230 LARNED, GARDNER, Pres., Berry Bearing Co., 4242 S. 1st Ave., Lyons, IL 60534

LARSON, JOHN C., Sales Rep., Michigan Industrial Lumber, P.O. Box 612, Whiting, IN 45394 LATTINA, ALAN, Serv. Engr., Centrifugal & Mechanical Industries, Inc., 11140 S. Towne

Square-Suite 204, St. Louis, MO 63128 LAUER, BRIAN, Territory Mgr., Roland Equipment Co., P.O. Box 2879, Springfield, IL 62708 LAUFER, JAN, Optical Div., M&S Fire & Safety, P.O. Box 4348, Evansville, IN 47724

LAUR, KIRBY, Belt Mgr., Freeman United Coal Mining Co., Rt. 148, Waltonville, IL 62812

LAURENT, EDWARD L., Pres., Water & Oil Technologies, Inc., 52 Eastfield Rd., Montgomery, IL 60538

LAWRENCE, DAVID W., Chairman & CEO, Gooding Rubber Co., P.O. Box 729, La Grange, IL 60525

†LEDVINA, C. T. (CHRIS), Zeigler Coal Co., 5415 N. Sheridan Rd., Suite 5511, Chicago, IL 60640

LEHMAN, BOB C., Purchasing Agent, Arclar Co., P.O. Box 444, Harrisburg, IL 62946

LEIGHTON, MORRIS W., Chief, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

LEMMONS, SHARON K., Claims Mgr., Lynch Coal Operators Reciprocal Assn., P.O. Box 715, Terre Haute, IN 47805

LEMONS, ARLEY, (Retired), Sesser Concrete Products Co., 702 N. Park St., Sesser, IL 62884

LENDRUM, SHAUN P., Sales Mgr., Stamler Corp., P.O. Box 307, Main & Stamler Strs., Millersburg, KY 40348

LETSKY, CONNIE, 225 Persimmon Dr., Swansea, IL 62221

LEVANTI, WILLIAM, Safety Dept., Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896

LEWIS, TERRY, Customer Serv. Rep., Gooding Rubber Co., 1200 Blakely, Benton, IL 62812

LILLY, PETER B., Pres., Kerr-McGee Coal Corp., P.O. Box 25861, Oklahoma City, OK 73125

LINDENSCHMIDT, TERRY, Field Sales, Baker-Bohnert/Service Group, P.O. Box 169003, Louisville, KY 40256-9003

†LINDSAY, GEORGE C., 2515 Farrell Ave., Park Ridge, IL 60068

LINK, WILLIAM R., Training Spec., No. 1 Mine, Monterey Coal Co., P.O. Box 496, Carlinville, IL 62626

LIPPENCOTT, THOMAS W., Regional Mgr., Roberts & Schaefer Co., 2790 Mosside Blvd., Monroeville, PA 15146

LITTLEFIELD, KENNETH, Pres., B & L Industrial Systems, Inc., P.O. Box 1223, 2241 Adams, Granite City, IL 62040

LITTON, CHARLES, Asst. Branch Mgr., Commercial Test. & Engr. Co., P.O. Box 752, Henderson, KY 42420

LITTON, K. D., Bulk Material Hdl. Mgr., Reliance Electric, Inc., P.O. Box 862, Beckley, WV 25801

LOGSDON, CHERYL, Adminis. Coord., Rogers Group, Inc., P. O. Box 849, Bloomington, IN 47402-0849

LOLAN, DONALD J., Sales Rep., Midco Sales & Service, P.O. Box 28729, St. Louis, MO 63146 LONG, JANE, Pres., Roland Machinery Co., P.O. Box 2879, Springfield, IL 62708

LORENZO, SYLVER, Mine Mgr., Coal, Inc., RR3 Box 229, Linton, IN 47441

LOUNSBURY, RICHARD E., Environ. Advisor, Monterey Coal Co., P.O. Box 496, Carlinville, IL 62626

LOWE, DIANNA, Hillsboro Coal Co., P.O. Box 280, Hillsboro, IL 62049

LUBBERT, RANDALL, Dragline Training Instr., Southern Illinois University, Coal Research Center, Carbondale, IL 62901

LUCAS, WALTER S., Vice Pres., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946 LUMM, D. K., Geol., IL State Geological Survey, 615 E. Peabody, Champaign, IL 61820 LUTZ, MICHAEL E., Sales Engr., Power Torque, Inc., #1 Chisholm Trail, Columbia, IL 62236

LYMAN, ROBERT M., Geologist, Sun Coal Company, P.O. Box 10388, Knoxville, TN 37919 LYNN, JERRY A., Sales Rep., Fabick Machinery Co., P.O. Box 760, Marion, IL 62959

LYTLE, JOHN M., Head, Applied Res. Lab, IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

*MAC DONALD, J. W., Consultant, 501 W. Reed St., Benton, IL 62812

MACK, THOMAS E., Sales Engr., Halbach & Braun Industries, 90 W. Chestnut St., Washington, PA 15301

MAHLER, JAMES, Vice Pres. Admin., Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62208

MALL, RON, Sales Rep, Schaeffer Mfg. Co., 102 Barton St., St. Louis, MO 63104

MALLICOAT, DEBBIE, Marketing Assist., Lister-Petter, Inc., P.O. Box 1160, Olathe, KS 66061

MALONE, JAMES (PAT), Pres., Jake's Tire Co., P.O. Box 670, Marion, IL 62959

†MANCI, SAMUEL L. (No Address)

MANN, MITCH, Sales, Coal Age Service Corp., P.O. Box 250, West Frankfort, IL 62896

MARCUM, RON, Mgr. of Mines, Consolidation Coal Co., P.O. Box 218, Pinckneyville, IL 62274

MARLOW, GENE, Sales Engr., Ulmer Equipment Co., 1554 Fenpark Drive, Fenton, MO 63026

MAROSCHER, GUS, Reg. Sales Mgr., American Longwall, 1906 Suzanne, Marion, IL 62959 MARSHALL, S. R., Engr., Pyro Mining Co., P.O. Box 289, Sturgis, KY 42459

MARTIN, BERNARD DEAN, State Mine Inspector, IL Dept. of Mines & Minerals, RR 2, Box 170A, Taylorville, IL 62568-9802

†MARTIN, CHARLES EDWARD, Mgr., Human Resources, McDonnell Douglas Astronautics Co., Box 516, St. Louis, MO 63166

MARTIN, DAVID, Branch Mgr., Illinois Bearing Co., 207 Swan Ave., Centralia, IL 62801

MARTIN, GEORGE E., Vice Pres. Operations Serv., AMAX Coal Co., Inc., 251 N. Illinois St., Box 6106, Indianapolis, IN 46206-6106

MARTIN, HARRY, Exec. Vice Pres, Westfalia Mining Progress, 1018 Kanawha Blvd., E -Suite 300, Charleston, WV 25301

MARTIN, JAMES W., Mine Plann. Engr., Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896

MARTIN, NEIL, Vice Pres.-Adminis., R & H Service & Supply Co., P.O. Box 250, Carterville, IL 62918

MATUSKA, DAN, Sales Engr., Century Lubricating Oils, Inc., P.O. Box 161, Marion, IL 62959 MAUCK, HARVEY B., Owner, Deep Valley Coal Co., 1107 N. Logan Ave., Danville, IL 61832 MAY, BILLY, Sales Rep., Mohler Technology, P.O. Box 669, Boonville, IN 47601

MAYS, FRED, Sales Rep., Sandvik, P.O. Box 68, Charlton Hts., NC 25040

MC BRIDE, DON, State Mine Inspector, IL Dept. of Mines & Minerals, Rt. 1, Box 255, Pittsburg, IL 62974

MC CABE, WILLIAM J., Sales Mgr., Oberjuerge Industrial Prods., 2517 Adie Rd., Maryland Heights, MO 63043

MC CANDLESS, DON, Sales, Bearings Service Co., P.O. Box 758, Marion, IL 62959 MC CANN, MICK, Sales Rep., Illinois Bearing Co., 207 Swan Ave., Centralia, IL 62801

- MC CARTNEY, CLIFF, Dyna-Rok Mgr., Ingersoll-Rand Co., 3993 Daughtery Rd., Salem, VA 24153
- MC CLINTICK, LAWRENCE L., Plant Mgr., Eastern Electric Apparatus Service, 1565 S. Vandeventer Ave., St. Louis, MO 63110
- MC CONNELL, DON, Mgr. Loss Prevention, AMAX Coal Co., Inc., P.O. Box 730, Marion, IL 62959
- MC CORMICK, RICHARD L., Vice Pres., Conn-Weld Industries, Inc., PO Box 5329, Princeton, WV 24740
- MC COY, LARRY, Sales Mgr., Esco Corp., 1017 Griggs St., Danville, IL 61832
- MC COY, ROBERT E., Pres., Gunther-Nash Mining Construction Co., 2150 Kienlen Ave., St. Louis, MO 63121
- MC CULLOUGH, BILL, Sales, Evansville Auto Parts, Inc., P.O. Box 926, Evansville, IN 47706-0926
- MC DOWELL, NEAL, Terr. Mgr., Roland Machinery Co., P.O. Box 2879, Springfield, IL 62708
- MC FARLAND, JOHN, Gen. Maint. Sup., Zeigler/Old Ben Coal Co., 1103 N. McLeansboro, Benton, IL 62812
- MC FARLAND, KEITH A., Mgr., Vermilion Power Station, Illinois Power Co., Box 250, Oakwood, IL 61858
- MC GLADDERY, THOMAS, Buyer, Freeman United Coal Mining Co., 111 Airway, Marion, IL 62812
- MC KAY, JEFFREY, Geotechnical Spec., A.S.P. Enterprises, Inc., 1546 Fenpark Dr., Fenton, MO 63026
- MC MULLEN, MICHAEL, Mine Engr., Peabody Coal Co., P.O. 150, Marissa, IL 62257
- MC NEIL, DALPH S., Pres., Brookville Mining Equip. Corp., 20 Pickering St., Brookville, PA 15825
- MC NULTY, JAMES E., Sr. Assoc., Coal Industry Consultants, Inc., P.O. Box 4345, Wheaton, IL 60189-4345
- MC NUTT, AL, Sales Rep., Grainger , 2535 Metro Blvd., Maryland Heights, MO 63043
- MC PEAK, ROBERT, Mgr. Materials Services, Zeigler Coal Co., 50 Jerome Place, Fairview Heights, IL 62208
- MC WHORTER, P. L. "Judge", Gen. Sales Mgr., Phillips Machine Service, Inc., P.O. Box 1245, Beckley, WV 25802-1245
- MC WILLIAMS, JIM, Tec.I Consultant, Industrial Technologies, Inc., 10284 Page Blvd., St. Louis, MO 63132
- MECHTENBERG, TOM, Regional Mgr., Austin Powder Co., P.O. Box 19, Stendal, IN 47585 MEHNERT, BRENDA, Geological Engr., IL State Geological Survey, 615 E. Peabody Dr.,
- Champaign, IL 61820
- MELARAGNO, JOHN, Plant Mgr., Jeffrey Service Ctr., Dresser Industries, Inc., P.O. Box C, Norris City, IL 62869
- MELCHOR, M. JOSEPH, Sr. Vice Pres. / Engr., Gunther-Nash Mining Construction Co., 2150 Keinlen Ave., St. Louis, MO 63121
- MERIDETH, ELMO, Mgr. of Sales, Special Mine Services, Inc., P.O. Box 188, Country Club Rd., West Frankfort, IL 62896
- MERRIFIELD, NEAL H., Vice Pres., Underground Operations, Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896
- MERRITT, DENVER, Mine Foreman, White County Coal Co., P.O. Box 457, Carmi, IL 62821
- MESSMER, JERRY, Pres., Centrifugal Services, Inc., 260 Watertower Rd., Cadiz, KY 42411 MEYER, KENNETH R., Exhibit Mgr., GIW Industries, Inc., 5000 Wrightsboro Rd., Grovetown, GA 30813-9750
- MIHALEK, PAUL, Longwall Coord., Monterey Coal Co., 511 E. 1st North Str., Carlinville, IL 62626
- MILLARD, TIM, Sales, Central Illinois Steel Co., Box 78, Carlinville, IL 62626
- MILLER, JOHN J. (IKE), Mgr.-Sales/Service, Roberts & Schaefer Co., 120 S. Riverside Plaza, Suite 400, Chicago, IL 60606

MILLER, RICHARD, Mgr., Marcal Rope & Rigging, Inc., Box 477, Alton, IL 62002 MILLER, RICK, Sales Rep., Mohler Technology, P.O. Box 669, Boonville, IN 47601-0669 MILLER JR., R. G., Roberts & Schaefer Co., 120 S. Riverside Plz., Chicago, IL 60606 MILLIGAN, JACK, Purchasing Agent, Jader Fuel Co., Box 620, Shawneetown, IL 62984 MINER JR., JAMES A., Pres., Kerco, Inc., P.O. Drawer 665, Madisonville, KY 42431

MINGES, BRETT, Mgr.-Sales & Marketing, Lubricon, 350 E. Churchman Ave., Beech Grove, IN 46107

MINNETTE, GREG, Sales Mgr., Vernon Corp., P.O. Box 246, Booneville, IN 47601

MISSAVAGE, ROGER J., Dir., Computer-Aided Res. & Instr., Southern IL University, 207 S. 7th St., Herrin, IL 62948

MITCHELL, CARL, Sales Rep, Austin Powder Co., P.O. Box 63, Irontown, PA 63650

MITCHELL, MIKE, Real Estate Mgr, IL Oper., Meadowlark, AMAX Coal Co., Inc., P.O. Box 730, Marion, IL 62959

MITCHELL, WILLIAM, Branch Mgr., Roland Equipment Co., P.O. Box 2879, Springfield, IL 62708

MOAKE, WARD, Chief Electrician, Peabody Coal Co., R. R. 1, Marissa, IL 62257

MONARCH, DENNIS D., Division Mgr., Gooding Rubber Co., P.O. Box 487, Benton, IL 62812 MOONEYHAM, ROBERT, Inspector, IL Dept. of Mines & Minerals, R.R. 2, Box 420, West Frankfort, IL 62896

MOORE, GARY, District Mgr., Chem Link, 907 N. Elm St. A#301, Hinsdale, IL 60521-3645 MOORE, JOHN, Mgfrs Rep, Dukane Mining Products Group, 4369 Winchester Dr., Allison Park, PA 15101 92

MOORE, MARVIN R., R.R. 2, Box 163A, Goreville, IL 62939-3802

- MORGAN, GARY, Regional Parts Mgr., Simmons-Rand Company, P.O. Box 513, Marion, IL 62959
- †MORGAN, GEORGE H., Sales Mgr., White Hydraulics, P.O. Box 1127, Hopkinsville, KY 42240

MORGAN, JOHN H., Geologist, 1805 E. Poplar St., West Frankfort, IL 62896

MORGAN, MARK S., Dist. Sales Mgr., J. H. Fletcher & Co., 411 E. Geiger St., Morganfield, KY 42437

MORGAN, RANDY, Sales, Jake's Tire Co., P.O. Box 670, Marion, IL 62959

MORK, JOHN W., Pres. & CEO, Gooding Rubber Co., P.O. Box 729, La Grange, IL 60525

MORLOCK, R. J., Chmn. of the Board, Commerical Test. & Engr. Co., 1919 S. Highland Ave., Suite 210-B. Lombard, IL 60148

MORONI, E. T. (GENE), (Retired), Old Ben Coal Co., P.O. Box 477, Herrin, IL 62948

MORONI, TOM, Sr. Sales Engr., BP Oil, Inc., 6814 Shieldwood Rd., Tolodo, OH 43617-1264 MORSE, JAMES (JIM), Area Mgr., Gardner-Denver Mining & Const., P.O. Box 58, Florissant, MO 63032

MORSE, RONALD E., Director, IL Dept. of Mines & Minerals, P. O. Box 10137, Springfield, IL 62791-0137

MUELLER, DIANEW., Environ. Scientist, Peabody Coal Co., 7900 Jefferson Road, Freeburg, IL 62243

MULLINS, W. H., Consultant, 1019 Election Dr., Benton, IL 62812

MUNIE, JOYCE, Sec. Mgr., Mine Pollution Control, IL EPA, P.O. Box 19276, Springfield, IL 62794-9276

MURPHEY, LLOYD, Sales Mgr., Lummez Sales Company, 1059 Jennings Station Road, St. Louis, MO 63137

MURPHEY, MARY-ELLEN, Owner, Lummez Sales Company, 1059 Jennings Station Road, St. Louis, MO 63137

MURRAY, FREDERICK N., Consultant, 3734 E. 81st Pl., Tulsa, OK 74137

MURRAY, ROBERT E., 32 Cotswold Ln., Moreland Hills, Chagrin Falls, OH 44022

MUSKO, JR., MICHAEL J., Area Sales Mgr., Celtite Tecknik, 150 Carley Court, Georgetown, KY 40324

NANCE, ROGER B., Geologist, Freeman United Coal Mining Co., PO Box 100, West Frankfort, IL 62896-0100 NASH, BILL, Vice Pres. Op., Coal, Inc., R.R. 3, Box 229, Linton, IN 47441

NAWROT, J.R., Assoc. Scientist, Southern IL University, Coop. Wildlife Res. Lab, Carbondale, IL 62901

NEIGHBORS, DAVE, Survey Party Chief, Crown III, Freeman United Coal Mining Co., P.O. Box 259, Farmersville, IL 62533

NELSON, DWIGHT, Sales, Acetylene Gas Company, 3500 Bernard Str., St. Louis, MO 63103

NELSON, LONNIE G., Engr. Mgr., AMAX Coal Co., Inc., P.O. Box 730, Marion, IL 62959

NEMECEK, MONA L., Sr. Geologist, AMAX Coal Co., Inc., 4849 Hillside Ave., Indianapolis, IN 46205

NEUBAUER, ROBERT J., 1008 S. Butternut Circle, Frankfort, IL 60423

NEWCOM, CECIL, Mine Supt., Brushy Creek Mine, Brushy Creek Coal Co., Inc., 4270 N. America Rd., Galatia, IL 62935-9694

NEWCOM, JOHN, Pres., Marion Mining Bolt Corp., R.R. 10, Marion, KY 42064

NEWMAN, FREDERICK G., Consulting Geologist, R.R. 1, Box 151A, Gillespie, IL 62033

NIEBRUEGGE, PAUL E., Sales, Hopcroft Electric, Inc., 2 Glen Crossing Rd., Edwardsville, IL 62025

NIZIOLKIEWICZ, DENNIS, Mgr. Industrial Relations, Zeigler Coal Co., 500 N. DuQuoin St., Benton, IL 62812-1224

NOEL SR., W. E. (BILL), Dis. Sales Cons., Long-Airdox Co., P.O. Box 479, Benton, IL 62812

NOEL, JR., BILL, Dist. Mgr., Long-Airdox Co., Box 479, Benton, IL 62812

NOLAN, DALE, Land Reclamation Specialist, IL Dept. of Mines & Minerals, Coal Development Park #2, Carterville, IL 62901

NORRIS, DALE, Prep. Plant Mgr., Galatia Mine, Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946

NOVAK, NEIL D., Assist. Vice Pres. Bus. Dev., Arch Mineral Corp., City Place One, St. Louis, MO 63141

*NUGENT, FRANK, Chairman, Chief Exec. Officer, Freeman United Coal Mining Co., 222 N. La Salle St., Chicago, IL 60601

NUGENT, JOHN T., Gen. Sales Mgr., Freeman United Coal Mining Co., 111 Airway Dr., Marion, IL 62959

NUTTER, THOMAS B., Sr. Staff Engr., Monterey Coal Co., P.O. Box 496, Carlinville, IL 62626

NYSTROM, LEONARD T., Dist. Mgr., Okonite Co., 10805 Sunset Office Dr. #K-L 100, St. Louis, MO 63127-1008

O'BRYAN, DAVE, Consultant (Retired), Peabody Coal Co., R.R. 2, Box 665, Linton, IN 47441

O'KEEFE, ARTHUR (MIKE), Operations Supt.-Captain Mine, Arch of Illinois, P.O. Box 308, Percy, II 62272

O'NEAL, ROY J., Personnel Coord., White County Coal Co., P.O. Box 457, Carmi, IL 62821

OAKLEY, KENNETH W., Sales & Service Rep., Advanced Mining Systems, Inc., RR #4, Box 188, Benton, IL 62812

OBERHELLMAN JR., T. A., Consultant, 444 Pepperidge Ct., Aurora, IL 60506

ODLE, JERRY, State Mining Inspector, IL Dept. of Mines & Miners's, Rt. 1, Box 58A, Thompsonville, IL 62890

ODLE, JOE, Sales Rep., Rudd Equipment Co., P.O. Box 3935, Evansville, IN 47737

OLDSON, JOHN, Jennmar Corp., 1330 Old Freeport Rd., Pittsburgh, PA 15238

OLMSTED, DAVID, Sales Engr., Durex Products of IN, Inc., 814 W. Mulberry St., Kokomo, IN 46901

ORLANDI, WILLIAM J., Pres., Carbon Coal Co., 1525-35th Ave., Vero Beach, FL 32960

OTTEN, M. E., Parts Service Mgr.-Carterville, Roland Equipment Co., P.O. Box 2879, Springfield, IL 62708

*PACE, E. MINOR, (Retired), Inland Steel Coal Co., 700 Lake Park Dr., Mt. Vernon, IL 62864 PACK, DAVID, National Accounts-Mining, Texaco Lubricants Co., 1714 Deer Tracks Trail, 2nd Fl., St. Louis, MO 63131

PACK, EDWARD Y., Engr., Monterey Coal Co., P.O. Box 496, Carlinville, IL 62626

PADDOCK JR., FREDERICK W., Reg. Mgr. Engr., Consolidation Coal Co., 11821 Spruce Orchard Dr., St. Louis, MO 63141

- PADGETT, JEFFREY T., Roof Control Spec., Monterey Coal Co., P.O. Box 496, Carlinville, IL 62626
- PALMER, KAREN, Technical Information, Southern IL University, Coal Research Center, Carbondale, IL 62901
- PANNELL, DON, District Sales Mgr, CSE Corporation, 118-C Harper Industrial Park, Beckley, WV 25801
- PARIS, LARRY, White County Coal Co., P.O. Box 457, Carmi, IL 62821
- PARKE, E. WAYNE, 314 Bayview Dr., Avon Lake, OH 44012
- PARKER, TULLY, Dist. Mgr., Miller Electric, 123 Olde Farm Rd., Troy, IL 62294
- PARR, DAVE, Vice Pres., Mt. Vernon Elect., Co., Inc., 1313 Harlan Rd., Mt. Vernon, IL 62864
- PASTOR, DENNIS, Product Sales Rep., Hancor, Inc., R.R. 3, Box 392, Pana, IL 62557
- PATTERSON, BILL, Supt., Zeigler Coal Co., RR #1, Box 166, Pinckneyville, IL 62274
- PATTERSON, KENNY, Mine Mgr., Arclar Co., P.O. Box 444, Harrisburg, IL 62946
- PATTERSON, R. KEITH, Product Mgr., Jeffrey Service Ctr., Dresser Industries, Inc., 274 E. First Ave., Columbus, OH 43201
- PATTERSON, TOM, State Mine Inspector, IL Dept. of Mines & Minerals, 1670 Galatia Rd., Galatia, IL 62935
- PATTON, KENNETH, Mgr., Mainline Power Products, P.O. Box 4315, Evansville, IN 47724
- PAYNE, JOHN W., Vice Pres., Sales, R & H Service & Supply Co., R.R. 2, P.O. Box 250, Carterville, IL 62918
- PEARSON, K. D. "ALFIE", Marketing Mgr., Lister-Petter, Inc., P.O. Box 1160, Olathe, KS 66061
- PENA, PETE, Pres., Pena Tire of Southern IL, P.O. Box 205, DuQuoin, IL 62832
- PENSONEAU, TAYLOR, Vice Pres., IL Coal Association, 212 S. 2nd St., Springfield, IL 62701 PEREGOY, JIM, Sales, Frontier-Kemper Constructors, Inc., P.O. Box 6548, Evansville, IN 47719
- PERKS, ALAN V., Maint. Mgr., TSM Central Shop, Peabody Coal Co., R.R. 2, Box 85, Marissa, IL 62257
- PERSINGER, J. EARL, Dist. Mgr., Schroeder Brothers Corp., 127 Distribution Dr., Bldg. #3, Birmingham, AL 35209
- PETERSON, BRAD, Mgr. of Engr. & Surface Systems, Turris Coal Co., P.O. Box 21, Elkart, IL 62634
- PETERSON, PATRICK J., Sr. Mining Engr., Freeman United Coal Mining Co., PO Box 100, West Frankfort, IL 62896
- PETERSON, PETE, Field Operations Mgr., Schaeffer Mfg. Co., 102 Barton St., St. Louis, MO 63104
- PETTER, ROBERT P.(BOB), Pres., Henry A. Petter Supply Co., Box 2350, Paducah, KY 42012-2350
- PETTIT, LARRY G., Sales, Mt. Vernon Elect., Co., Inc., Harland Rd., Mt. Vernon, IL 62864
- PHIFER, STEVEN C., Environ, Engr., Freeman United Coal Mining Co., P.O. Box 259, Farmersville, IL 62533
- PHILLIPS, JIM, Sales Rep, Schaeffer Mfg. Co., 102 Barton St., St. Louis, MO 63104
- PHILLIPS, KENT, Marketing Mgr., Brake Supply Co., Inc., P.O. Box 447, Evansville, IN 47703-0447
- PIERPOINT, ALISON J., Principal Econ. Geol., Stagg Engineering Services, Inc., 3524 Moravian Court, Bethlehem, PA 18017
- PIERPOINT, CHARLES H., Dist. Mgr., Conn-Weld Industries, Inc., R.R. 1, Box 3, Woodlawn, IL 62898
- PILEGGI, JOSEPH J., Gen. Mine Mgr., Freeman United Coal Mining Co., Rt. 148, Waltonville, IL 62812
- PILLOW, MARK, Sales Mgr., M&S Fire & Safety, P.O. Box 4348, Evansville, IN 47724
- PISANESCHI, PETER R., Engr. Adv., Monterey Coal Co., P.O. Box 94, Albers, IL 62215
- PLACEK, NANCY, Regional Account Mgr., Lubricon, 350 E. Churchman Ave., Beech Grove, IN 46107

PLETKA, CHARLES S., Sales, Service Machine Co., P.O. Box 8177, Huntington, WV 25705 POLITO, MARCO A., Vice Pres. Sales, B. P. Tracy Co. (Div. Washington Mould), P.O. BOX 518, Washington, PA 15301

POLLACK, TOM, Owner & Pres., Associated Supply Co., P.O. Box 26, West Frankfort, IL 62896

†POLING, GILBERT (No Address)

POND, ROBERT A., Sales, Frontier-Kemper Constructors, Inc., P.O. Box 6548, Evansville, IN 47712

POOR, BOB L., Sales, Du Quoin Iron & Supply Co., Box 181, Du Quoin, IL 62832

POPOVICH, JAY, Vice Pres., MICON, 1900 Andrew Str., Munhall, PA 15120

POPP, JOHN T., Geologist, MAPCO Coal, Inc., 2365 Harrodsburg Rd., Sute B250, Lexington, KY 40504

PORTER, DICK, Division Pres., Austin Powder Co., 400 N. Bluff, Collinsville, IL 62234

PORTER, JOHN B., Project Engr., Zeigler Coal Co., 512 S. 20th St., Mt. Vernon, IL 62864 POWELL, R.D., Sales Rep., Brake Supply Co., Inc., P.O. Box 447, Evansville, IN 47703

PRESLER, DONALD, Account Specialist, Apache Hose & Belting Co., Inc., 2435 Rock Island

Blvd., Maryland Heights, MO 63043

PRESLER, MARK, Conveyor Serv. Mgr., Apache Hose & Belting Co., Inc., 2435 Rock Island Blvd., St. Louis, MO 63043

PRICE, JOHN D., Maintenance Foreman, Peabody Coal Co., R.R. 2, Box 166, Coulterville, IL 62237

PRICE, TIM, Inside Sales, McJunkin Corp., P.O. Box 285, Calvert City, KY 42029

PRIOR, IVAN, Owner, General Belt Service, Inc., RR2, Box 392, Benton, IL 62812

PRITCHARD, MICHAEL, Engr., Wabash Mine, AMAX Coal Co., Inc., R.R. #4, Box 588, Benton, IL 62812

PRITCHETT, RODNEY R., Sales Mgr., Du Quoin Iron & Supply Co., P.O. Box 181, DuQuoin. IL 62832

PRUNTY, JAMES C., Reg. Sales Mgr., Tabor Machine Co., 3800 Lickenbrook Rd., Marissa, IL 62257

PRUNTY JR., M. E., Roberts & Schaefer Co., 425 Grove St., Evanston, IL 60201

PTASNIK, LEE, Pres., Mine & Process Service, Inc., P.O. Box 484, Kewanee, IL 61443

PUCKETT, RANDY, Vice Pres. Sales, Lebco, Inc., P.O. Box 656, Benton, IL 62812

PUCKETT, VERNEL, UMWA, Brushy Creek Coal Co., Inc., 4270 N. America Rd., Galatia, IL 62935-9694

PYTEL, W. M., Research Assoc., Southern IL University, Dept. of Mining Engr., Carbondale, IL 62901

QUAM, R. ERIC, Mgr.-Engr., Peabody Coal Co., P.O. Box 76, Marissa, IL 62257

QUENON, ROBERT H., (Retired), Peabody Holding Co., Inc. (Retired), 301 N. Memorial, St. Louis, MO 63102

QUERTERMOUS, DALE, Gen. Mgr., Arclar Company, Box 444, 617 E. Church, Harrisburg, IL 62946

QUEVILLON, TOM, Sales, Texaco Lubricants Co., 1714 Deer Tracks Trail, 2nd Fir., St. Louis, MO 63131

RALEY, FRED, White County Coal Co., P.O. Box 457, Carmi, IL 62821

RALPH, DOUG, Sales Coord., Morgantown Machine & Hydraulics, P.O. Box 191, Nashville, IL 62263

RAMER, RALPH W., Pres., Screenco, Inc., 3003 Brainard Rd., Pepperpike, OH 44124

RAUZI, KEN, Dist. Mgr., ILL-MO Welding Products, P.O. Box 229, Mt. Vernon, IL 62864

READY, DALE, Owner, Ready Drilling Co., R.R. 1, Box 201B, Mason, IL 62443

REED, CHARLES E. (CHUCK), Vice Pres., Kerco, Inc., P.O. Drawer 665, Madisonville, KY 42431

REED, JOHN, Vice Pres., Marketing, Brookville Mining Equip. Corp., 20 Pickering St., Brookville, PA 15825

REES, BEN H., Sales, Rees Mine Supply Sales, Inc., P.O. Box 296, Du Quoin, IL 62832

- REEVES, TIM, Mgr., Corporate Services, Southern IL Power Cooperative, RR4, Box 607, Marion, IL 62959
- REIDELBERGER, B. CARL, Supt., Zeigler Coal Co., P.O. Box 1, Sparta, IL 62286

REILLY, MICHAELK., Chairman & CEO, Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62208

REIMER, BOB, Sales Rep., Fabick Machinery Co., Box 760, Marion, IL 62959

RENO, WAYNE D., Vice Pres., Sales, Peabody Development Co., P.O. Box 1649, Henderson, KY 42420

- REPASS, BETTY, Sales Rep, American Mine Research, Inc., P.O. Box 234, Rocky Gap, VA 24366
- REQUARTH, DAVID L., Sr. Project Engr., Peabody Coal Co., R.R. 2, Box 17, Edinburg, IL 62531
- RESNIK, WILLIAM L., Sales Rep.-Marion Div., Birmingham Bolt Co., 809 Skyline Dr., Marion, IL 62959
- REYNOLDS, MARK, Regional Sales Mgr., Georgia Duck & Cordage Mill, 2757 Brighton Ct., Geneva, IL 60134
- RICE, FRED, (Retired), Peabody Coal Co., R.R. 4, Box 114A, Beaver Dam, KY 42320

RICE, JIM, Pres., Southern IL Petrol, Inc., P.O. Box 119, DuQuoin, IL 62832

- RICE, NEIL D., Dragline Trng. Instr., Southern IL University, Coal Research Center, Carbondale, IL 62901
- RICHEY, GREG, Safety Engr., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

RICHTER, JIM, Pres., Power Conductors & Equip. Co., Inc., P.O. Box 6957, St. Louis, MO 63123

RIGDON, BOB, Sales Mgr., Flanders Electric of Illinois, 1000 N. Court St., Marion, II 62959 RING, JEFF, Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62208

- ROACH, DAVE, Sales Engr., Jeffrey, Dresser Industries, Inc., P.O. Box C , Norris City, IL 62869
- ROBERSON, ROD, Pres., E. N. E. Corp., RR 1, Box 55, Bonnie, IL 62816
- *ROBERTS, E. H., (Retired), 6 Lincoln Drive, Mt. Vernon, IL 62864
- ROBERTSON, JOE A., Survey Technician, Illinois Mine Subsidence Ins. Fund, 4 Executive Dr., Suite 4, Fairview Hts., IL 62208

ROBERTSON, JULIA S., Controller, Timmons Electric Co., Inc., 433 N. Townsend St., Morganfield, KY 42437

ROBINSON, C. R., Engr. Tech, Central IL Public Service Co., P.O. Box 86, West Union, IL 62477

ROBINSON, DENNY, Asst. Supt., Peabody Coal Co., R.R. 2, Box 213, Freeburg, IL 62243

ROBINSON, MARK, Plant Mgr., Eagle Seal Mine Sealant, P.O. Box 283, McLeansboro, IL 62859

ROBINSON, RICHARD C., Sales Mgr., Trellex Midwest, Inc., 11837 Adie Road , Maryland Heights, MO 63043

ROBINSON, ROGER D., Product Support Mgr., Construction Machinery Corp., P.O. Box 99429, Louisville, KY 40269-0429

RODGERS, ANDREW T., Pres. & CEO, Celtite Technik, Inc., 150 Carley Court, Georgetown, KY 40324

ROHDE, C. M. (CHUCK), Dist. Mgr., Continental Conveyor & Equip. Co., P.O. Box 2507, Mt. Vernon, IL 62864

ROHRBAUGH, TERRY, Vice Pres., Marketing, Mainline Power Products, P.O. Box 4315, Evansville, IN 47724

ROLAND, W. Dale, Outside Sales, McJunkin Corp., Box 285, Calvert City, KY 42029

ROLLINSON, JANE PHEE, Pres., Central Petroleum Co., 100 W. Main, Box 54, Salem, IL 62881

ROOF, JEFF, Parts Mgr., Lakeshore Mining Equip, Corp., Industrial Park Rd., Benton, IL 62812

RORICK, ANDREW H., Forest Geologist, Shawnee National Forest, 901 S. Commercial, Harrisburg, IL 62946 ROSS, ROBERT W., Sales Rep., Viking Chain Co., Box 526, Palos Hts., IL 60463

ROTH, AL, Mgr. of Engr., AMAX Coal Co., Inc., 20 N.W. First St., Evansville, IN 47708-1258

ROTRAMEL, JARRET, Supv. Benton Rescues, IL Dept. of Mine & Minerals, 503 E. Main, Benton, IL 62812

ROTZ, SCOTT, Mgr., Repair Services, Mt. Vernon Elect., Co., Inc., P.O. Box 1548, Mt. Vernon, IL 62864

ROWLAND, STEVE S., Gen., Mgr., Galatia Mine, Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946

RUCH, RODNEY R., Assist Branch Chief, Mineral Res.& Engr., IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

RUDZINSKI, JOE, Sales, Tabor Machine Co., Box 3037 Bluewell Station, Bluefield, WV 24701

RUPPEL, TOM, Somerville Coal Mining Corp., 2310 Decker Dr., Vincennes, IN 47591

RUTLAND, RANDY, Construction Machinery Corp., P.O. Box 99429, Louisville, KY 40269-0429

RYAN J.R., J. T., Chairman of Exec. Comm., Mine Safety Appliances Co., P.O. Box 426, Pittsburgh, PA 15230

SADLER, THOMAS B., (Retired), Old Ben Coal Co. (Ret.), RR2, Box 00, Benton, IL 62812-9802

SANDBERG, CHARLES, OSMRE, 511 W. Capitol #202, Springfield, IL 62704

SANDERS, KEN, Vice Pres. - Mining Div., Penn Machine Co., 1018 Kanawha Blvd., E. Ste 1101, Charleston, WV 25301

SANDERS, NEDA, Methods & Procedures Analyst, IL Dept. of Mines & Minerals, 300 W. Jefferson, Springfield, IL 62791

SANDUSKY, EARL E., Field Rep., Joy Technologies, Inc., Box 73, Benton, IL 62812

SANTEN, PAT, Sales Mgr., Columbia Quarry Co., P.O. Box 128, Columbia, IL 62236

SARVER, BARRY, Southern Sales Rep., J&R Manufacturing Co., Rt. 2, Box 173F, Bluefield, VA 24605

SAWYER, THOMAS H., Owner, Tom Sawyer Electric Sales, Inc., P.O. Box 921, Marion, IL 62959

SCHARP, ROBERT, Pres. Operations, Kerr-McGee Coal Corp., P.O. Box 25861, Oklahoma City, OK 73125

SCHAUBLE, ROY, Lubrication Engr., Texaco Lubricants Co., 1714 Deer Tracks Trail, 2nd Fl, St. Louis, MO 63131

SCHNAKE, J. STEVE, Environmental Engr., Zeigler Coal Co., 500 N. DuQuoin St., Benton, IL

*SCHONTHAL, JOSEPH, Pres., J. Schonthal & Assoc., Inc. (Retired), 1220 Rudolph, Apt. 2N, Northbrook, IL 60062

†SCHUBERT, R. R., Vigor & Billings , P.O. Box 1239, Ashland, KY 41101

SCHULTE, BOB, Territory Mgr., Industrial Technologies, Inc., 10284 Page Blvd., St. Louis, MO 63132

SCHWAPPACH, FRED, Training Instr., Illinois Eastern Comm. Colleges, 233 E. Chestnut St., Olney, IL 62450

SCOTT, J. MATTHEW, Sales Rep., Scott M.T.S., Inc., HCR 33, Box 36, Rolla, MO 65401 SCOTT, JAMES J., Pres., Scott M.T.S., Inc., HCR 33, Box 36, Rolla, MO 65401

SCOTT, RALPH, Vice Pres., Product Technology, Advanced Mining Systems, Inc., P.O. Box 4727, Steubenville, OH 43952

SEAVERS, WAYNE, Mine Surveyor, Zeigler Coal Co., Box 211, Orient, IL 62874 SEAY, BILL, Purchasing Mgr., Turris Coal Co., P.O. Box 21, Elkart, IL 62634

SEBECK, EUGENE, Asst. Supt., Peabody Coal Co., Box 85, RR2, Marissa, IL 62257

SERGIO, MIKE, Reg. Mgr., Jeffrey Div., Dresser Ind., Box 479, Itasca, IL 60143

SHAFFER, ART, Adv. Mgr., Long-Airdox Co., P.O. Box 429, Benton, IL 62812

SHANKS, ROBERT W., Pres., Arch of Illinois, Inc., P.O. Box 308, Percy, II 62272 SHEA, NICK T., Staff Fuel Procure. Adminis., CILCO, 300 Liberty St., Peoria, IL 61602 SHEW, RON, Pres., Ron Shew's Welding & Fabricating, Inc., RR 1, Marion, IL 62959

SHIELDS JR., MARVIN, Vice. Pres., Engr., Tabor Machine Co., Box 3037, Bluewell Station, Bluefield, WV 24701

†SHIMKUS, ERVIN L., Safety Mgr., Peabody Coal Co., 30 Bel Rue, Belleville, IL 62221

- *SHOCKLEY, RICHARD R., Director, Center for Res. on Sulfur in Coal, Suite 200, Coal Develop. Park, PO Box 8, Carterville, IL 62918-0008
- SHOCKLEY, V. W. (RED), Sales & Serv., Cincinnati Mine Machinery Co., Box 711, Benton, IL 62812
- SHUMATE SR., MACK H., Sr. Vice Pres./Engr. & Plan. (Retired), Zeigler Coal Co. (Retired), 6425 Longmeadow, Lincolnwood, IL 60646
- SIEBE, ALAN, Sales Rep., Brake Supply Co., Inc., P.O. Box 447, Evansville, IN 47703-0447 SIGMON, RICHARD, P.O. Box 414, Bluefield, WV 24701
- SIGMUND, DALE E, Pres., Sligo, Inc., Box 171, 140 E. Prairie Ave., St. Louis, MO 63166
- SILER, LARRY W., Assoc. Fuel Agent-Fossil, Commonwealth Edison, P.O. Box 767, Chicago, IL 60690
- SILLIMAN, BOBBY, Sales Engr., A. L. Lee Corporation, PO Box 2370, Mt. Vernon, IL 62864 SILVERMAN, MARC S., Mgr.-Geologic Services, Peabody Development Co., 301 N. Memorial Dr., St. Louis, MO 63102

SIMMONS, JOE, Olfice Mgr., Sahara Coal Co., Inc., P.O. Box 330, Harrisburg, IL 62946

- SIMMONS, STEVE, Office Mgr., Mainline Power Div., J. H. Service Co., Inc., P.O. Box 4315, Evansville, IN 47724
- *SIMON, JACK A., Chief Emeritus, IL State Geological Survey, 502 W. Oregon, Urbana, IL 61801
- SIMPKINS, ALBERT, Foreman, Coal Age Service Corp., Ken Gray Blvd., West Frankfort, IL 62896

SIMPSON, JAMES M., Supt., Old Ben #21, Zeigler Coal Co., P.O. Box 609, Sesser, IL 62884 SIMPSON, STEVE, Sales, Allied Construction-LPI, P.O. Box 1160, Olathe, KS 66061

SIMS, STEVE, Parts Mgr., Construction Machinery Corp., P.O. Box 97, Marion, IL 62959

- SINGH, MADAN M., Pres., Engineers International, Inc., 98 E. Naperville Rd., Suite 101, Westmont, IL 60559-1595
- SINHA, A. K., Prof., Southern IL University, College of Engineering & Technology, Carbondale, IL 62901
- SIZEMORE, DANNY W., Mine Mgr., Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946

SLACK, CLAYTON F., Pres., CLUES Corp., 1602 Matthew Lane, Marion, IL 62959

- SLEDGE, CAROL, Office Mgr., Joy Technologies, Inc., P.O. Box 1269, Mt. Vernon, IL 62864 SLOAN, WALTER E., Cincinnati Mine Machinery Co., 2980 Spring Grove Ave., Cincinnati, OH 45225
- SLYGH, PHILIP L., Mgr. Rebuild Orders, Jeffrey Rebuilt Ctr., Dresser Ind., P.O. Box C, Norris City, IL 62869
- SMART, MICHAEL, Mgr. of Mines, Zeigler Coal Co., 500 N. DuQuoin St., Benton, IL 62812 SMITH, CECIL, Maint. Supt., Mine 21, Zeigler Coal Co., P.O. Box 346, Benton, IL 62812

SMITH, FRED R., Sales, Norris Screen, Wickham Ave., Princeton, WV 24740

- SMITH, GREGORY C., Sr. Mine Geologist, Stagg Engineering Services, Inc., P.O. Box 7028, Cross Lanes, WV 25356
- SMITH, HOWARD, Product Support Rep., Fabick Machinery Co., P.O. Box 760, Marion, IL 62959
- SMITH, NORMAN S., Prof., University of Missouri, Rolla, Dept. of Mining Engr., Rolla, MO 65401
- SMITH, ROBERT Z., Vice Pres., Sales-Mining Prods., Peabody ABC Corp., P.O. Box 77, Warsaw, IN 46580
- SMITH, ROGER, Foreman, AMAX Coal Co., Inc., P.O. Box 144, Keensburg, IL 62852

SMITH, SONNY, Pres., S & S Distributors, P.O. Box 186, Farina, IL 62838

SMITH, W. KEITH, Pres., Sales, Freeman United Coal Mining Co., P.O. Box 1087, Marion, IL 62959-7587 SMITH, WILLIAM A., Pres., Paul Weir Co., 2340 River Rd., Suite 203, Des Plaines, IL 60018 SMITH, WILLIAM S., (Retired), Peabody Coal Co., 1400 Waverly, Collinsville, IL 62234 SNEED, DARRELL, Electronic Serv. Spec., National Mine Service Co., Rt. 1, Box 279,

Woodlawn, IL 62898

SNEED, DWIGHT L., Zeigler Coal Co., 50 Jerome Lane, Fairview Heights, IL 62223

SNYDER, DUKE, Dist. Mgr., Morgantown Machine & Hydraulics, P.O. Box 191, Nashville, IL 62263

SOLLAMI, JIM, Vice Pres., Sollami Co., P.O. Box 627, Herrin, IL 62948

SOLLAMI, PHILLIP, Pres., Sollami Co., P.O. Box 627, Herrin, IL 62948

SORRELL, SHERWOOD W., (Retired), Peabody Coal Co., 201 Joseph Dr., Fairview Heights, IL 62208

SOWELL, JERRY, Sales, Dayco Corp., 532A Zenk Rd., Troy, IL 62294

SPANI, EUGENE, Sales Mgr., Towers Mine Tool, Inc., Box 133, Christopher, IL 62822

SPEARS, BEN T., Dir. Human Resources, MAPCO Coal, Inc., P.O. Box 911, Henderson, KY 42420

SPENCER, JIM, Sales Engr., General Electric Co., 207 Dartmount Dr., O'Fallon, IL 62269 SPIHLMAN, RUTH ANN, Sales Rep., Lummez Sales Company, 11505 St. Route 160, Trenton, IL 62293

SPIVEY, JOSEPH S., Pres., IL Coal Association, 212 S. 2nd St., Springfield, IL 62701

SPOTTE, WALTER Vice, Pres., Lincoln Equip. Co., 20 Museum Rd., Washington, PA 15301 SPRESSER, ROGER, State Mine Inspector, IL Dept. of Mines & Minerals, P.O. Box 10137, Soringfield, IL 62791

SPROULS, MARK W., Editor, Coal Magazine, 29 North Wacker Dr., Chicago, IL 60606

SPURLING, GARY A., Asst. to Pres., Jack Kennedy Metal Prods., Inc., P.O. Box 138, Taylorville, IL 62568

STAGG, ALAN K., Pres.-Principal Geol., Stagg Engineering Services, Inc., P.O. Box 7028, Cross Lanes, WV 25356

STANLEY, JERRY, Survey Party Chief, Freeman United Coal Mining Co., P.O. Box 100, West Frankfort, IL 62896

STAUFFER, GREG E., Sales Rep., L-TEC Welding & Cutting Systems, P.O. Box 6947, Leawood, KS 66206-0947

STEELE, TOMMY JOE, Safety Mgr., White County Coal Co., P.O. Box 457, Carmi, IL 62821 STEELE, TROY T., Training Spec., Retired, 526 Idlewood Dr., Clarksville, TN 37043

STEFFEN, JOHN R., Mgr., National Accounts, El Dorado Chemical Co., Inc., 103 Edgewood Park, Marion, IL 62959

STEIMEL, BOB, Mgr. Sales, S. Cohn & Son, Inc., RR#4, Box 353A, Washington, IN 47501 STEINKE, MICHAEL P., Sr. Buyer, Zeigler Coal Co., 500 N. DuQuoin St., Benton, IL 62812

STEINKE, MIKE, Sales, Sligo, Inc., 140 E. Prairie Ave., St. Louis, MO 63147

STEINMETZ, JACK, Section Mgr., Mine 24/Old Ben Coal Co., Zeigler Coal Co., R.R. #2, Box 459, West Frankfort, IL 62896

STEPHENS, KEVIN, Mgr., S. Cohn & Son, Inc., RR #4, Box 353A, Washington, IN 47501

STEPHENSON, JOHN D., The Deister Concentrator Co., 901 Glasgow Ave., PO Box 1, Fort Wayne, IN 46801

STEWARD, LARRY, Dir. Materials Management, Peabody Coal Co., P.O. Box 1990, Henderson, KY 42420-1990

STEWART, JAMES R., Sales, S & S Urethane, Inc., Box 234, Royalton, IL 62983

STILLEY, RICHARD, Dir., Midwest Sales, Century Lubricating Oils, Inc., P.O. Box 161, Marion, IL 62959

STOKER, STEVE, Account Mgr., W. S. Tyler Co., 4325 Arrowtree, St. Louis, MO 63128

STRATTON, JOHN D., Purchasing, Du Quoin Iron & Supply Co., P.O. Box 181, Du Quoin, IL 62832

STRITZEL, DAVE, Dir.-Health & Safety, Zeigler Coal Co., 500 N. DuQuoin St., Benton, IL 62812-1224

STROTHMANN, KRIS, Technical Sales Rep, Kennametal, Inc., Rt.2, 1422 N. 25th, Mt. Vernon, IL 62864 STUNKARD, BRUCE, Sr. Indus. Engr., Kerr-McGee Coal Corp., P.O. Box 727, Harrisburg, IL 62946

SUBLETTE, WILLIAM F., Sales Mgr., Hemscheidt America Corp., 115 Industry Dr. P.O. Box 500, Pittsburgh, PA 15230

SURGENER, JOHN, Sales, Baker-Bohnert Service Group, P.O. Box 169003, Louisville, KY 40256-9003

SUTTON, WARD J., Plant Mgr., AMS - Carbondale, Inc., P.O. Box 3100, Carbondale, IL 62902-3100

SWAN, KENNY, Product Service Rep., Fabick Machinery Co., P.O. Box 760, Marion, IL 62959

SWIFT, RICH, Sales Eng., Areo-Quip Corp., 925 Douglas St., Alton, IL 62002

SWINGLE, DOROTHY J., Purchasing Supv., Wabash Mine, AMAX Coal Co., Inc., P.O. Box 144, Keensburg, IL 62852

TABOR, HOLLIS, Pres., Norris Screen, 614 S. Wickham Ave., Princeton, WV 24740

TABOR, LINDY, Pres., Tabor Machine Co., Box 3037, Bluewell Station, Bluefield, WV 24701

TANNETT, OLIVER, Dist. Mining Mgr., Wire Rope Corp. of America, Inc., 6430 Newburgh Rd., Evansville, IN 47715

TAYLOR, JIM B., Special Account Mgr., Continental Conveyor & Equip. Co., Box 400, Winfield, AL 35594

TAYLOR, LOREN, Human Resource Mgr., AMAX Coal Co., Inc., P.O. Box 730, Marion, IL 62959

TAYLOR, MARK S., Mgr., Minesafe Electronics, P.O. Box 281, Sturgis, KY 42459

TAYLOR III, LLOYD W., Midwest Div. Mgr., Commercial Test. & Engr. Co., P.O. Box 752, Henderson, KY 42420

TEASDALE, DONALD R., Reg. Sales Mgr., Bethlehem Wire Rope, 3630 Coffee Tree Ct., St. Louis, MO 63129

TEISA, EMIL J., MSHA, R.R. 1, Box 5, Coffeen, IL 62017

TELLE, JIM, Vice Pres., Aaron D. Cushman & Assoc., Inc., 7777 Bonhomme Ave., Suite 900, St. Louis, MO 63105

TELLMANN, JOHN R., Vice Pres. Engr. ,Plann. & Acquis., MAPCO Coal, Inc., 2525 Harrodsburg Rd., Suite 300, Lexington, KY 40504

THOMASSON, EDWIN M., Res. Dir., MSHA (Retired), RR1, Box 399, Carbondale, IL 62901

THOMPSON, ALBERT C., Project Engr., Consolidation Coal Co., 35 Mocking Bird lane, Carterville, IL 62918

THOMPSON, MIKE, Pres., Sesser Concrete Products Co., P.O. Box 100, Sesser, IL 62884

THOMSON, MICHAEL L., Gen. Sales Mgr., Celtite Technik, 150 Carley Court, Henderson, KY 40324

TIEN, JERRY, Assist. Prof., University of Missouri, Rolla, 226 McNutt Hall, Rolla, MO 65401 TILLSON JR., CHARLES B., Consultant, 1920 SE 32nd Terr., Cape Coral, FL 33904-4429

TIMMONS, JOHN M., Supt., Timmons Electric Co., Inc., RR#4, Box 45-C, Morganfield, KY 42437

TIMMONS, RONALD L., Electrical Engr., Timmons Electric Co., Inc., 319 E. Houston Str., Morganfield, KY 42437

TIMMONS, JR., SAMUEL L., Owner, Timmons Electric Co., Inc., P.O. Box 527, Morganfield, KY 42437

TITUS, TIM, Sales Rep, Brake Supply Co., Inc., P.O. Box 447, Evansville, IN 47703

TOPAL, JEFF, Parts Mgr., Cummins Gateway, Inc., 7210 Hall St., St. Louis, MO 63147

TORBERT, JR., FRANK L., Dir.-Marketing, Joy Finance Co., One Oxford Centre, Suite 3650, Pittsburgh, PA 15219

TORRES, JOHNNY P., Sr. Engr., Monterey Coal Co., P.O. Box 94, Albers, IL 62215 TOWERS, RICK, Vice Pres., Towers Mine Tool, Inc., Box 133, Christopher, IL 62822

TOWERS, TOM, Pres., Towers Mine Tool, Inc., Box 133, Christopher, IL 62822

TOWNSEND, RICHARD, Adminis. Mgr., MAPCO Coal Inc., P.O. Box 911, Henderson, KY 42420 TRACY, BILL, Sales Rep., M&S Fire & Safety, P.O. Box 4348, Evansville, IN 47724

TRAVELSTEAD, CHARLES, Gen. Mgr., - Engr., Exxon Coal Minerals Australia, 32 Boundary Rd., Wahroonga, NSW, Australia 2076

TRAYLOR, DAVID, Maintenance Foreman, Consolidation Coal Co., R.R. #1, Box 1010, Donnellson, IL 62019

TROUT, DARREL R., Estimator, Jeffrey Service Ctr., Dresser Industries, Inc., P.O. Box C, Norris City, IL 62869

TRUE, RANDY, Sales Rep, R & H Service & Supply Co., P.O. Box 250, Carterville, IL 62918 TUCKER, JOHN B., Sales Mgr., Conex, Inc., 233 Bon Harbor Cove, Owensboro, KY 42301 TUPPE, LESTER H, Illinois Sales Mgr., Jennmar Corp., Rt. 4, Box 290, Mt. Vernon, IL 62864

TUREK, STEVE, Branch Mgr., Fabick Machinery Co., P.O. Box 760, Marion, IL 62959

TURNER, JAMES E., Sales, American Mine Tool Co., R.R. 1, BOX 9A, CHRISTOPHER, IL 62822

TURNER, RICK, Operations Mgr., Rogers Group, Inc., P. O. Box 849, Bloomington, IN 47402-0849

TURREL, JOHN D., Vice Pres., Hydrocarbon Survey, R.R. 2, Box 238, Mt. Vernon, IL 62864 UGO, JOHN A., Sales, Coldwell & Co., Inc., Box 42, Terre Haute, IN 47808

ULMER, JIM, Pres., Ulmer Equipment Co., 1554 Fenpark Dr., Fenton, MO 63026

URBAN, JOE, Health & Safety, United Mine Workers Of Am., 605 S State, Christopher, IL 62822

URBANCIC, JOHN J., Vice Pres. of Purchasing, Freeman United Coal Mining Co., 222 N. La Salle St., Chicago, IL 60601

URMSTON, WALTER W., Owner, OKI Padgett Systems, #2 Simon Lane, Fairfield, OH 45014 VALETT, GENE L., Principal Geologist, Morrison-Knudsen Ferguson Engineers, 7295 Highway 94 S., St. Charles, MO 63303

VALLI, RICK, Sales Rep, Grainger, 2535 Metro Blvd., Maryland Heights, MO 63043

VAN CLEVE, MIKE, General Maint, Foreman, White County Coal Co., P.O. Box 457, Carmi, II 62821

VAN DEMAN, JOSEPH A., Sales Engr., FMC Corp., M.H.E. Div., 4 Spencer Valley Ct., St. Peters, MO 63376

VAN DERVEER, RICHARD A., Exec. Vice Pres., Ocenco, Inc., 10225 B2nd Ave., Kenosha, WI 53142-7737

VAN ROOSENDAAL, DAN J., Geological Engr., IL State Geological Survey, 615 E. Peabody Dr., Champaign, IL 61820

VANCIL, J.B. (SAM), Asst. Dir., IL Dept. of Mines & Minerals, 503 E. Main, Benton, IL 62812

VANCIL, JACK, Pres., Local 2420, United Mine Workers of Am., RR 2, Box 74, Galatia, IL 62935

VANTUYL, KEVIN, Sales, North American Green, 1546 Fenpark Dr., Fenton, MO 63026 VEHIGE, MIKE, Sales Rep., Laffey Equipment Co., P.O. Box 16285, St. Louis, MO 63105 VELIA, MERLE W., Plant Mgr., Eldorado Chemical Co., Inc., P.O. Box 285, Percy, IL 62272 VENDITTO, JIM, Regional Sales Mgr., Lister-Petter, Inc., P.O. Box 1160, Olathe, KS 66061 VETTER, K. H., Sales Rep., Falk Corp., 180 Weidman Rd., Manchester, MO 63021

WAGNER, CURTIS, Project Engr., Monterey Coal Co., P. O. Box 496, Carlinville, IL 62626 WALDEN, FRED E., Land Reclamation Spec., IL Dept. of Mines & Minerals, P.O. Box 10197, Springfield, IL 62791-0197

WALDING, JOHN H., Product Mgr., Denver Thomas, Inc., P.O. Box 96, Birmingham, AL 35201

WALKER, DALE E., Vice Pres. Oprs. Surface Mines, Freeman United Coal Mining Co., P. O. Box 570, Canton, IL 61520

WALKER, HAROLD L., 2110 Belmore Ct., Champaign, IL 61820

WALL, PEGGY, UMWA, Brushy Creek Coal Co., Inc., 4270 N. America Rd., Galatia, IL 62935-9694

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