Dry Cleaning of A High Sulfur Coal Case Study

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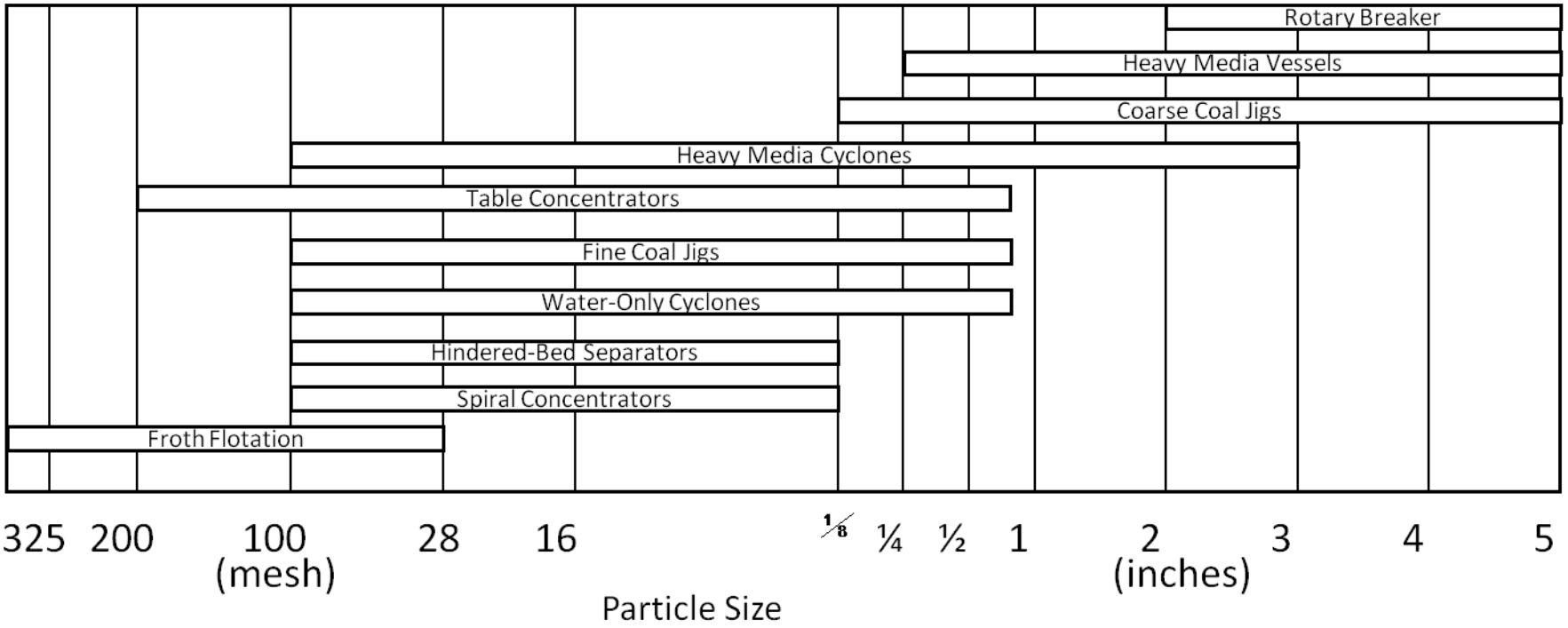
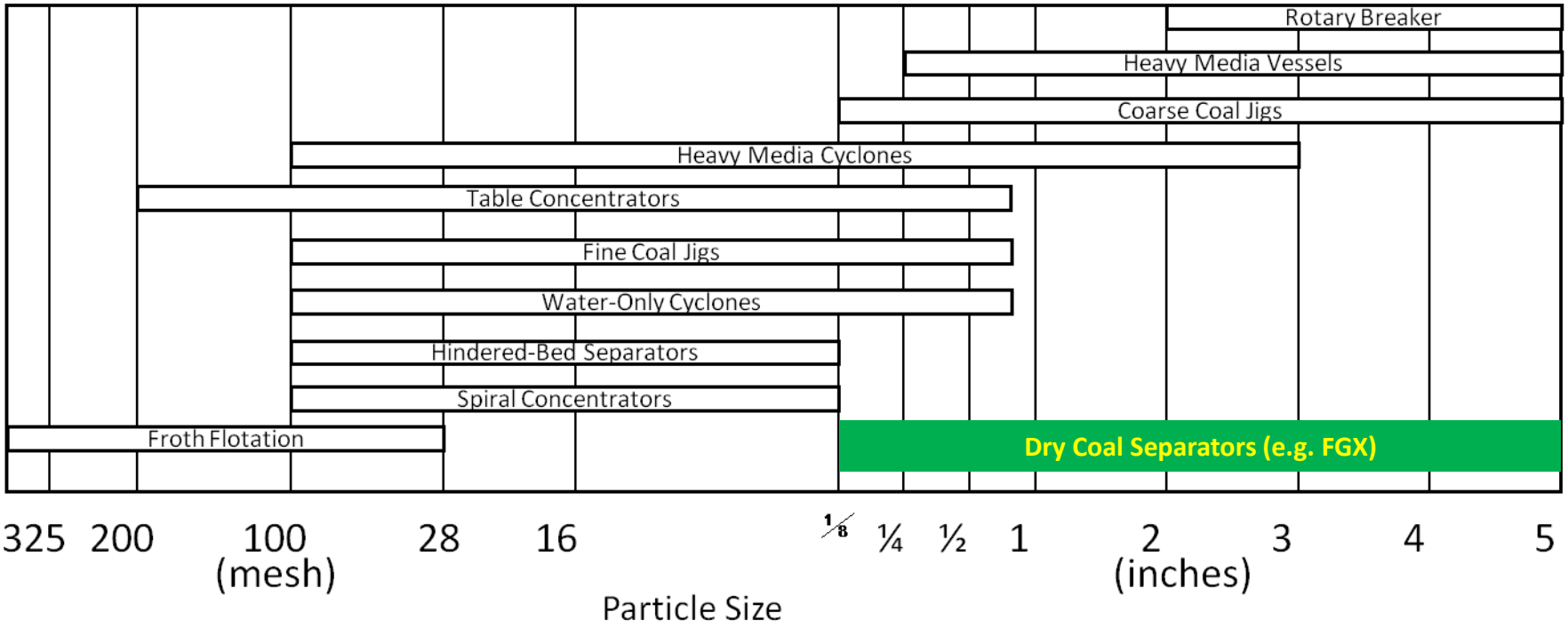


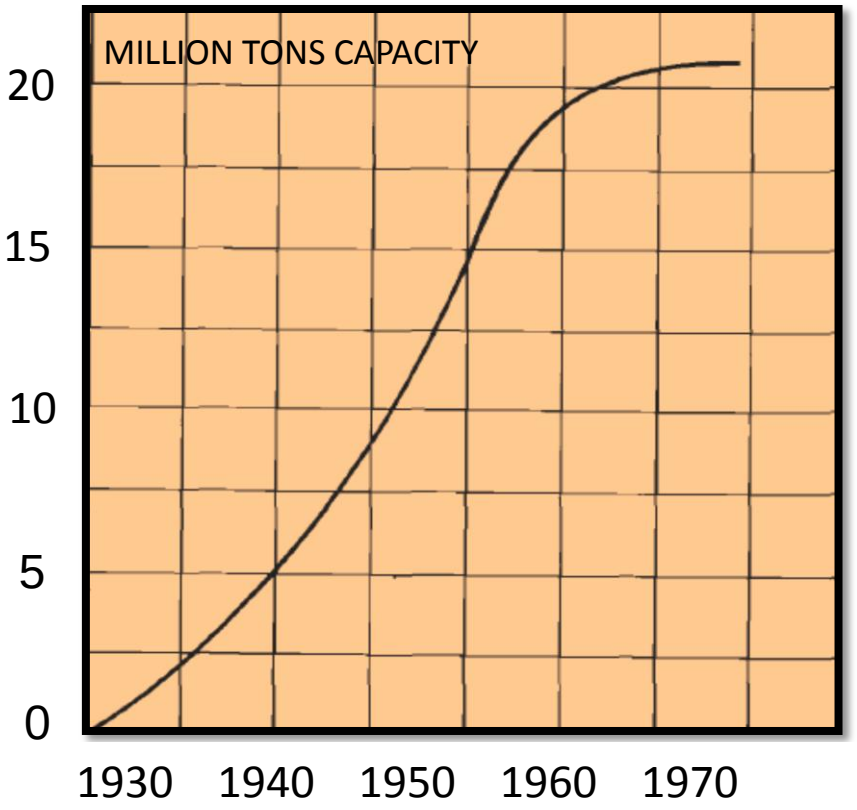
Coal Preparation Equipment used with respect to size of the coal



Coal Preparation Equipment used with respect to size of the coal

Introduction

- Wet cleaning plants and processes are:
  - More Efficient;
  - Effectively clean from coarse to ultrafine;
  - Not impacted by feed moisture.
- WHY DRY CLEANING?
  - Scarcity of water;
  - Particle degradation in wet cleaning plants;
  - Dewatering issues avoided;
  - Reduced capital and operating costs;
  - Reduced environmental impacts.

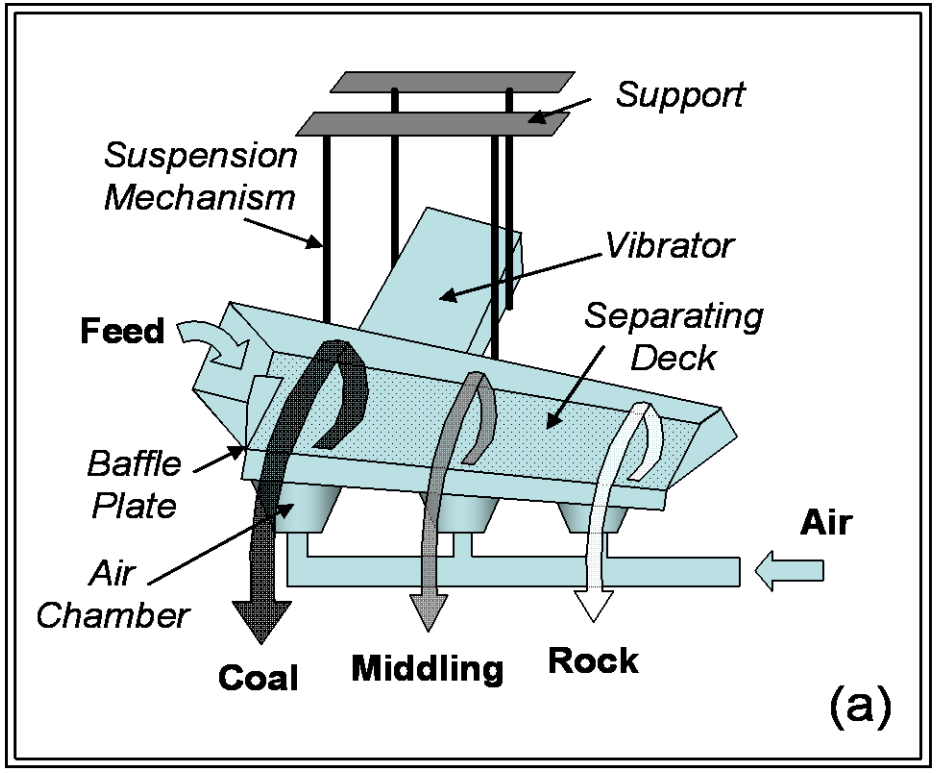


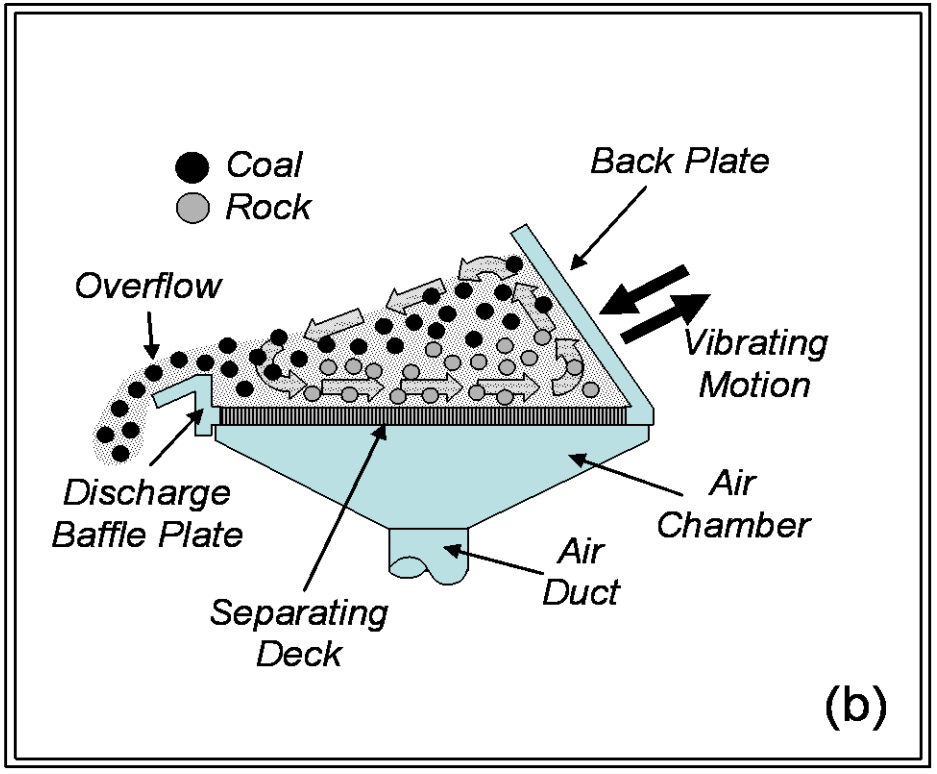
(Mcculough et. al., 1968)

Dry cleaning is making a global comeback in the 21st century

Dry, Fluidized Bed Table Separator

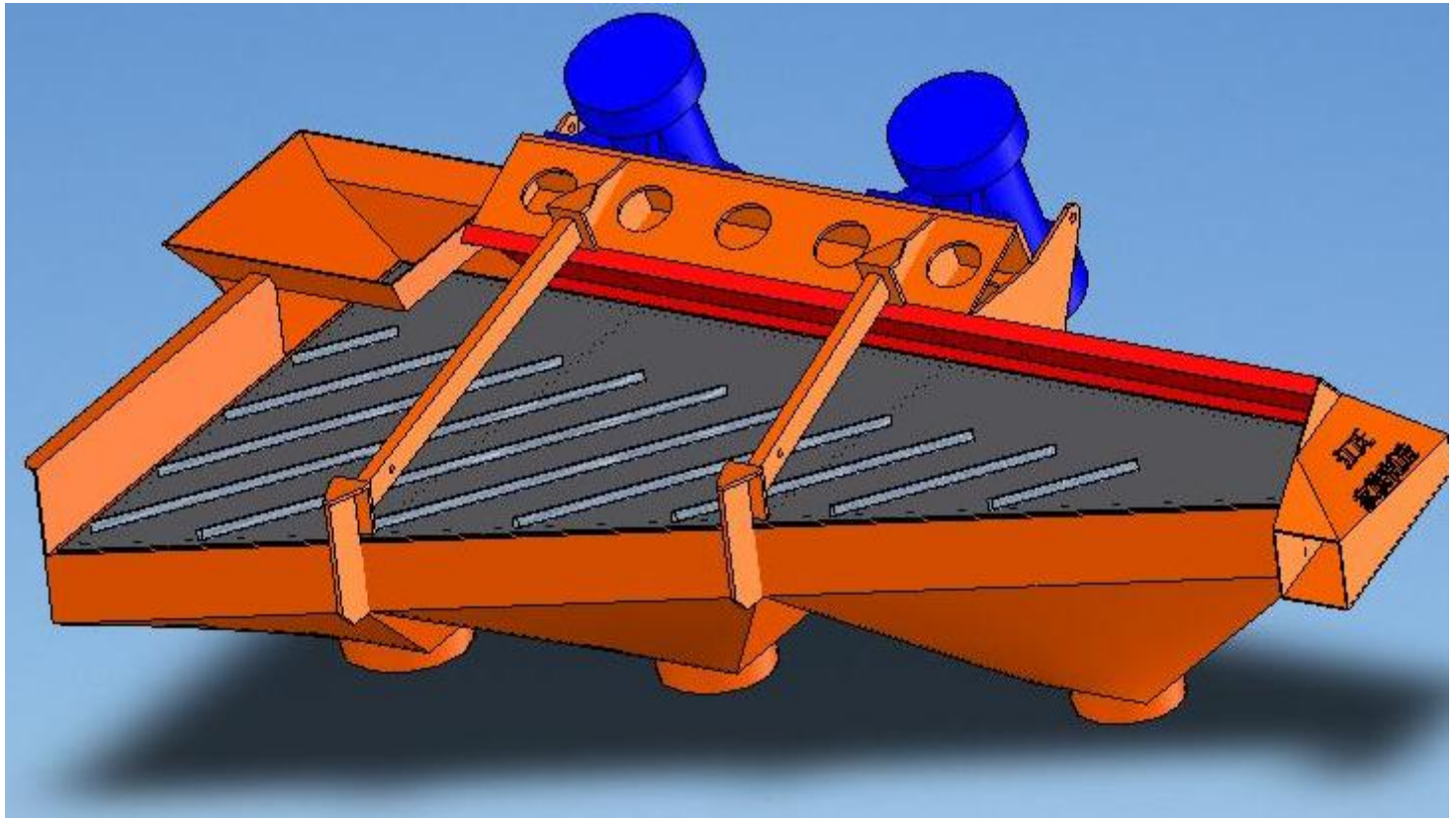
- Earliest air tables date back to 1850's.
- Major development during 1910-1930.
- Major technology developments in China over the last two decades.

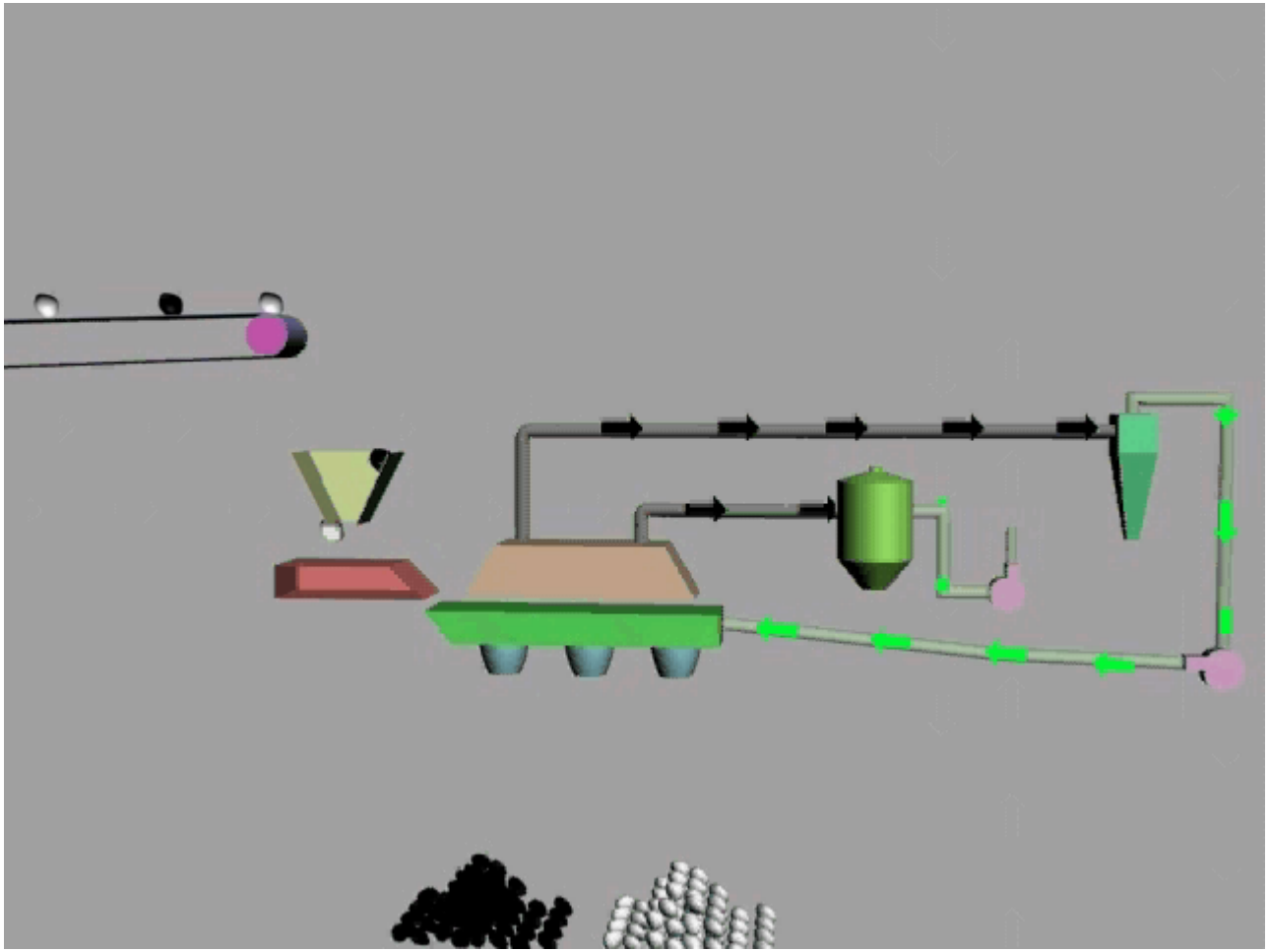




What's FGX?

- A completely dry coal preparation method.
- A simple, efficient & cost-effective separation process.
- A **GREEN** and energy efficient technology.





Benefits

- Saving transportation costs.
- Saving water costs.
- Saving processing costs & increasing plant productivity.
  (Less maintenance, less chemical, less headache for water treatment…)
- Permitting is relatively easier.

Eagle River Coal ,LLC
Harrisburg, IL

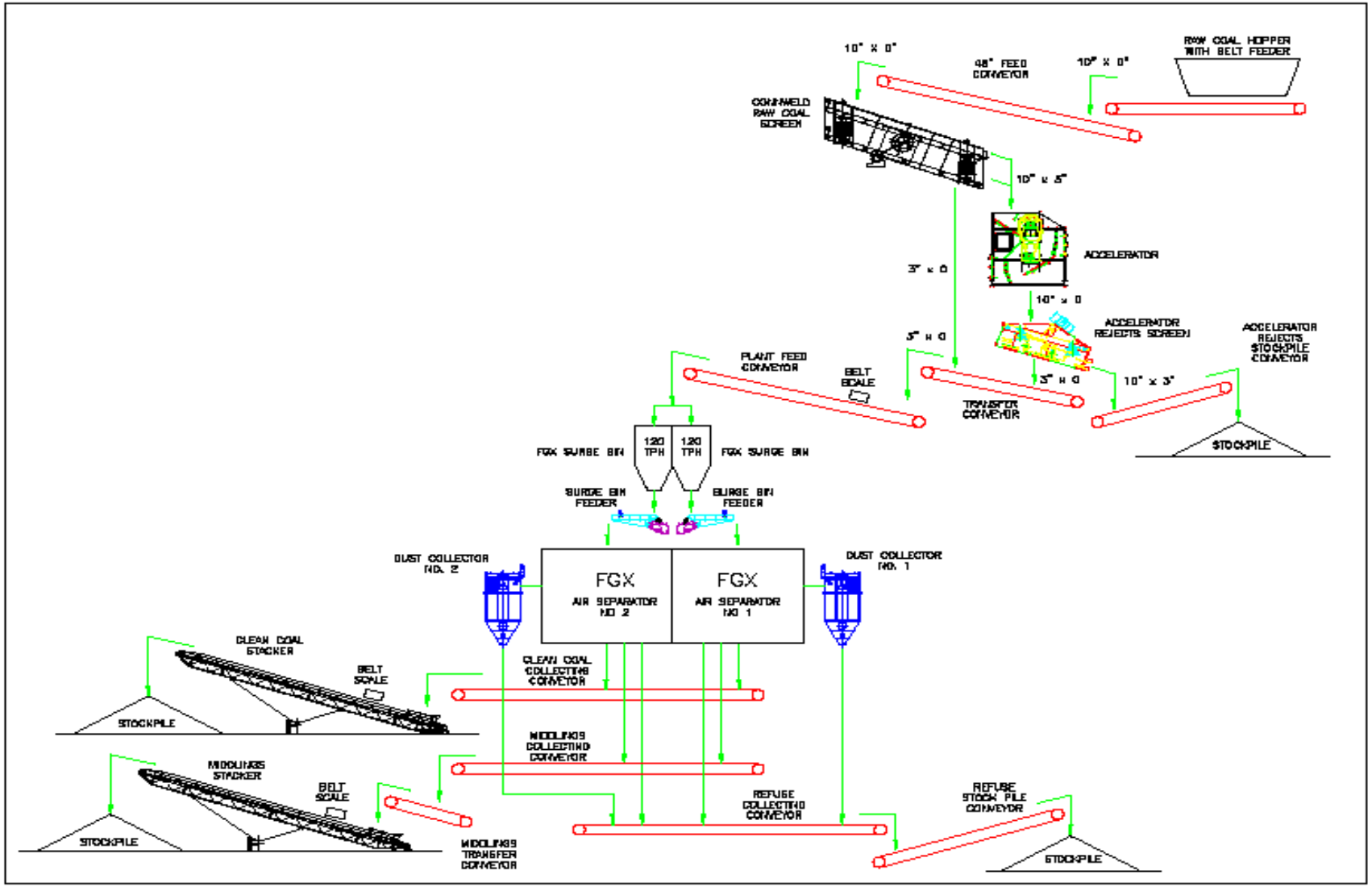
- **High sulfur coal and about 20% ash**

- **Operating for the last 12 months**

At a rate of ~ 250 tph

FGX Dry Coal Separator Specifications at Eagle River Coal LLC

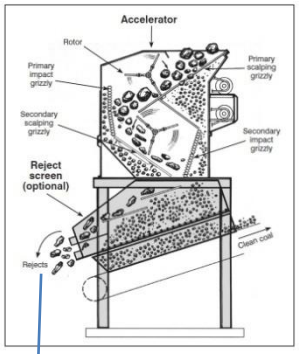
- **Total capacity of the plant 250 tph – 3” raw feed**
- **Major equipment includes 2 x 125 tph vibrating tables**
- **Plant produces Coarse and small size clean coal, middlings, refuse, and fine dust**
- **Cleaning set-up at a cut point density of 1.8**



Process Flow Diagram of FGX Dry Coal Processing System for Eagle River Coal LLC

FGX- 24A

Accelerator



ROM Coal

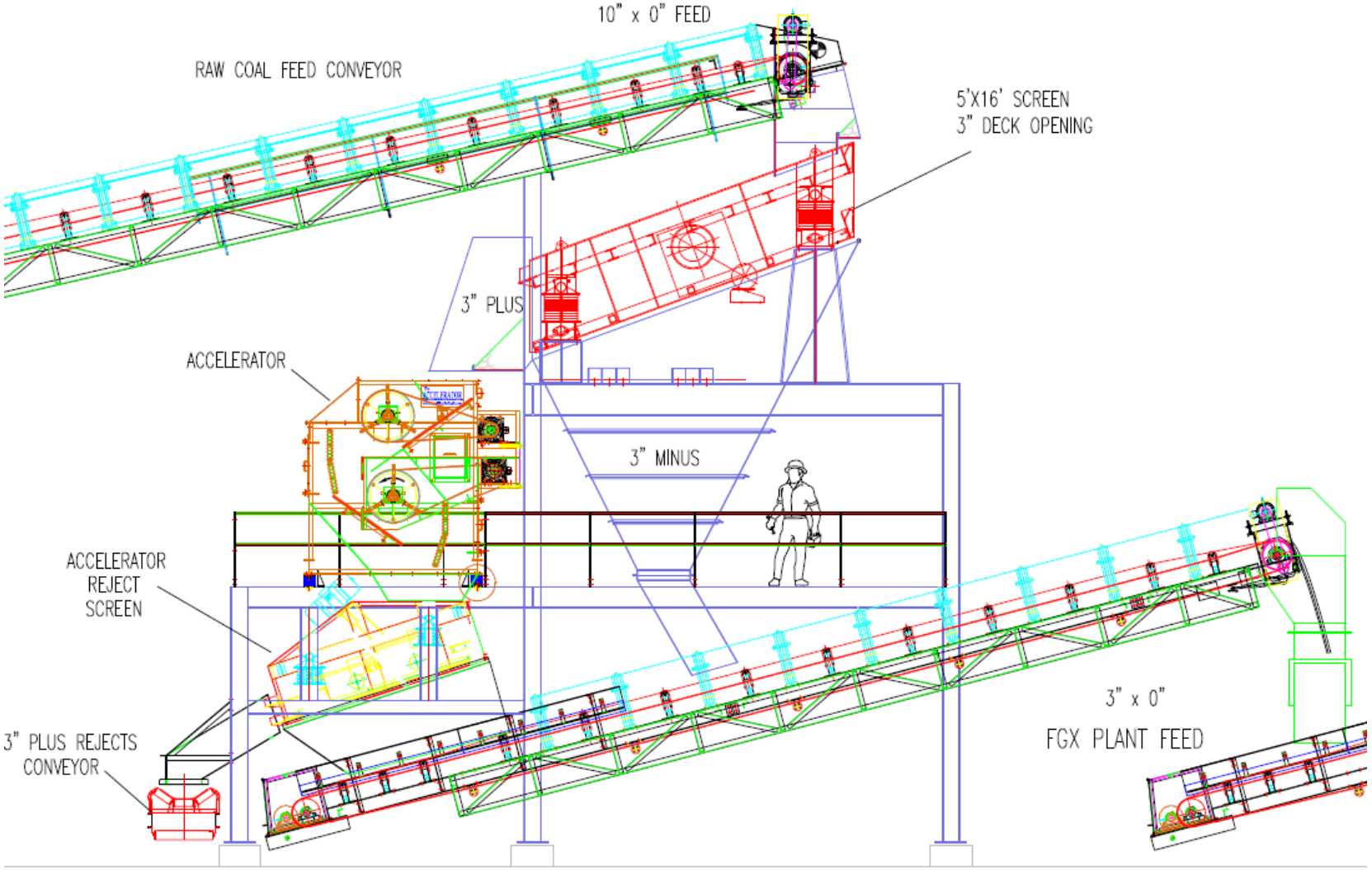
Accelerator Rejects

Rejects

Middlings

Clean Coal

Process Flow Diagram for the Eagle River Coal LLC

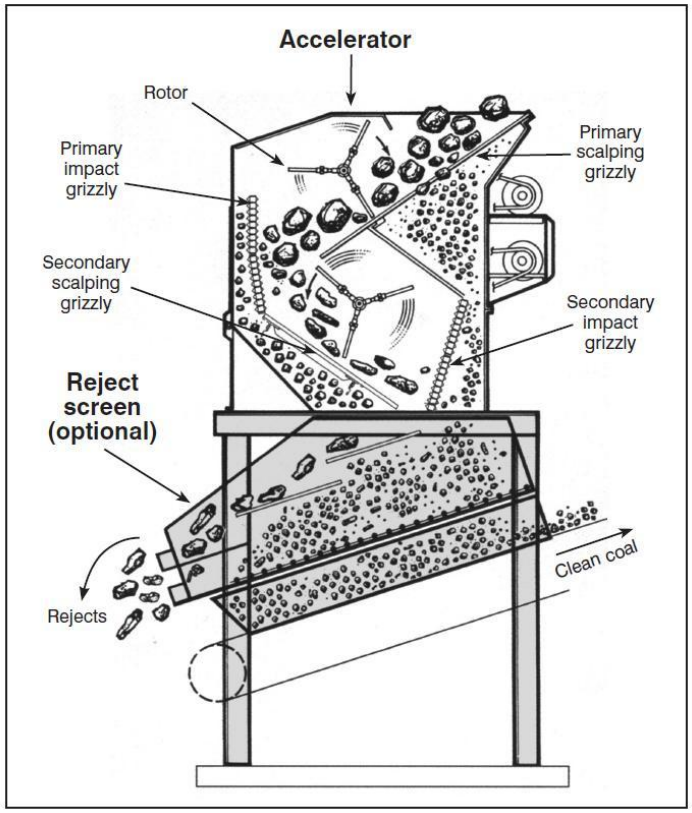


Raw Coal Screening & Sizing at Eagle River Coal LLC

Raw Coal Feed & Sizing at Eagle River Coal LLC

Imperial Technologies
Accelerator

- Variable Speed Vertical Impact Breaker
- Fractures Coal without breaking rock, so screening separation is made
- Processes 10” x 3” ROM Coal to Uniform Sized, Cleaner Coal Product
- Liberates coal from pyretic material to improve FGX processing efficiency



Accelerator Benefits

Accelerator @ FGX Plant

- **Liberate Coal From Rock/Shale with screening (Lower Ash & Sulfur)**
- **Improve Raw Coal Quality**
- **Uniform Sized Raw Coal Feed**
- **Increases FGX Plant Recovery as compared to crushing everything**
- **Maximize Coal Throughput**
- **Reduce Plant Wear**

Eagle River Coal, LLC
Raw Coal Data:

Ash	16 –18%
Sulfur	~6.0 % St
Total moisture	4.5%
Surface moisture	1.5%
HGI	52-60

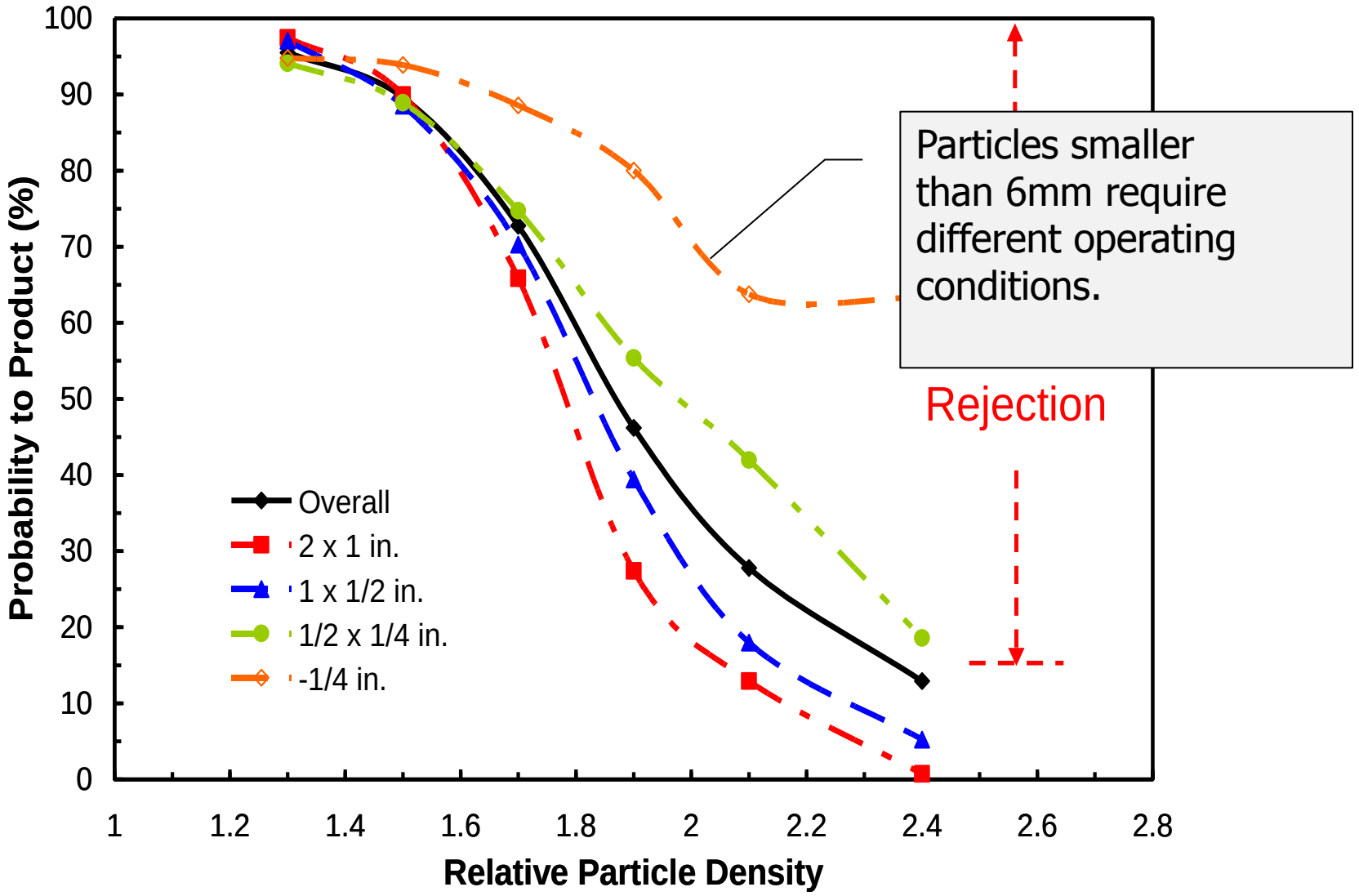
Eagle River Coal, LLC
Product Data

Product	Ash%	Sulfur%	Heating Value(Btu/lb)
ROM	16-18	5-5.5	12,000-12,200
Clean Coal	8.5-9.5	3.5-3.8	12,800-13,000
Middlings	10.0-12.0	3.8-4.5	11,850-12,250
Refuse	20-28	~8.00	8,000-8,500

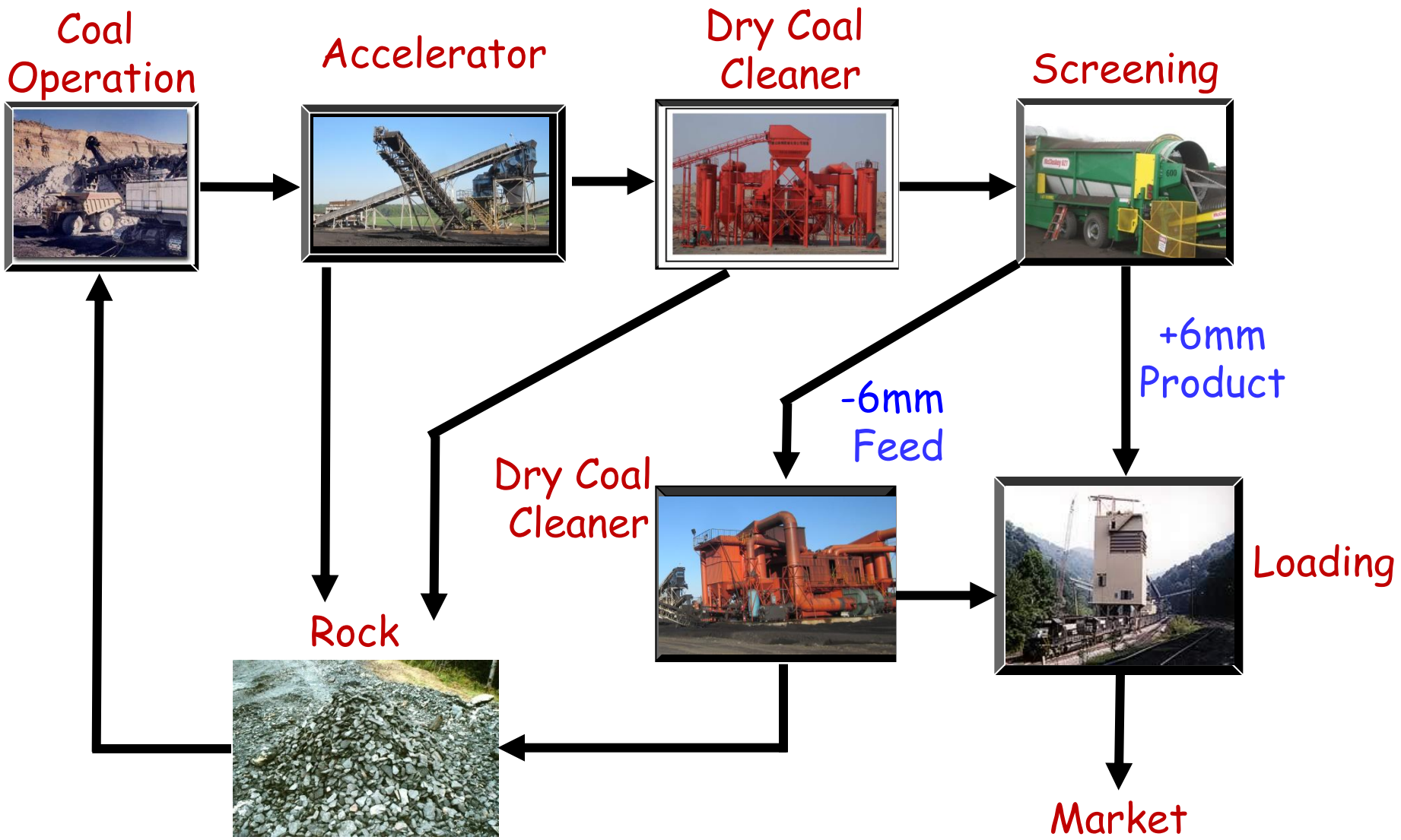
Yield (two products clean coal and middlings) ~ 80%

Combustible Recovery ~92%

Separation versus Particle Size



Dry Coal Cleaning Scheme



Economic Benefit

- Unit capacity = 500 tph
- Yield to reject = 36.4%
- Reject Amount = 500 x 0.364 = 182 tph

- Annual Operating Hours =6000 hrs/yr

- Total reject left at mine
= 182 tph x 6000 hrs/yr = 1,092,000 tons

- Transportation cost = $0.50/t mile

- Mine-to-plant distance = 20 miles

- Transportation cost/ton = $10.00/ton
  - Annual transportation savings = 1,092,000 x $10

= $ 10,092,000

Lost Coal Cost

- Total reject = 182 tph
- % 1.60 float in reject = 0.78 %
- Total coal loss = 182 x 0.0078 = 1.42 tph
- Annual coal loss = 1.42 x 6000 hrs/yr
  = 8518 tons
- Sale price = $ 50/ton
- Lost coal cost = 8518 x 50 = $ 425,880/yr

Summary Economic Benefit

- FGX operating cost = $1.50/ton

- Annual operating cost = $1.50 x 500 x 6000
  = $ 4,500,000/yr

- Summary

  Transportation savings = $ 10.09 M
  Coal loss = $ 0.43 M
  Operating cost = $ 4.50 M

  Net profit gain = $ 5.66 M

Commercial Dry Table Separators

- Over 1000 installations of dry-air table separators worldwide.
  - Brazil
  - China
  - Mongolia
  - South Africa
  - South Korea
  - India
  - USA
- Table capacity = 10 to 250 TPH
- Plus 6 mm material
- Less than 10% surface moisture

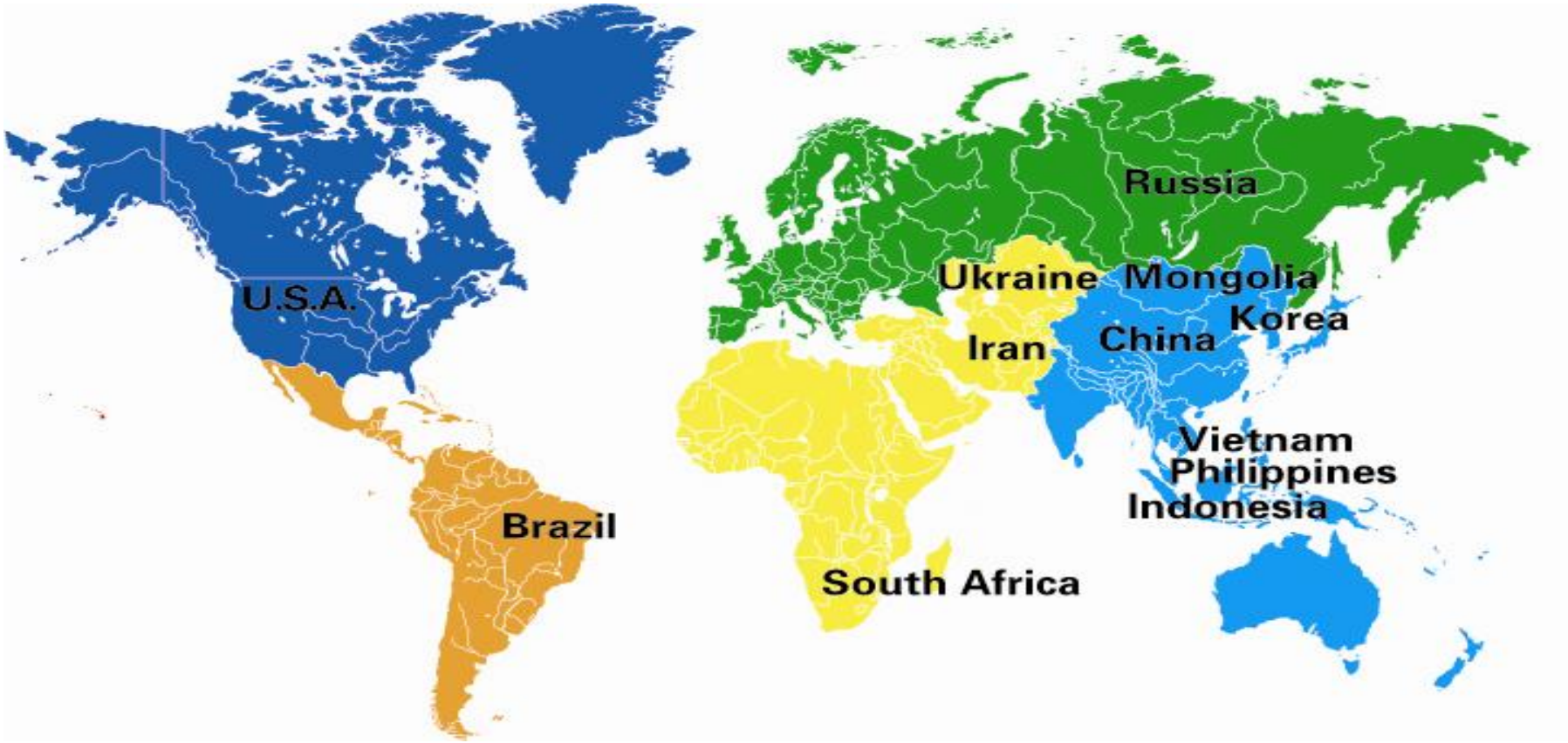
Illinois FGX Separator Installation
250 TPH capacity

Applications

- Steam coal deshaling;
- Pit cleaning/rib coal recovery;
- Gob pile processing;
- Deshaling of metallurgical coal;
- Dry separation of high sulfur coal;
- High wall mining coal on-site processing;
- Coal prep in regions with water scarcity;
- Processing of low-rank coal, e.g. lignite;
- De-stoning of coal in utilities and cement plants.

Easy to install;
Easy to operate;
Low maintenance;

- **Commercial installation from 10 to 480 tph on a single unit;**
- **Over 1,000 clients in China;**
- **Sold in more than a dozen of countries worldwide:** China, Indonesia, Kazakhstan, Mongolia, Russia, South Korea, South Africa, The Philippines, Turkey, Ukraine, United States, Vietnam, etc.



THANK YOU

ANY QUESTIONS?