FINE COAL BENEFICIATION

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Indian Coal

Problem
- Mineral matter is finely disseminated in coal matrix
- Difficult to obtain low-ash product
  - Causes low thermal efficiency in power plants
  - Requires sweetener for metallurgical application
  - >$3 billion import

Solution
- Fine grinding for liberation of mineral matter
  - Fine coal cleaning
  - Fine coal dewatering
Finer coal produces lower-ash coal.
Another Example

Release Analysis
Assam Coal I

- 28 x 100 mesh
- -100 mesh
- -325 mesh
But fine coal cleaning is difficult and costly.

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<th></th>
<th>Size-Size</th>
<th>Solid-Solid</th>
<th>Solid-Liquid</th>
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<td>Coarse</td>
<td>Raw Coal Screens</td>
<td>Dense Media Vessel</td>
<td>Dewatering Screens</td>
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<td>Medium</td>
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<td>Dense Media Cyclone</td>
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<td>Ultrafine</td>
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<td>Froth Flotation</td>
<td>Disc Filter</td>
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Increasing Difficulties
Middle Fork, Virginia

- Coal industry discards fine coal
  - Impoundment
    - ~2-2.5 billion tons in the U.S.
  - Underground injection

- Microcel™ Technology developed at CAST
  - >$50 million profit from one pond

Then…

…and Now

Microcel Technology
The technology is used to recover coal in operating plants.
Moura Dawson
(Anglo Coal)
A missing link

Fine Coal → Water → Flotation → Dewatering → Clean Coal

ash/sulfur → water
Dewatering Aid Technology

Licensed to Nalco Company

![Graphs showing volume over time and cake moisture versus reagent dosage for different dosages of reagents.]

Pinnacle impoundment, WV
Hyperbaric Centrifuge Technology

Licensed to Decanter

Screen-bowl Centrifuge

Hyperbaric (or Centrabaric™) Centrifuge

![Screen-bowl Centrifuge Image]

![Hyperbaric Centrifuge Image]

![Graph with Percent -325 Mesh in Feed against Product Surface Moisture (%) with Screenbowl and Centribaric™ Curves]
Commercial Installation

As a result of successful test results with the first unit, the company bought more units. Other companies may follow the suite.
Proposed Flowsheet for Indian Coking Coal

Existing Plant

Slurry Feed

Rotary Distributor

Column Flotation

Classifying Cyclones

Rod Mill

Feed Sump

Sparger Compressor

Note: Not all clarified and process water streams are shown.

Four-Stage Conditioner

Disc Filter

Thickener

U/F Pump

O/F Pump

Vacuum Receiver

Vacuum Pump

Filtrate Pump

Waste

Clean Coal

Conveyor
Summary

- **CAST technologies**
  - Commercially available technologies
  - Microcel™, Dewatering aids, Hyperbaric centrifuge
  - A novel dewatering technology
    - Under development

- **Proposed work**
  - To design and build a 75-100 tph fine coal beneficial plant
  - METSO Minerals-India, Prime
    - Engineering
    - Construction
  - Virginia Tech, Subcontractor
    - Lab work
    - Flowsheet design

- **Benefits**
  - Increase domestic supply of metallurgical coal
    - Decrease import of metallurgical coal
  - Improve coal quality and reduce CO₂ emissions
Acknowledgement

- The National Energy Technology Laboratory for financial support
- Licensees of the technologies developed at CAST
  - Metso Minerals
  - Eriez Manufacturing
  - Nalco Company
  - Decanter Machine Company