FY95-XIX-60
COAL QUALITY MANAGEMENT SYSTEM

CONTRACTOR: Microbeam Technologies Incorporated

PRINCIPAL INVESTIGATOR:

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PARTICIPANTS

Sponsor	Cost Share[1]
BNI Coal, Ltd.	$560,565
ND Industrial Commission	$250,000
Total Project Cost	$810,565

Project Schedule - 2 Years
- Contract Date - 6/30/95
- Start Date - 6/1/95
- Completion Date - 6/1/97

Project Deliverables
- Interim Report - 10/15/95 ✓
- Interim Report - 04/01/96 ✓
- Interim Report – 11/01/96 ✓
- Final Report – 06/15/97 ✓

OBJECTIVE / STATEMENT OF WORK

The objective of this proposal is to integrate, demonstrate and commercialize a PC-based hardware/software package that will relate coal characterization to mining, combustion and boiler performance. The site-specific application of this proposal is the Center Mine of BNI Coal and the Milton R. Young Station.

STATUS

Coal Quality Management System (CQMS) software was developed to predict the effects of ash-forming components in coal on slag flow behavior, radiant wall slagging, convective pass fouling, and erosion and abrasion of system parts as a function of coal composition and boiler operating conditions. Much of the work in this project was directed at determining the boiler operation and fuel quality factors that cause the slag to freeze in the cyclone resulting in burning oil to maintain slag flow.

A number of interrelated boiler operations and coal quality factors have been identified that have the potential to cause oil burning.

[1] The total project cost has been reduced to $810,565.00 because MTI did not receive $281,269.39 in funding from US DOE/NICE[3].

The most important findings of this work are:

- Slag freezing in the cyclones is a complex phenomenon involving both boiler operation and coal quality effects:
  - Coal quality impacts include:
    - Low BTU, high moisture and high ash can result in decreased heat input resulting in lower temperature making it difficult for slag to flow.
    - High variability in minerals such as clays and quartz that cause increases in slag viscosity (highly acidic slags) have the potential to cause freezing of slag resulting in oil burning.
    - Partitioning occurs between ash that ends up in slag versus the ash that leaves the cyclone resulting in depletion of calcium and other elements in the slag that decrease viscosity.
    - Optimum coal composition produces a slag with a T_{250} of approximately 2400^{o} F
  - Operational impacts:
    - Low excess air causes separation of fluxing materials such as iron from the slag resulting in increasing viscosity and slag freezing.
    - Increases in coal flow rates appear to precede oil burning events.
    - Operational impacts may influence the retention of burning coal particles in the cyclones resulting in transfer of ash to slag.

- A beta version of the CQMS software is available for testing through Microbeam Technologies Incorporated.
  - The CQMS software predicts:
    - Sulfate index (low-temperature convective pass fouling)
    - Silicate index (high-temperature convective pass fouling)
    - Wall slagging index
    - Abrasion index
    - Erosion index
    - Cyclone slagging index
    - Ash resitivity