

PREDICTIVE AND REMEDIAL MEASURES FOR PARTICLE IMPACT EROSION AND ABRASION WEAR IN CLEANER COAL ENERGY CONVERSION TECHNOLOGIES

OBJECTIVES

A number of the components of cleaner coal energy conversion plants are subject to damage by erosive and abrasive wear – particularly by coal or ash material. This is of concern to equipment suppliers who are required to provide commercial guarantees of the operating lifetimes of components, and to plant operators who need to plan maintenance schedules.

There is a requirement for reliable predictive methods for abrasive and erosive wear rates based on the characteristics of the coals being fired. Recent developments in the application of Computer Controlled Scanning Electron Microscopy (CCSEM) for the quantitative analysis of coals, coal minerals and ash materials provides a new means of obtaining the relevant data on the coal and ash characteristics. This project is intended to make use of these advanced coal characterisation techniques within a programme of experimental work to study the erosiveness and abrasivity of coals and ashes. It is intended that the programme will help:

- to provide relevant experimental data on the relationships between the ash characteristics of coals and their abrasivity and erosiveness
- to develop predictive methods which will allow the estimation of the abrasion and erosion properties of unfamiliar coals
- to identify and test new materials, material combinations and coatings that can provide increased resistance to erosion and abrasion for boiler components
- to develop design procedures and design features for coal-fired boiler plants which can minimise the impact of erosive and abrasive wear

SUMMARY

In order to achieve the programme objectives a number of activities are planned including selecting and characterising a suite of coal and ash materials – including indigenous coals from India, Southern Africa and China, in addition to British coals and coals traded on the world market – using conventional techniques and advanced CCSEM analysis. The abrasion and erosion resistance of a range of materials will be studied. These will include materials employed for the manufacture of mill grinding elements, pf pipework, burner components and boiler tubes plus a number of specific erosion-resistant coatings.

Laboratory-scale testwork to quantify mill component abrasion will be carried out using the Mini-mill test facility operated by Mitsui Babcock in Renfrew. Boiler component material erosion will be tested using the erosion test rig in Renfrew. The test data will be employed in the development of methods for predicting the abrasion and erosion wear of power plant components and to inform design decisions on materials for specific duties.

COST

The total cost of the project is £240 000 with a contribution of £120 000 from the DTI

DURATION

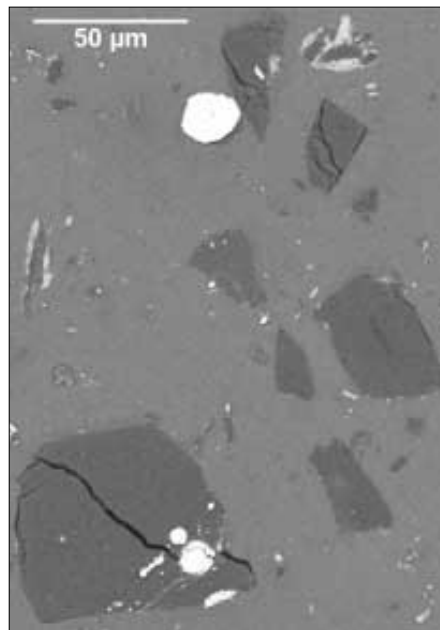
2 years – January 2001 to December 2002

CONTRACTOR

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In collaboration with

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Powergen plc



(Image courtesy of Imperial College)

Cross-section through pulverised coal particles showing both excluded pyrite (white, top) and included pyrite (bottom), together with other coal minerals

Further information on the Cleaner Coal Technology Programme, and copies of publications, can be obtained from:
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