Blending of coals to meet power station requirements

The ultimate aim of coal-fired power plants is to provide the maximum amount of power output at the lowest possible cost. Plant operators must balance the maintenance of plant operation and output with the most inexpensive coals available. Due to changing coal production and markets, many plants will not be able to source coals that meet the exact specifications of their plant and will therefore have to combine the coals available to them to produce a blend that is acceptable. As legislation on emissions tightens, many plants are moving to ‘cleaner’ coals as a means of compliance.

This report reviews the different reasons for coal blending, the coal characteristics which plants hope to maximise or minimise, and gives examples of the most common methodologies used to achieve coal blending in practice. The report tends towards reviewing the most advanced, state-of-the-art systems as these are covered extensively in published literature. However, as much as possible, the report gives an indication of the more basic ‘day-to-day’ approaches which are used at the average coal plant.

Blending of coals results in a combination of characteristics from each of the individual coals in the blend. Some coal characteristics, such as ash, sulphur and moisture content, are additive and can be calculated from the proportions of the different coals in the blend. Other characteristics such as grindability are not. Calculation and modelling tools are available to purchase which range from simple excel spreadsheets to complex mathematical models. Many plants develop their own models to suit their specific combustion system. These tools will be used to predict potential benefits and problems in new coal blends. However, most plants will not rely solely on such tools and will perform small test runs when major changes are made in a coal blend. Further, it is generally held that it will be a long time before computer models are trusted more than a plant manager with years of experience.

Blending can be achieved in a number of ways – from simple co-ordinated stockpiling to more advanced, technically challenging methods. Every time coal is moved provides an opportunity for blending – but also incurs cost. And so blending is co-ordinated with coal movement as much as possible. Coals will be mixed as they are mined, to even out variations in quality between seams. Further mixing or blending can occur as coal is loaded into trucks or ships to be moved long distances. And coal stockpiles can be managed systematically to include layers or sections of different coals. The reclamation of the coal is then performed in such a way as to collect a mixture of coals through the different layers and sections. The movement of the collection process provides the mixing and blending action. In some cases, this can be performed with a simple bucket and bulldozer, in other cases, more advanced systems and equipment will be used. The selection of blending process and equipment will be dependent on location (available space), level of blending required, and cost.

IEA Clean Coal Centre is a collaborative project of member countries of the International Energy Agency (IEA) to provide information about and analysis of coal technology, supply and use. IEA Clean Coal Centre has contracting parties and sponsors from: Australia, Austria, Canada, China, the European Commission, Germany, India, Italy, Japan, New Zealand, Russia, South Africa, Thailand, the UK and the USA.

Each issue of Profiles is based on a detailed study undertaken by IEA Clean Coal Centre, the full report of which is available separately. This particular issue of Profiles is based on the report:

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This report is free to organisations in member countries. £100 to organisations in non-member countries for six months after publication, and free thereafter.
Dedicated coal blending facilities are becoming more common, especially at hubs such as ports and terminals. Online sampling and analysis systems can be used to control blending processes in real-time. Advanced management systems can be used to co-ordinate deliveries of coals via train or ship to ensure that silos and stockpiles deliver blends to exacting customer requirements.

Coal blending is a relatively complex issue. However, most plants manage to adjust to coal blending requirements through a combination of outside expertise (specially designed blending systems, or blends modelled), trial and error, and judgments made by a qualified on-site expert.

Coal blending is extremely useful to the coal industry as it:

- maximises the use of lower quality coals which would otherwise be discarded;
- extends the life of local fuel supplies;
- increases the marketability of any new coal source and expands the variety of coals which can be accepted around the world
- ensures that coal plants receive coals which meet performance requirements

Inter-regional coal trade flows

The flow of internationally traded coal in 2009 gives a general idea of just how much coal is transported between continents and how far it may travel. As coal demand continues, new mines are developed and new infrastructure is created to make this coal available to the international market. Coal users now have significantly more opportunity to pick and choose coals than ever before. Blending allows plants to take advantage of the different coals available to them. Many modern plants in South East Asia are designed to burn up to 100 different coal types of various quantities and ranks and will blend coals as required prior to use.