

Coal Preparation

Coal is a heterogeneous material, and coal produced from operating mine is even more variable due to the incorporation of non-coal bands, mineral aggregates and possibly of certain amount of roof and floor rock in the output material.

Originally, coal preparation was confined to the hand picking of coarse refuse from belts and the crushing and screening of coal to give the particular sizes (mainly coarse size) required by the market at that time.

The need for coal preparation is more related to consumer demands than to the requirements of the producer, but it is also due to the development of greater environmental constraints in the past.

Properties of Coal Preparation

① Sampling:

Sampling is one of the most fundamental aspects of the planning, design and assessment of coal preparation processes.

It is often an area that is not well understood or appreciated.

Obtaining an accurate and representative sample is a difficult task, firstly because coal and coal seams can

be extremely variable and secondly because samples must be taken under widely different circumstances. Samples may need to be taken from borehole core the mine working face, from high speed belts, out of slurries and from the feed and products of numerous coal preparation operations.

Automatic sampling devices provide the best opportunity to obtain accurate and representative samples, and such devices should be a standard part of coal preparation plant design.

Regular or routine samples should be taken automatically while spot-check samples can be taken by hand if a suitable place has been provided. Conveyor transfer point and the discharge end of screens are often the best places for taking hand samples in a preparation plant, as are pipe outlets that discharge downward in a vertical plane.

Frequently frequency of sampling and the size of the collected should take into account both the nature of the material being sampled and the requirement of the subsequent testing or analysis programme.

Care should also be taken not to introduce a bias when subdividing the sample. Automatic sample dividers again give the best results in this regard. When small samples are required for analysis the sample should be crushed prior to

subdivision at various stages of sample size reduction that may be necessary.

Assessment of Properties

There are a number of different reasons for sampling in conjunction with coal preparation processes in order to assess the properties of any coal or refuse materials. Such reasons include the following:

- (a) To determine the size distribution, either for the purpose of predicting size distribution for plant design, or for checking the screening or classifying efficiency in plant operation.
- (b) To determine the washability characteristics, by means of float-sink testing, for purpose such as designing a preparation plant, monitoring changes in plant feed, predicting plant or individual unit results, and checking the separating efficiency of plant or the individual unit in a plant.
- (c) To determine the analytical characteristics of the coal or refuse material.
- (d) To assess froth-flotation characteristics of the material, or the effect of the various reagent used.
- (e) To determine setting characteristics of a plant slurry or to assess chemical or chemical addition rates for use in concentration process.

(b) to check the quality of the separating medium (e.g. magnetic/water slurry) or to investigate losses of separating medium in a plant.....

(c) Size of coal :-

The usual nomenclature practice is in coal preparation of crushed coal in our country and abroad in respect of size specification area: large coal (600-150mm), coarse coal (150-25mm), small coal (25-0.5mm), fine coal (0.5mm or below) and ultra fine coal (passing through 53 micron sieve)

In most of the washeries in India the coal is normally crushed below 75mm in size before processing.

Different types of crushers are used for size reduction of coal. These are generally commonly jaw crusher, gyratory crusher, roll crusher, ball mill and many other.

For screening operations different size screens are used such as shaking or jigging screens, vibrating screens, resonance screen.

Depending upon the common practice and utilization in coal preparation units, the screens are also named as raw-coal screen, primary screen, pre-sizing screen, sizing screens, under size-control screen.

① Washing of Coal

More than 95% of the common impurities in coal are clay, carbonaceous minerals with about 85% alumina and silica in ash.

Complete removal of dirt from coal is not a normal practice. The size of coal also influence its washability to great extent. successive crushing, screening and washing most of the dirt is removed. However, most clean coals having ash level around 1% or even zero are required for electro-chemical and electro-thermal industries.

The Principle of specific gravity differentiation has been applied in cleaning coal by washing. To separate coal from the mineral matter, coal is put in a liquid of specific gravity, 1.50, and stirred thoroughly. After sometimes the stirring is stopped. After a while the clean coal floats at the top and mineral matter together with dirt bands settle at the bottom. The clean coal is taken out, washed thoroughly with water and dried before sending to customer.