

Gist of Discussions held in the Webinar on Coal Sampling and Analysis

held on 22nd December, 2020 on virtual platform.

As a part of its service to the industry and all stakeholders and also as a fall out of the concerns expressed by various speakers during the twentieth anniversary webinar held on 4th December 2020, CPSI had organised a virtual Webinar on 22nd December 2020 on an important and topical theme: 'Coal: sampling and analysis'.

Welcoming the keynote speaker, Dr. R P Singh, Quality Council of India (QCI) and expert panelists and the participants, Shri Alok Perti, IAS (Retd), Former Coal Secretary and Chairman, CPSI, stressed upon the importance of sampling and analysis in the coal production and supply chain. He also gave a brief background about third-party sampling and testing of coal supplied to power plants.

Shri R K Sachdev, President, CPSI also welcomed the keynote speaker, panelists and the participants. He further observed that coal being a heterogeneous naturally occurring material, its quality parameters namely ash content, moisture content, sulphur etc. vary widely. Proximate Analysis is the standard method by which these parameters are determined. The coal producers and suppliers are required to ensure that the quality of coal is maintained as per agreed coal supply agreement.

Shri Sachdev further noted that the focus of the deliberations in the Webinar would be on various technical aspects of sampling and analysis of coal produced and marketed in India. Some important quality related aspects of imported coal will also be addressed by the panelists.

Dr. R P Singh, Secretary General,) delivered the Keynote address in which, besides describing the role of the Quality Council of India, he addressed upon the need for honest sampling and analysis of coal, covered various important technical, procedural and infrastructural aspects of sampling and analysis of coal at the loading points as well at the delivery points at the power plants and other major consumers. He also dwelt upon the issues and challenges being faced by sampling teams deputed by QCI and also by other private agencies who have been tasked with collection of samples at the loading points of Coal India Ltd and Singareni Collieries Company Ltd.

Dr. R P Singh further mentioned that the Standards of Sampling as laid down by the Bureau of Indian Standards were originally prescribed in early fifties and these need up-dation on urgent basis.

Dr. R P Singh made a comprehensive presentation highlighting the methodologies of sampling and testing of coal. He also made a very pertinent point regarding obsolete standards being followed by the agencies in absence of any updated versions. He strongly emphasized upon the need for revisiting IS : 436 (Part I/Set 1) - 1964 by the Bureau of Indian Standards (BIS) on an urgent basis. Standards for analysis of samples also need to be reviewed and updated in the light of changed scenarios of mining methods etc.

While summing up his presentation, he stressed upon the need to address the following challenges:

- Huge amount of paperwork is involved in manual systems being practiced. This is to be replaced by IT tools and techniques;
- Infrastructure and Enabling Conditions must be improved by implementing the automated sampling using mechanical sampling facilities;
- Local and political issues need to be addressed by the coal companies by ensuring the human resource and mine safety measures are strictly followed.

Panel Discussions

The expert panel comprised of the following subject experts:

- i. Dr. A K Singh, Head Resource Quality Assessment Group, CIMFR.
- ii. Shri Mehar Kuchimanchi, Director, SGS, India.
- iii. Dr. Durgesh Sharma, Business Director, Cotecna, India.
- iv. Shri Ratnesh Rai, Managing Director, QA Testing laboratories.
- v. Shri Pankaj Rai, Managing Director, Quality Austria Central Asia (India).
- vi. Dr. Tarit Kumar Bhattacharya, Head (C & M), Inspectorate Griffith (India).
- vii. Shri Shivam Dwivedi, Scantiest PCD-7, Bureau of Indian Standard (BIS).
- viii. Representative of CMPDIL

The discussions were moderated by Shri R K Sachdev, President CPSI. Shri Sachdev observed that in any commercial transaction of selling and buying of coal, transparency about the source, the quality and the quantity of coal is key in the coal supply chain. The determination of the quality of coal is an important subset of the commercial transaction. The panelists were requested to keep focus during their presentations on the following issue:

'Are the practices being followed in India for Sampling and Analysis in the Production-Preparation-Supply chain of coal adequate? If not how to make them at par with the global standards?'

The Panelists made presentations covering inter alia, methods of sampling and sample preparation, division, packaging and transportation of samples, standard laboratory testing procedures, analytical techniques and compilation of test results etc. They also dwelt upon various methods of collection of coal samples from stockpiles, conveyors, trucks and wagons etc. The advantages and shortcomings of each method were deliberated at length.

They also outlined the coal properties, such as calorific value, volatile matter, moisture, sulphur, chlorine and ash (elemental composition) content which largely form the basis of sale contracts. These properties are all measured at samples taken during loading/unloading of the coal. Payment for the coal is based on the analytical results.

A consensus was reached on the following critical aspects of the subject under discussions:

- i. It is an accepted fact that 80% errors happen during sampling, 15% during sample preparation and only 5% in lab testing.
- ii. Accuracy of sampling is dependent upon size and nature of coal to be sampled, method of sampling and equipment available, the quantity to be represented by the sample mass and the degree of precision required.
- iii. The accessibility and site conditions, weather conditions, technical constraints, skill level of manpower deployed are among various influencing factors that affect the accuracy and the integrity of the sampling process.
- iv. Mechanical sampling from moving streams is the preferred method for sampling coals, while manual sampling should be avoided whenever possible.
- v. The best location for sampling from a moving stream is at the discharge point of a conveyor belt or where the complete stream can be intercepted at regular intervals.

- vi. Coal samples can also be taken from a moving conveyor belt, but 'stop belt' method is accurate and preferred for sampling of coal.
- vii. Sampling from stationary coal lots, such as coal stockpiles, loaded wagons or trucks, is sometimes necessary, but it is problematic and difficult to collect representative samples.
- viii. Manual coal sampling methods from loaded wagons has its limitations such as, segregation due to large coal, impractical to collect samples from full depth, and possible bias due to manual operations, etc.
- ix. Automated mechanical sampling (AMS) systems are being preferred globally, as these can be standardised to include preliminary preparation of the coal sample and are designed as per prescribed protocols.
- x. Auto Mechanical sampling Augers are most preferred sampling systems for stationary coal lots, such as stockpiles, loaded wagons and trucks. Augers are available in various designs and are made to fit as per the requirements and nature of sampling.

Laboratory analysis

- i. The type of analysis normally requested by the thermal coal suppliers and coal consumers are proximate analysis and an ultimate analysis, together with one or more of the miscellaneous analyses or tests i.e. Ash Chemistry, Ash Fusion Temperature, Highgrove Grindability Index (HGI), etc. In the case of coking a different regimen of tests and analysis is prescribed by the steel industry.
- ii. Coal has the tendency to gain or lose moisture and to undergo oxidation when exposed to the atmosphere; it is therefore necessary that all coal analyses follow standard procedural guidelines in order to obtain reliable and reproducible results.
- iii. The analyses need to be sufficiently accurate so as to preclude any technical and/or economic consequences. Hence, strict adherence to the standard procedures is necessary to obtain repeatable and reproducible results.
- iv. There are many relatively new approaches, usually based on modern sophisticated instrumentation, that have been shown to have wide applicability to coal analysis. Several such instruments are fast and can simultaneously determine IM, Ash, VM and carbon, hydrogen & nitrogen and/or other elements in various samples.
- v. Instrumental analytical techniques enable tests of coal be carried out where the coal is mined, processed, transported, or utilized.

Recommendations

- i. Sampling on crushed coal below 100mm or preferably at 50mm, because lower the size of coal, better is the sampling precision and less discrepancies in results.
- ii. Implementation of Auto Mechanical Sampling (AMS) system at all sampling points.
- iii. Urgent need of revisiting IS : 436 (Part I/Set 1) – 1964 to include Auto Mechanical Augers sampling for sampling of coal from loaded wagons & trucks and its implementation on ground.
- iv. Huge amount of paperwork is involved in manual systems being practiced. This is to be replaced by IT tools and techniques.
- v. Infrastructure and enabling conditions must be improved by implementing the automated sampling using mechanical sampling facilities.

vi. Local and political issues need to be addressed by the coal companies by ensuring the human resource and mine safety measures are strictly followed.

In order to instill confidence with the users of coal it is necessary that sampling and testing of coal is done with technically modern methods where the possibility of error is minimized. This can be achieved in implementing the recommendations stated above in a time bound manner.

It was suggested that the Ministry of Coal in consultation with NITI Aayog, set up a committee of representatives of Coal India, SCCL, CIMFR, Quality Council of India and Bureau of Indian Standards (MIS) to suggest a time-bound plan of action for implementing the suggestions and recommendations stated above.

In order to facilitate and ensure acceptance of its recommendations by all stakeholders; the committee should be headed by the Quality Council of India (QCI).