COAL STOCKPILES IN INDIAN POWER PLANTS

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SUMMARY:

This paper presents the aspects of the coal stockpiles currently in vogue in the Indian Power plants and the suggested improvements. About 65% of the power generation in India is by coal based power plants. These coal based power plants are spread all over India viz. near the pit head, near the ports and in the interiors far away from the mines and ports. Most of the power plants have coal stockpile of capacities ranging from 7 days to 45 days requirement of the power plant.

Majority of the coal stockpiles in the Indian power plants are open type formed by the rail mounted stackers. This type of open stockpiles poses many environmental hazards. This paper discusses the improvement in the stockpiling system in the thermal power plants.

1 INTRODUCTION

The installed capacity of the coal based power plants in India is about 130,000 MW. The consumption of coal per annum is about 480 million TPA. About 85 million TPA of coal is imported. These power plants are located in different parts of India. Some are located near the pit head, some near the ports and the rest in the interiors far away from the mines and ports.

Majority of the coal stockpiles in the power plants are open type formed by the rail mounted, slewing type stackers. The capacity of the coal stockpiles range from 7 days to 45 days requirement of the power plant. In terms of tonnage, this would be about 50,000 Tonnes to 800,000 Tonnes

2 COAL TRANSPORT AND STORAGE IN THE POWER PLANT:

Coal will be transported to the power plant by belt conveyors in case of pit head power plants. In case of power plants located far away from the mines, coal will be transported by rail. In some cases, coal from the mines will be transported by ships to the nearest port and from there it will be transported either by belt conveyors or by rail depending on the distance of the power plant from the port. In case of imported coal, the same will be transported to the nearest port by ships, from where coal will be transported to the power plant either by belt conveyors or by rail. Coal thus received at the power plant will be unloaded, crushed if required to the required size and then stored in the stockpile.

Storage of coal in the stockpile is necessary to take care of any disruptions in the transport system or in the coal mines due to which coal cannot be received at the power plant on such days. The general practice is to provide a 7 /15 days stockpile in case of a pit head power plant depending on the reliability of the mines and the conveying system. In case the power plant is far away from the coal mines, coal stock of 30 days requirement will be provided. In case coal is received by ships, stockpile of 45 days capacity will be provided, as the reliability of shipping will be less due to variations in the weather conditions especially during the monsoon period.

3 TYPE AND FORMATION OF STOCKPILE:

The coal stockpile in most of the power plants will be formed by the rail mounted, slewing and luffing type stacker. The stockpile formed by this will be either triangular shape or trapezoidal shape. In some power plants, where the storage capacity is less (say 50,000 T), the stockpile will be formed by telescopic chute arrangement and by dozing. The stockpiles will be of open type.

Fig. 1 Typical coal stockpiles in a Thermal Power Plant

4 PROBLEMS FACED WITH THE PRESENT STCOKPILE SYSTEM:

There are several problems being faced with the present type of open stockpile system. The major problems are listed below:

- Fugitive dust nuisance from the stockpile due to wind
- Spontaneous combustion of coal in the stockpile

Due to the fugitive dust emission from the stockpile, the dust particles will be carried by the wind and causes pollution. This would pollute the plant area and could cause damage to the other utilities like cooling towers, switch yard etc. in the power plant. In some of the plants these stockpiles are close to the boundary of the plant, the coal dust particles carried by the wind causes dust nuisance in the neighboring villages.

Useful coal is lost due to wind erosion and the quantity of such loss would depend on the location of the stockpile and weather conditions. In the port area where strong winds are experienced for majority of the time, this loss will be high.

In the open stockpile, the spontaneous combustion of the coal would take place due to the voids in the pile and free flow of air. The spontaneous combustion of coal in the stockpile results in the degradation of the coal and causes changes in the physical and chemical properties of the coal. There could be a risk of dust explosion in the pulverizes and coal silos. Due to spontaneous combustion and heating of coal in the stockpile, the GCV of coal would also reduce and some quantity will be unsuitable for the intended use and causes economical loss. The performance of combustion in the furnace would also be seriously affected.

Wind and moisture in the coal play a major role in the spontaneous combustion of the coal. Wind supplies more oxygen for combustion. When the coal absorbs moisture, heat is generated. This heat increases the temperature of the coal. Hence addition of excessive moisture for suppressing the dust / fire shall be avoided.

During the spontaneous combustion of coal, some gases would be produced. This gas is also carried by the wind and causes pollution in the surrounding environment.

Fig. 2 – Spontaneous combustion in a Coal stockpile

5 DUST CONTROL and FIRE FIGHTING SYSTEM

Plain water type sprinkling system will be provided along the stockpile for suppressing the dust. Lot of water is being poured for dousing the fire due to spontaneous combustion in the stockpile. Huge quantity of water will be consumed every day for these purposes. This should be avoided, as excessive moisture in the coal would aid heating of the coal.

6 PROBLEMS DUE TO RAIN WATER:

During rainy season, rain water falling on the open coal stockpile will add more water. Handling of the coal becomes difficult as the wet coal chokes the chutes and sticks to the belt and causes dusting all along the return belt if the scrapping is not effective.

The excess water need to be drained and collected in the coal pile run off pit. Water contaminated with the coal fine particles will be allowed to settle in the coal pile run off pit where coal particles will be separated and clear water will be reused in the plant. In this process, useful coal will be washed out and causes product loss.

7 ALTERNATIVE SYSTEMS OF STORING THE COAL:

In view of the problems faced in the open type stockpile, several alternative methods of storing the coal in the power plants are evaluated. The following are the various major types of coal storage.

- Longitudinal covered shed with conventional rail mounted Stacker cum Reclaimer.
- Dome type structural storage shed with circular Stacker and Reclaimer.
- Wind barriers around the stockpiles with conventional rail mounted Stacker cum Reclaimer.
- Large capacity silos.

8 LONGITUDINAL COVERED SHED:

In this case, coal stockpile will be formed by the conventional rail mounted stacker cum reclaimer. The entire stockpiles and the Stacker cum Reclaimer machines will be covered with in the shed.

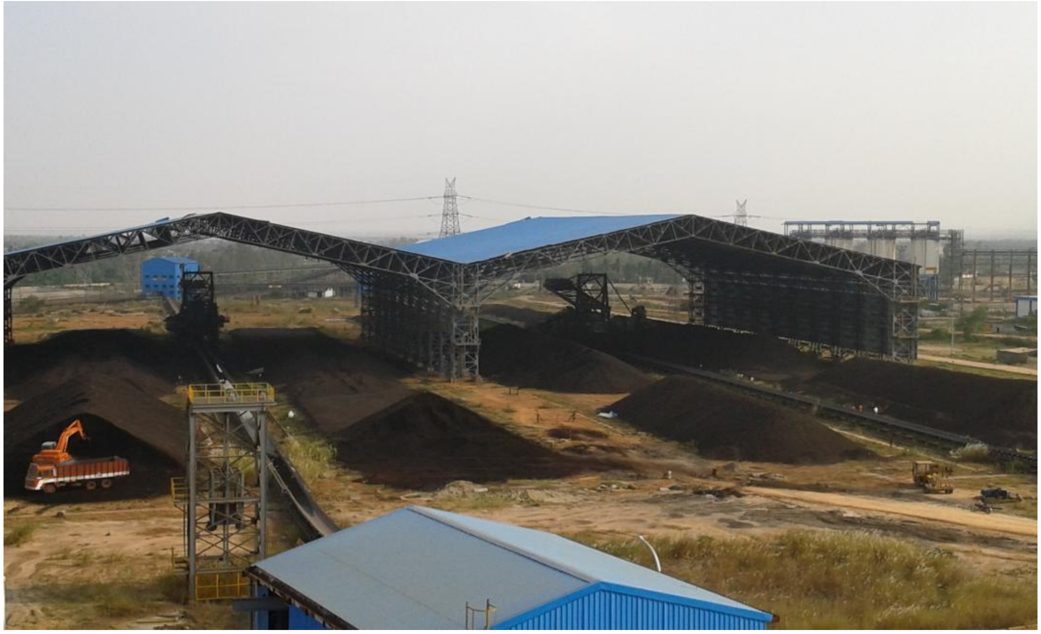

Fig. 3 Covered storage shed for the conventional coal stockpile

9 DOME TYPE COVERED SHED:

In this type of structure, the shape of the shed will be in the semi hemispherical form. There will be a concrete wall up to a certain height from the ground level and the structure will be erected above this wall. The dome structure of various sizes could be adopted depending on the storage required. A circular stacker and scraper type reclaimer could be used for reclaiming the coal.

With this type of shed, coal will protected from wind and rain and hence the problems associated with these will be avoided. This kind of storage shed can accommodate higher quantity of coal in a smaller area as the height of stockpile could be increased. The foot print required for this type of shed would be lesser compared to a longitudinal stockpile for an equivalent capacity.

Fig. 4 Dome shaped covered structure for the coal stockpile

10 **WIND BARRIERS AROUND THE STOCKPILE:**

The wind barriers could be provided around the stockpile to avoid the wind blowing on the stockpile. With this, it is possible to reduce the problems faced due to the wind like spontaneous combustion and pollution due to the carryover of the dust and gas from the stockpile. However the problems due to the rain water will still remain as the same cannot be contained.

The wind barriers are of structural steel frame work and the cover will be of geo textile material or colour coated sheets. This will be designed for the maximum wind speed in the plant area. Typical detail of the barrier is furnished below.

Fig. 5 Typical Wind barrier for the coal stockpile

11 LARGE CPACITY SILOS:

Large capacity silos could be used for storing the coal. With this, it is possible to reduce the problems faced due to wind and rain. The silo system has many advantages few of them are furnished below:

The foot print of the silo system will be less as compared to both the types of sheds and hence it will be advantageous where there is a constraint for the land. The filling of the coal could be more uniform in the silo with the use of a mechanical device and hence segregation can be avoided. The accessibility of oxygen is very limited and hence spontaneous combustion and heating of coal is greatly reduced. Monitoring of various types of gases like CO, NH4 etc can done continuously. The blending of different types of coal if required could be done with better accuracy with the controlled extraction from different silos.

For storing higher quantity of coal, more number of silos needs to be provided. The overall economics of the silo system with other covered shed needs to be worked out on case to case basis.

Fig. 6 Concrete silos for the coal storage.

11 CONCLUSIONS

The open type stockpile in the Indian power plants has many problems as detailed above. The pollution of the surrounding area is the main concern especially where the plant is located in the inhabited places. It is observed that closer to the older power plants, many villages have developed recently. In the new power plants, it is difficult to get the required land and the villages that are existing around the proposed power plants cannot be disturbed. Hence, it is essential to protect the environment for the people working in the plant and also the people living outside the power plant.

By providing the covered storage, the operating expenses of the power plant will also be lower. The loss of coal due to spontaneous combustion, erosion due to wind and rain from the stockpile could be reduced with the covered storage. The capital cost and operating costs could be worked out specific to each project and economic feasibility can be assessed. It is recommended to provide the covered storage for the coal stockpile in the power plants.