Implementation
Of
Quality Management System
For
Coal Handling Plant
Of
Thermal Power Station.

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1.0 Abstract: -
In the thermal power plants maximum requirements of fuel is a coal. Coal handling plant (CHP) is the main and major key system to transfer ton of coal fuel to the boiler plant. The handling of this fuel is a great job. The coal has to size, processed, and handled which should be done effectively and efficiently. Because of this CHP management required the coordinated integration of the operations, maintenance, engineering support, training, and administrative areas of any process in order to supply constant flow of fuel to boiler to avoid failure of energy supply to consumers. To fulfill this need the structure of management be a process-centered model, which is significant, as an International Standard to adopt as a relevant Standard, or best practice to increase the efficiency, reliability, and safety of the process.
But it is observed that CHP management activities are not linked to Quality Management System (QMS), which have particular management characteristics. This paper focuses on implementation of QMS for CHP. The main thrust of this is on process approach to QMS

2.0 Introduction: -
Process-centered management is a system that manages organizational activities as a process. The process is managed through QMS, which is clear on Plan, Do, Check and Act. (PDCA) as a process method. Using these characteristics transforms modern management practice into what may be the next generation of management. This type of management policy and strategy will improve performance of CHP through availability of equipment, reduction in railway costs through demurrage. For this purpose process of CHP should be divided into various process.

3.0 Four Lever Change: -
QMS is the planning control and management of individual organizational characteristics and their collective implementation. To manage CHP successfully, it is necessary to direct and control it in systematic manner and transparence manner. This success can result from implementing and maintaining a management system that is desired to continually improve performance while addressing need of all interested parties. The most effective way of introducing sustainable long-term, large-scale improvements in Management performance is to change managerial skill in a coordinated fashion. In addition, it is important to proactively manage the change in order to ensure that those affected by the change are committed to the change. in this case it is useful to consider effective organizational change as happening along four dimensions, called the 4 levers of change. (See figure no 1). These are illustrated below

3.1 Organizations and Structure: -
There have been recent moves, particularly with plant management to restructure the structure. The existing management structure cannot fulfill the plant requirement hence it is necessary to develop a structure, which improve performance. For this type of plant the matrix system structure [1] will work satisfactory. Under matrix structures authority and responsibility are assigned along at least two dimensions, which in the international context, are often product and region. The management structure should be of three tiers to avoid communication gaps. The new structure of CHP management should be as shown in Figure No 2.this structure will help to coordinate activities to direct and control the system with regard to quality. It is necessary to improve the level of maintenance, bringing the level of maintenance equal [2] to level of operation. An essential element of a QMS implementation is regular audit of compliance with the defined Management

procedures, together with an audit of data accuracy and timeliness. This is most effective when these become formal parts of an individual or team's performance appraisal remuneration.

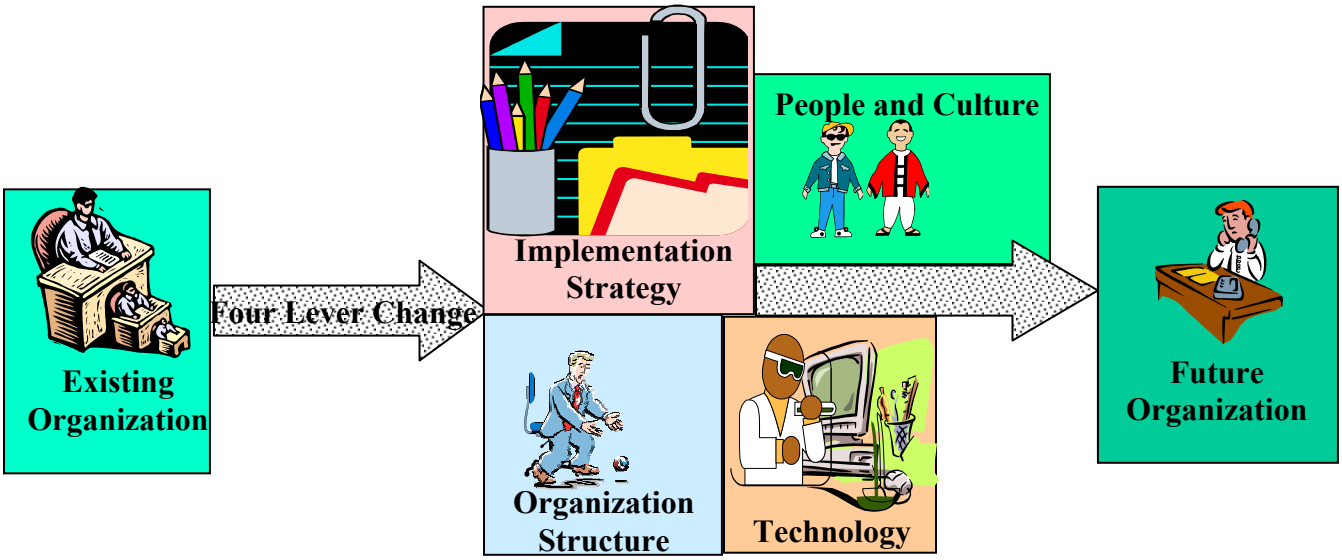

Figure No 1

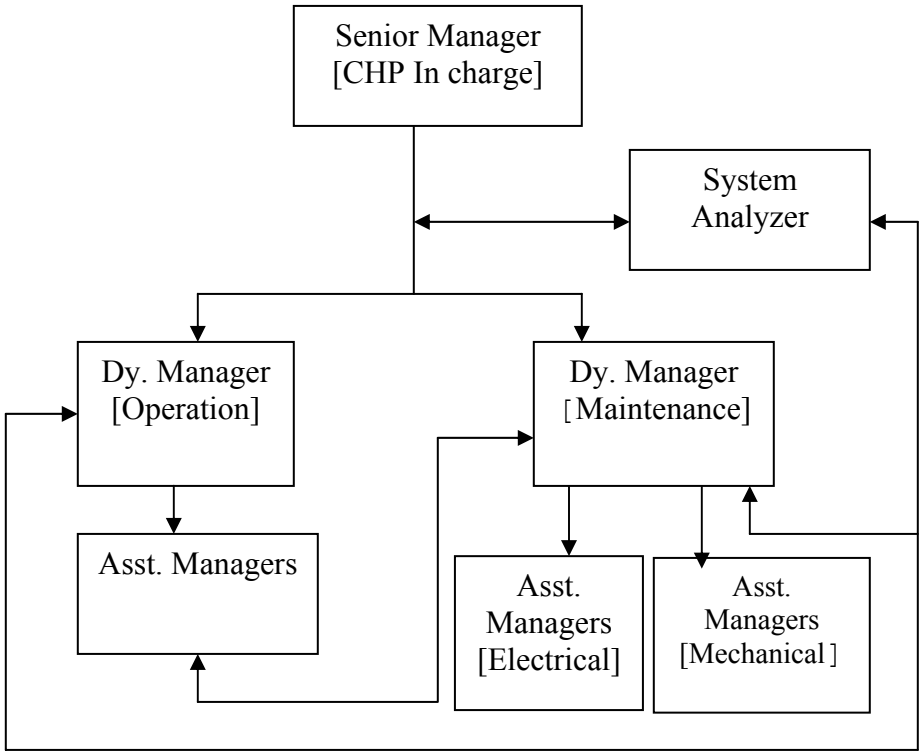

Figure No 2

3.2 Technology: -

It should not ignore the opportunities that may exist by utilizing other technologies around our plant and equipment, and linking these to management. These days, the greatest benefits that are being obtained from these types of implementations are being gained by linking Process Control Systems to Maintenance systems. These systems can monitor equipment performance, and give us an early warning that a piece of equipment may require some maintenance attention. Consider also the additional technologies that may want to apply on plant and equipment to take advantage of capabilities. This covers such areas as how work is allocated to the workforce, and how expectations are generated regarding a "reasonable" time for job completion. It also includes how daily priorities are set, and decisions made regarding the deferral or cancellation of planned work in order to incorporate daily breakdowns.

3.3 Implementation Strategy: -

It is important that a proper implementation strategy is developed. Apart from decisions on the functions required from a system it will be necessary to properly manage its installation. Operation and Maintenance group training requirements will have to be considered. The initial data input, which in itself can be a huge task, will have to be planned. Even apparently simple decisions, such as the way assets are numbered can have future implications.

3.4 People and Culture: -

The commitment of all involved should be assured before proceeding with the project since lack of commitment from any one group could cause it to fail. The commitment of trades groups should be sought at an early stage since it is likely that, at least initially, they will view any changes with suspicion. Many people see the introduction of the QMS as a means of closely monitoring the amount of work, which they are doing. While it is likely that there will be an element of this, so the positive approach should be developed. For example, stress the ease with which users will be able to get information and the access they will have to formal work procedures. If stock control is being introduced stress the advantages of this. When the system has been implemented and accepted it is likely that it will improve accountability due to jobs being linked to personnel. Also, if trade groups are to be involved in the input of data to the system (by closing off their own work orders) it is crucial that they are fully trained and aware of the importance of accurate input.

4.0 Process Approach: -

Effective Organizations have to identify and manage numerous interrelated and interacting processes. Often the output of one process is the input into the next process. The intent of ISO9001: 2000 is to encourage the adoption of the process approach to management of an organization and the standard is based on QMS process Model.

The QMS Process Model For CHP will define

Policy &Objective

Responsibility & Authorities

Feedbacks

The CHP process model showed in figure no 3 gives idea about the total involvement of customer (Boiler plant) and continual improvement of the processes.

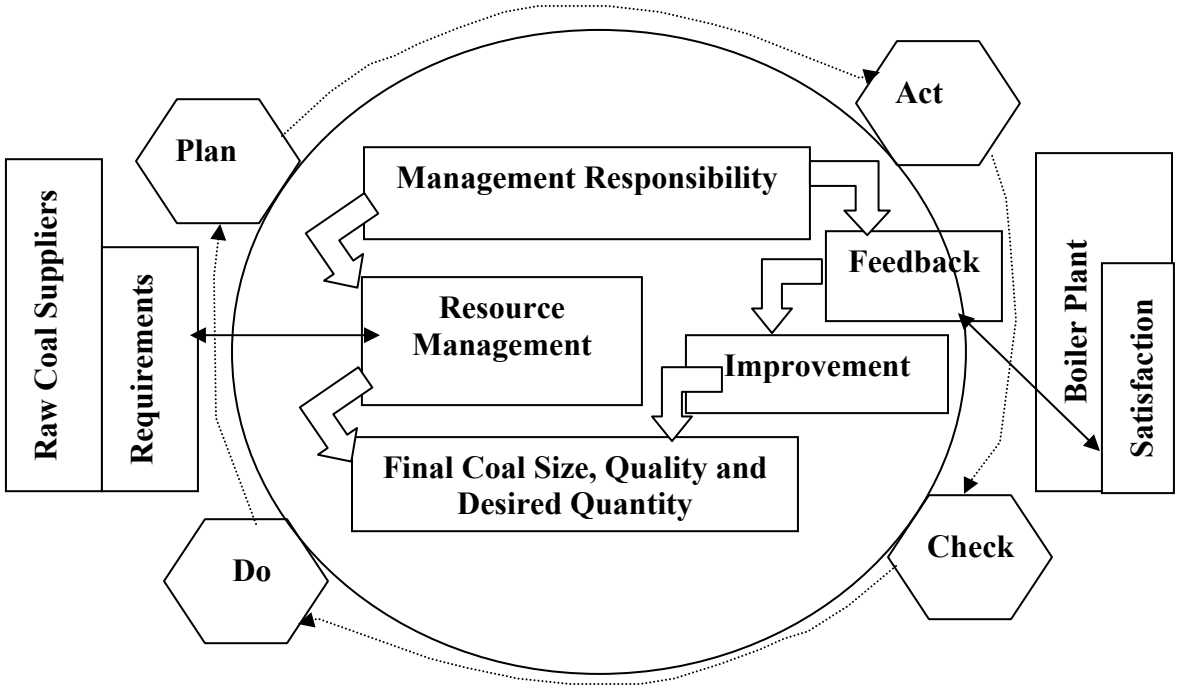

Figure No 3

4.1 CHP Process: -

The process of the CHP involves coal receipt from various systems and then unloads the coal at various unloading stations (See figure No 4). Then the coal is process as per requirement. After the processing it is to be transferred to bunker or stack yard. For controlling all these process the processes are equipped with control system. All the processes related to CHP are required to break in small processes. System for feedback is required from each process for improvement.

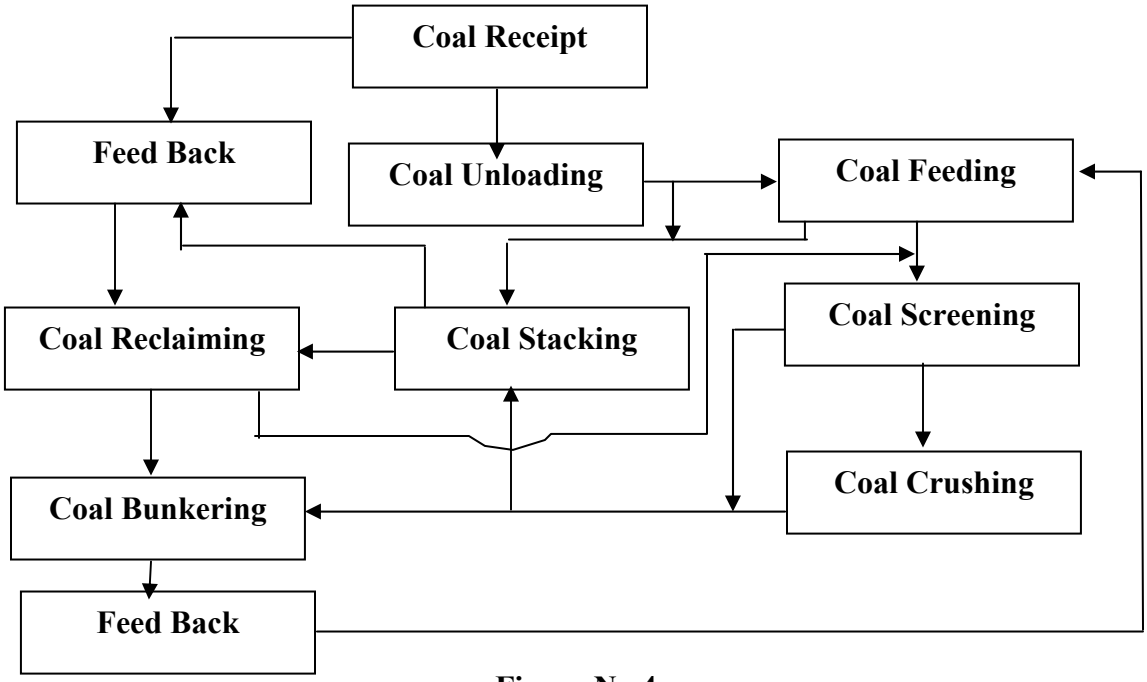

Figure No 4

The basic layout of Coal Handling Plant is shown by block diagram. (See Fig. No5) the coal is unloaded at various unloading station and transported by conveyors to crushing and screening plant via transfer house. After crushing required quantity of coal is transported to bunker via transfer house and remaining coal is stored in stockyard. The minimum stack level is maintained. This coal is reclaimed as per requirement. From the bunker the coal flows through coal mills to boiler furnace. The main aim of CHP to maintain level of coal in bunkers for smooth coal supply to boiler.

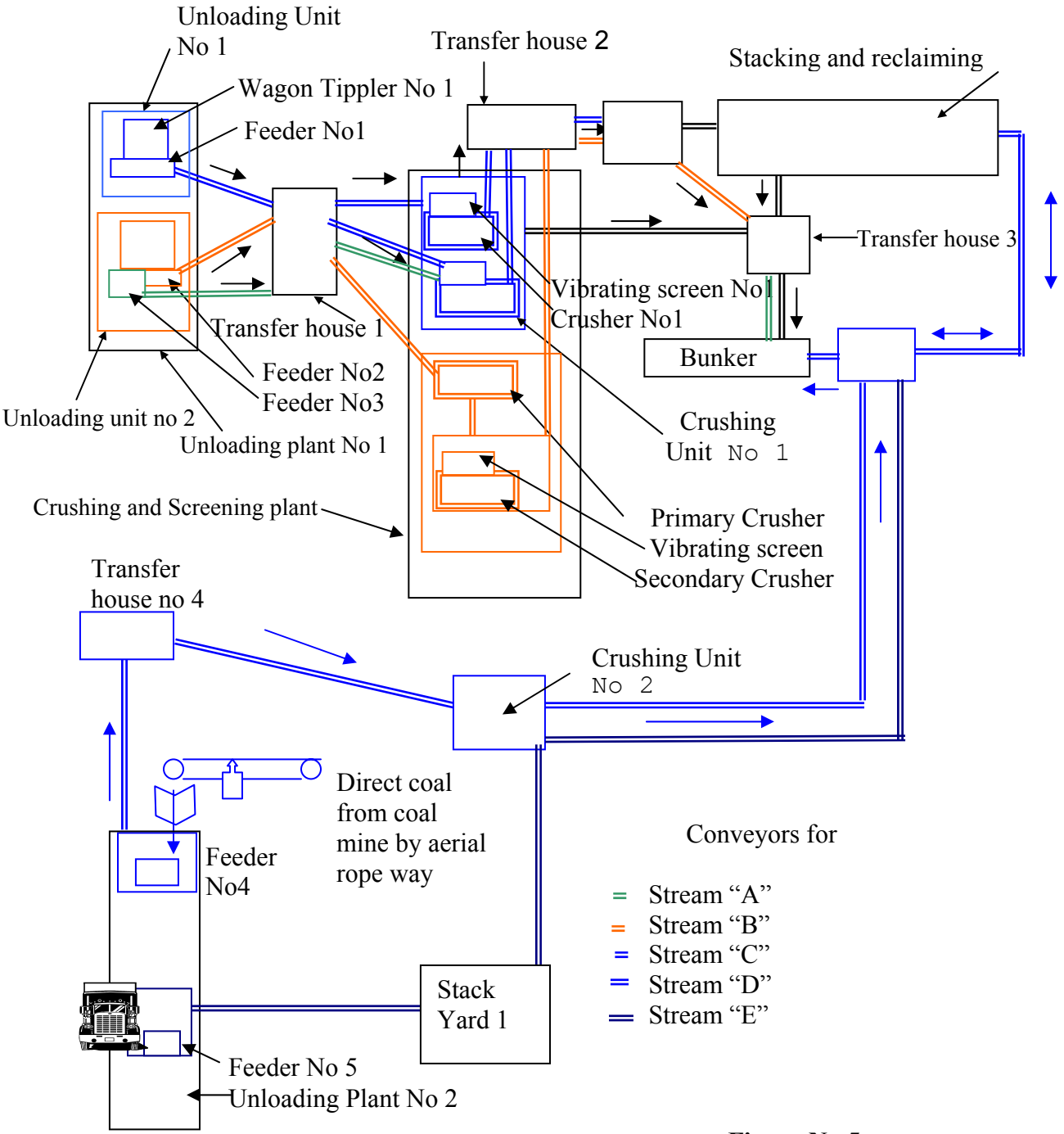

Figure No 5

The process in CHP listed below

1. Unloading Process
2. Feeding Process
3. Screening Process
4. Crushing Process
5. Stacking Process
6. Reclaiming Process
7. Bunkering Process

4.1 Unloading Process: -

These comprise of unloading units. The types of unloading units are depending upon the transport mode of coal.

The transport mode of coal is as follows.

a) Aerial ropeway
b) Railway
c) Road ways
d) Ship

a) Aerial Ropeway: -

Transport by aerial ropeway has an important role in coal handling due to its easy operation, maintenance, long service life and low cost per ton. The ropeway is normally aligned "as the crow files " (smaller investment cost), overcoming most topographical obstacles, because of its high [3] above the ground; also, it does not interfere with animals and persons nor requires the splitting up of properties and the acquisition of extensive rights of way.

b) Railway: -

The main transporting mode is rail transport. Normally, coal is brought to the unloading terminals by trains made up of either unit train cars (cars of same size and capacity) or of random cars (cars of varying sizes and capacities). If the rolling stock and infrastructure required to handle coal is to be built anew, almost invariably, unit train cars are used to achieve the required high unloading rate. Using wagon tippler carries the unloading of the coal. There are various capacities of tipplers used in coal handling of thermal power station.

c) Road ways: -

The coal is also brought to the unloading terminals by road using trucks, dumpers of various capacities. The road transport system shows an ever increasing uneconomical tendency as the price for diesel fuel, labor costs and the necessary costs incurred for land reclamation as well as the over burden depths increase. Increased distances will result in an expansion the truck fleet even for constant production rates.

d) Ship: -

As the ship unloading installations represent a substantial part of the total investment, utilization of the best, most economical design can have great impact on the over all economics of the terminal. Larger cargoes are, of course, more economical.

4.1.1 Process Description: -

The receipt of coal should be cheeked and then decide to operate the unloading station. The main object of this process is to unload received coal within least time and fill the hoppers. The limitation or controlling factors are the level of receiving hoppers. See figure no 6.

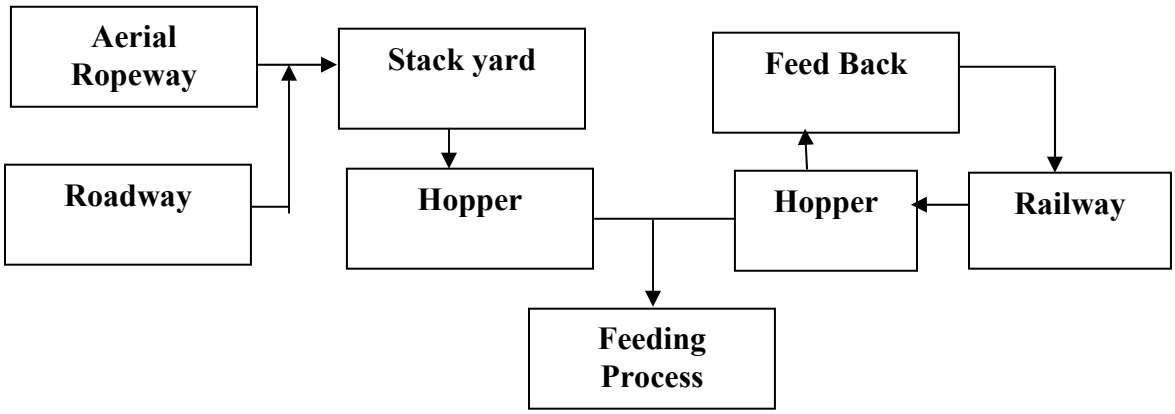

Figure No 6

4.2 Feeding Process: -

The feeding process involves continuous and control coal flow to meet the requirement. The handling as well as the processing tasks of this process has shaped the character of the coal handling plant. The use of dozers and mobile equipments are done for feeding purpose. The efficient and economical storage, movement and control of large tonnage coal handling installations, coal car unloading, storage, reclaim system depend on the proper application of feeders. These are extensively used in CHP for conveying coal.

Various types of feeders are used for these processes. Feeders protect the belt conveyors from damage by feeding the material onto the belt conveyors from storage hoppers, silos, surge hoppers and dumpers at a controlled rate. These are located below hoppers for feeding of material at uniform rate to Belt Conveyors. Feeders present the most efficient and economical method of conveying bulk material. The feeders, which are mainly used in the CHP, are given below.

1. Belt Feeder
2. Apron Feeder
3. Vibrating Feeder

a) Belt Feeders: -

Belt feeders maybe horizontal or inclined. The features distinguishing Belt Feeders from ordinary Belt Conveyors are the corking strand runs over a fixed runway or bed of closely spaced rollers (with a pitch of 0.25 to 0.2m); there are no idlers on the lower strand; the feeder has stationery skirt boards; belt speed is low (From 0.1 to 0.3 m/sec), as the material leaves the outlet slowly and forms a comparatively heavy layer on the belt. Belt feeders are used for granular and small lumped, less often for medium-lumped coal. A flow-control regulates capacity.

b) Apron Feeders: -

Apron Feeders are predominantly used for heavy and large lumped as well as for medium lumped materials. Apron Feeders of specific design with a runaway of increased strength are used to handle materials consisting of very large lumps, run-of-mine and sized coal, limestone, ore, etc. Apron speed generally ranges from 0.05 to 0.25 m/sec.

c) Vibrating Feeder: -

The Vibrating Feeder is an alternative of the Vibratory Conveyor and its operating principle reminds that of the conveyor. Low amplitude of Vibrations (generally 1 to 3

mm) and high vibrations (table stroke) frequency (up to 3000 per minute) are typical of the vibratory feeder. The trough is suspended on rods and supported by spring bars; it is driven by an electric motor or an electromagnet. Vibratory Feeders are preferably used for small lumped, less often for medium lumped coal.

4.2.1 Process Description: -

This process feed the coal, which is in hopper. The feeding rate is depending upon the requirement of boiler plant, stock level and the coal receipt. The process is critical, as it requires three-element control. See figure no 7

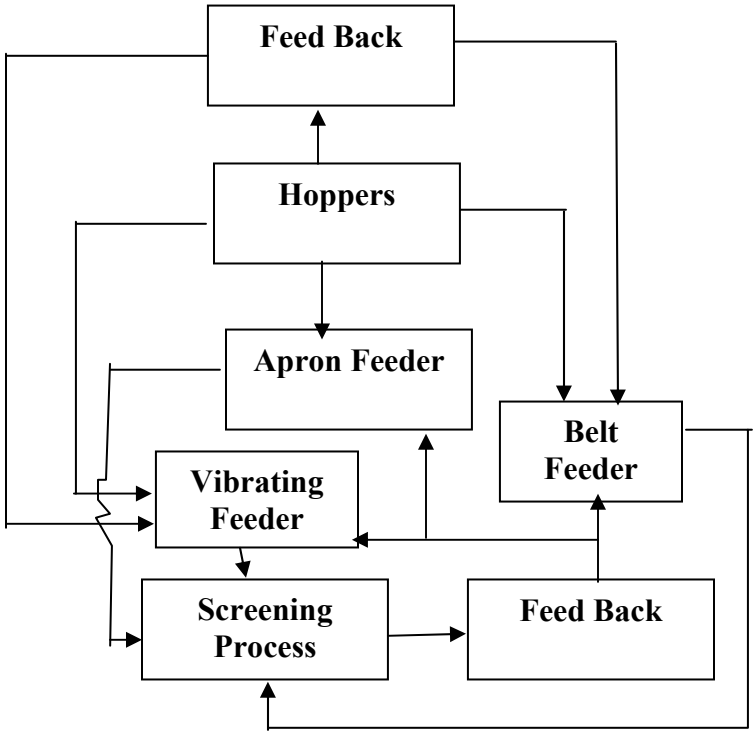

Figure No 7

4.3 Screening Process: -

There are three basic types of screening process. These are [4] scalping, fines removal and grading. Sufficiently small particles, at least in two dimensions, fall through the openings, whilst the oversize particles are retained on the surface of the screen. Screening performance can be affected by many factors, including particle shape, the material's bulk density, the flow ability of a material and surface moisture. Most importantly, perhaps, is the particle size distribution of the feed. For scalping operations at the coarse end of the particle distribution, very high screening capacities can be achieved since most of the particles are much smaller than the screen opening and pass through quite easily. Vibrating Screens and Roller Screens are generally used in CHP. But now days roller screen are used.

a) Vibrating Screens: -

Vibrating screen are of gravity feed type, being sloped downward from the feed to discharge end. A high frequency low magnitude vibration is given to the screen by an electric vibrator or other means. The purpose of vibration is to keep the meshes clear of

wedged particles and stratify the coal so that fine particles come down in contact with the screen. Generally these are double deck screen. The upper is trash screen which rejects the large pieces of foreign matter to a chute leading to suitable receptacle, while allowing a passage of coal to lower deck. The lower deck is sizing screen and the coal of required size is pass through it and other is transferred to crushing process.

b) Roller Screen: -

The coal is feed on the rollers, which are continuously rotate. While rotating these shaft transfer the coal from feeding end to crushing process end. The required size of coal is passed through gap of roller shafts. The remaining coal is passed through rollers to crusher.

4.3.1 Process Description: -

The coal revived is screen for reject of lumps and matter which cannot be crushed and at the same time the coal which is of desired size is directly feed to final process. Rest of the coal is feed to crushing process. The continuous monitoring is required for required size of coal is screen out through screen. It is also required to check coal reject for avoiding good coal pass out through reject. See figure no 8

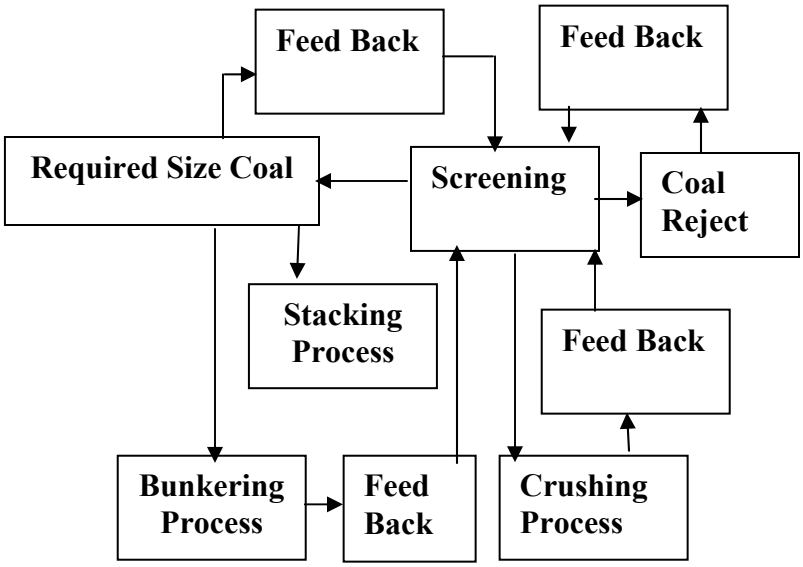

Figure No 8

4.4 Crushing Process: -

There are four basic process to reduce material. These are carried by impact, attrition, shear or compression. In CHP crushing process is the combination of Impact and Attrition Process. Some process involves Compression crushing. It is very simple process. The output of this process is important for coal size. See Figure No 9.

4.5 Stacking Process: -

This process involves in dead storage in the form of piles laid directly in the ground. In case of road transport and aerial transport coal are unloaded in stack yard and the coal is stacked properly using dozers. When coal supply by railway is excess it would be stacked through a separate conveyor. For these purpose stacker or telescopic chutes are used.

a) Telescopic Chutes: -

The chute consists of two hollow steel cylinders, its dimensions depending upon the size of the pile of the coal to be formed. Rectangular opening are spaced at regular intervals

both circumferentially and along the length of the chutes, the chutes stand vertically in the center of the area where the coal is to be stacked. When the coal inside the chute rises to level of the first row of opening, it spills out on the ground and forms a conical pile around the base of chutes.

b) Stacker: -

The stackers are used to stack coal at different places in stack yard. The stacker move on rail track, which is centrally, situated in coal stack yard. The boom of stacker moves both the side of the rail and combines vertical and angular movement in horizontal plane number of coal piles are prepared. Some times these stacker are equipped with bucket wheel for reclaiming purpose.

4.5.1 Process Description: -

Using stacker or telescopic chute stacks the coal revived from screen and from Crusher. The feed back of stack level is necessary to receiving coal from other process and this level is also important due to reject process is depend upon this level. See figure no 10.

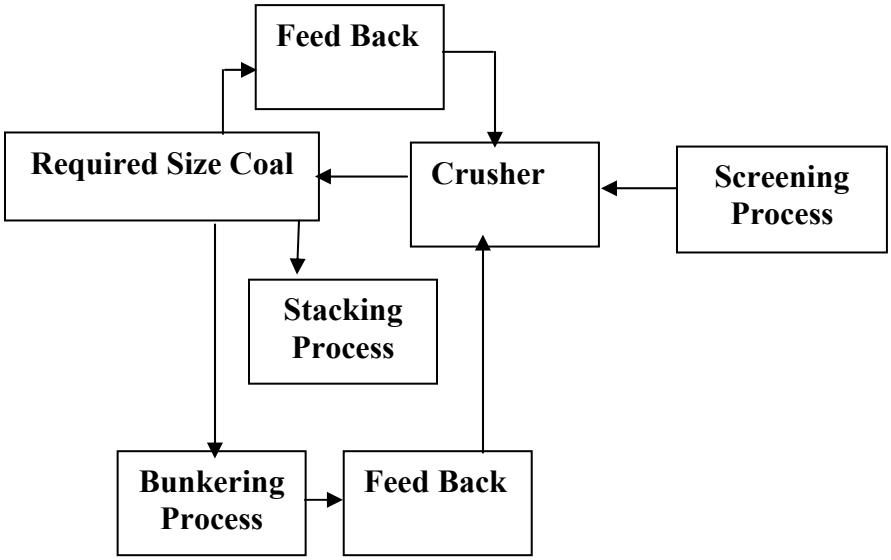

Figure No 9

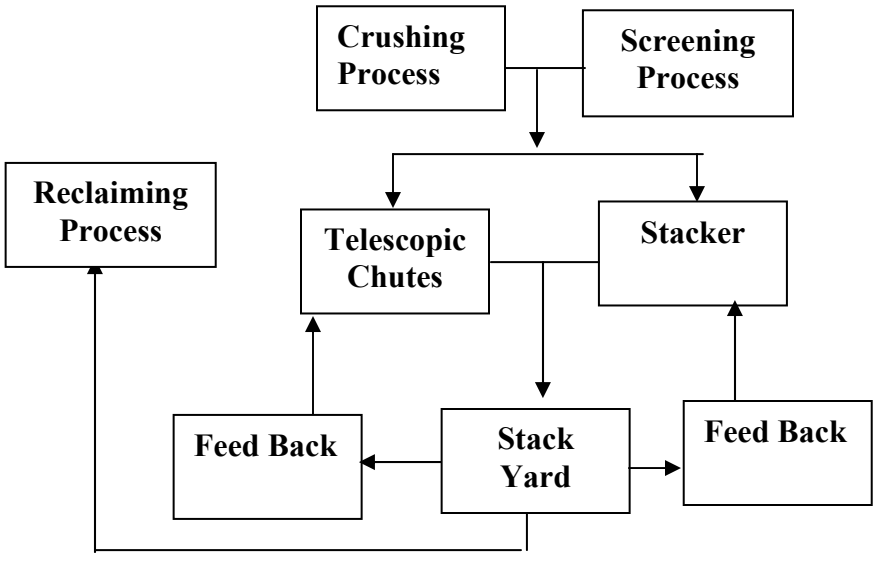

Figure No 10

4.6 Reclaiming Process: -

The stored coal is required to bunkered in case of emergency or improper coal supply. The reclaiming process involves the lifting of coal from stack yard by means of dozer or reclaimer like bucket wheel. The dozer feed this coal in hopper. This process is simple process. This process is simple. The main object of this process to bunker crush coal or non-crush coal as per requirement of bunker to support the other process feeding. See figure no 11

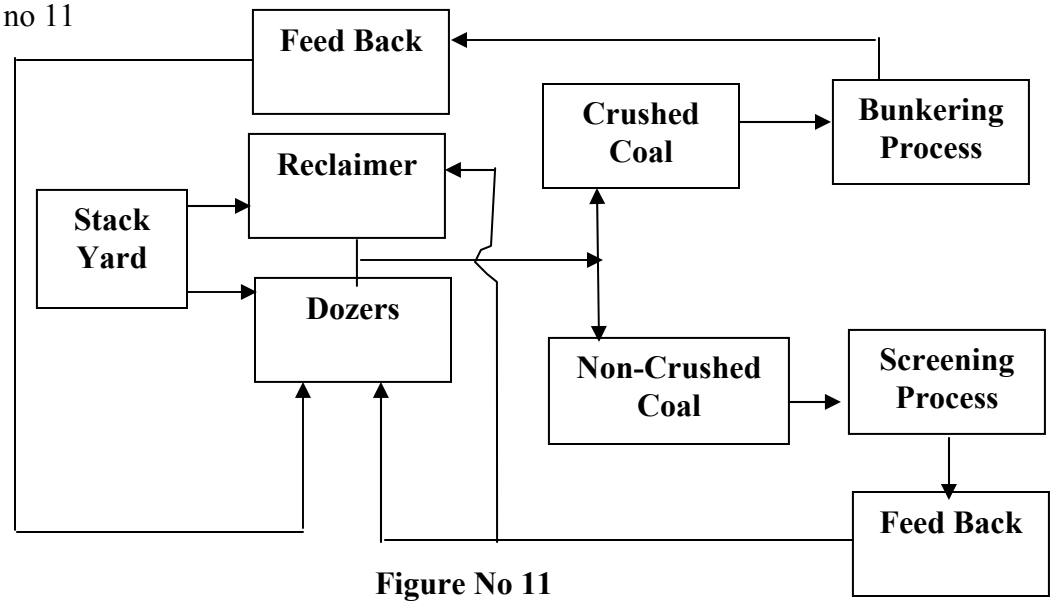

Figure No 11

4.7 Bunkering Process: -

This process involves feeding of bins and maintaining the level of these bins. From the conveyor belt the coal is discharged into bunker or bins with the help of trippers. The tripper is provided with wheels, which moves on rails parallel to conveyor on each side. It can be set in one position or made to travel slowly backward or forward between stops; to discharge the quantity of coal at desired location. Motorized trippers are usually used where continuous and uniform distribution of coal along the conveyors required or where frequent forward or reverse movement is required. Trippers having rigid welded steel frame to resist shock and minimize distortion. One way or two way discharge chutes are provided. The bifurcating chute permits the flow and discharge of coal to the desired side. See figure no 12.

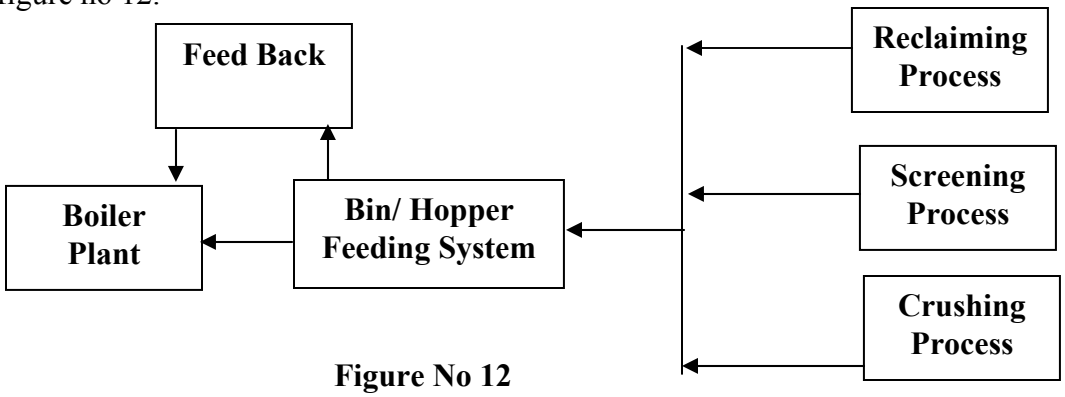

Figure No 12

5.0 Quality Policy: -

The quality policy of CHP should cover the purpose of operating the plant. It should include framework for establishing and reviewing quality objective. The policy, which is decided should be communicated and easily understand by the CHP employees. This policy is reviewed for continuing suitability.

6.0 Quality Objectives: -

CHP management shall ensure quality objective, which fulfill requirements for product. These objectives shall be measurable and consistent with the quality policy. As the CHP management has to fulfill the need of fuel required by boiler plant, the objective at least covers the requirement shown below.

The size and quantity of coal supply.

The quality of coal supplied which cover coal heat rate per Kg of coal.

7.0 Conclusion: -

This system will improve increase the efficiency, reliability, and safety of the process.

QMS is a tool for effective and efficient management. The proper use of this tool will only give benefits. By standardizing the system it is easy for developing vendors. The system suggested in this paper is a simple model which can be useful for coal handling which are not related with thermal power plant with slight changes.

8.0 References: -

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