

Need For Mechanised/Semi-Mechanised Ash Handling System From Human Consideration

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Paper and pulp industry has been using coal fired boilers. This is restricted to ash handling system for boilers upto 20 tonnes/hour and 24 hours/day coal consumption only. The ash contents in coal available in one country can be as low as 25% and as high as 45% by weight, depending upon grade of coal. On an average the ash content is about 35% by weight.

The coal is burnt on trowelling grate of the boiler. Type of stoker and the grate can also affect the size and physical characteristics of ash; though overall properties remain more or less same. Two forms of ash are generated. One is fly ash and the other is bottom ash. The former is in fine condition and the later is heavy and granular and it is this ash which needs much more attention. Fig. No. 2 (a) shows the stoker; the bottom ash hopper etc. and also shows ash passage.

Ash temperature is very high and though the modern steam generation plants provide for ash cooling through water jets or similar methods; yet, depending upon the type of stoker; impurities in coal: the particle size of ash can be as high as 400 mm and as low as even less than 3 mm.

HAZARDS OF MANUAL METHOD OF DISPOSAL

Battery of unskilled workmen are employed to shovel the hot ash and to empty the bottom ash hopper. The atmosphere surrounding the hopper area is very very hot and the work is dangerous due to temperature. It is totally inhuman condition under which these workmen operate, apart from risk of burns; fine ash particles get into the lungs during respiratory process of workmen. This certainly is health hazard. Ash particles being sharp and abrasive; possibilities of cuts and similar injuries are also strong.

These aspects have been verified by the authors at a number of places. It is the opinion of the authors that these reasons alone are sufficient enough to go in for mechanisation of ash handling and its disposal.

OTHER HAZARDS OF ASH

- a. Whole area of boiler house floor is rendered dusty.
- b. Environmental pollution is possible due to light particles flying all over.
- c. Ash particles find way to effluent stream thereby increasing load on treatment system.
- d. Due to frequent poking by workmen for ease of ash discharge outside air can find passage inside reducing overall efficiency of steam generation.
- e. Sometimes the ash contaminates the final product.

Subsequent paragraphs describe known existing methods of partial/full mechanisation of ash handling and its advisability.

PARTIALLY MECHANIZED ASH HANDLING SYSTEMS

- a. Most commonly used method is removal of ash manually and shoveled out of the boiler house area.
- b. As a partial improvement; ash is removed manually and filled into portable trollies, which are wheeled out of the boiler house area.
- c. Scraper chain conveyor.
- d. Belt conveyor.

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- e. Hydraulic (flushing) slurry.
- f. Pneumatic (dry) handling.

First three systems can be better understood by observing the figures 2(a), 2(b) and 2(c). Hydraulic slurry system consists of flushing out the ash such that ash-water mixture having bulk density of 1040 kg cum. is flushed out. i.e. the quantum of wash water is decided by quantum of ash. Pneumatic handling system, as the name describes, consists of pneumatic equipment like fans; blowers, cyclones and piping, etc to remove ash.

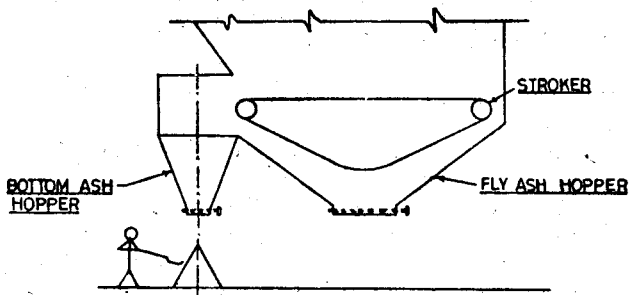


FIG 2(a)

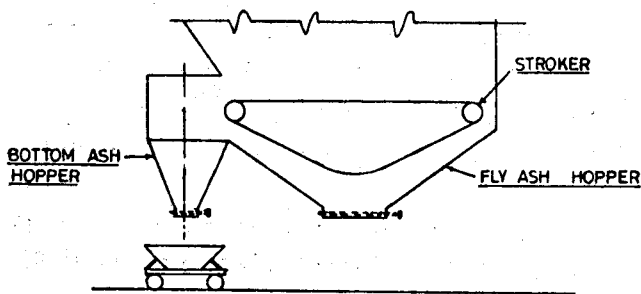


FIG 2(b)

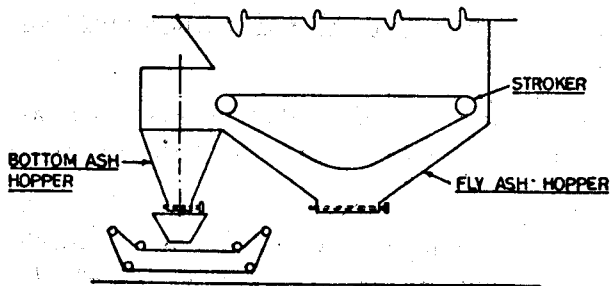


FIG 2(c)

SOME OF THE MAJOR ADVANTAGES AND DISADVANTAGES ARE ENLISTED HEREUNDER

- a. The method is without capital investment but involves use of human labour under terribly adverse and pitiable conditions.

- b. This method is slight improvement over the first one. However, human utilization is not drastically reduced. The capital requirement is however not very large.
- c. These methods are very quite satisfactory and have been & used more frequently than any of the other
- d. methods. However, the former relies on chain with blades and the latter on belt as carrying medium. Wear and tear of both is very large due to abrasive nature of ash and life of carrying medium is lower. Further, stoppage of unit would result into stoppage of boiler itself. The former is preferable to the latter despite the fact that chain is used due to sturdier components and as a consequence better service life.
- e. This method is; as already described, more suitable. However, when clinker (large lumps of ash cemented to fine coal particles and forming blocks) is encountered, the system is inadequate.
- f. This method; though used in Western countries, is not extensively used in this country and has its own limitations.

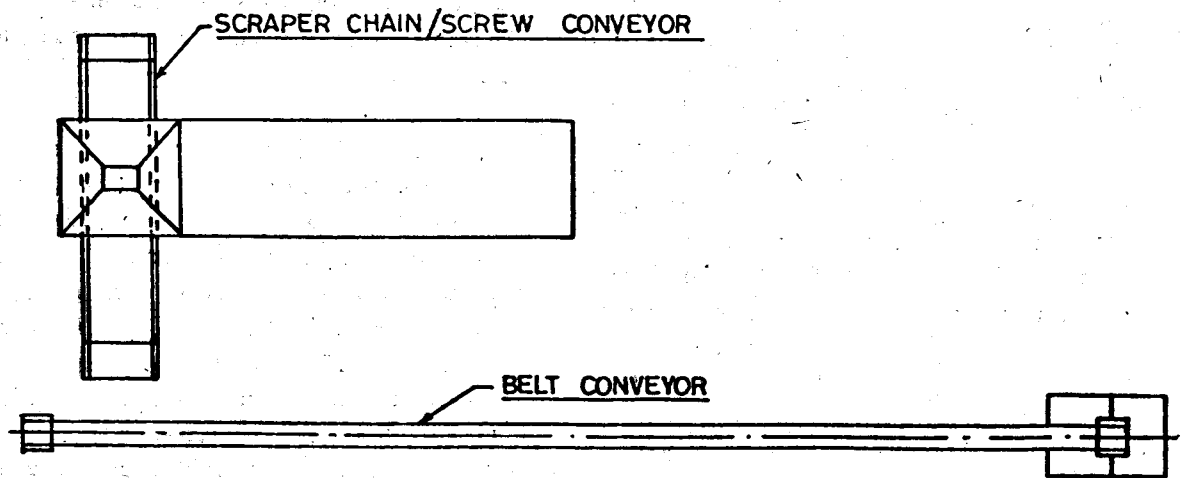
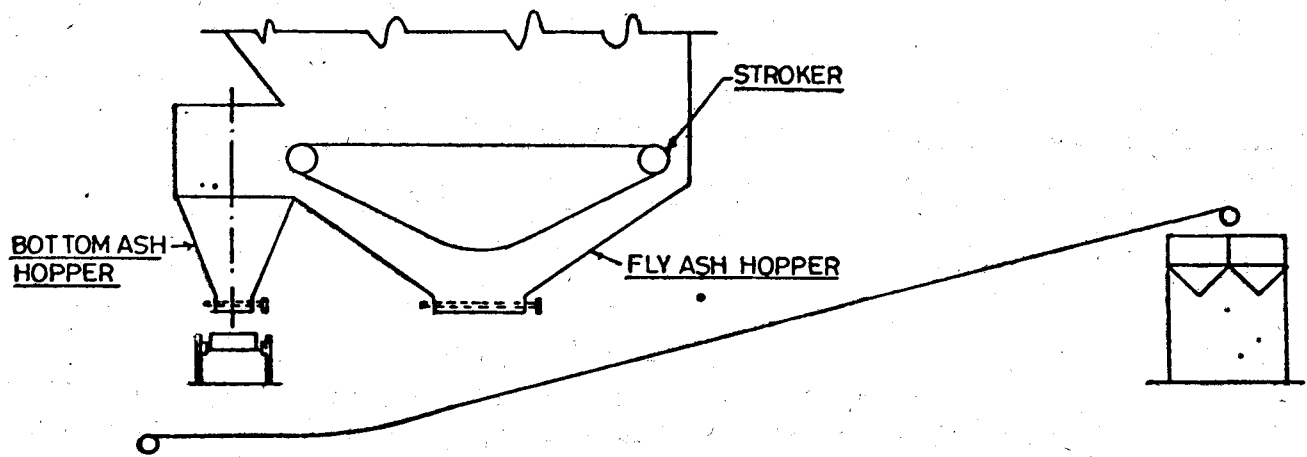
PROPOSED AUTOMATIC FULLY MECHANISED SYSTEM

The system would consist of the following :

- i. Motorised sector gate under the bottom ash hopper.
- ii. Mechanized water immersed discharge such as Apron, belt, chain, screw conveyor.
- iii. Belt conveyor to carry the quenched ash discharging the same into ash storage bins.
- iv. Ash storage bins.

The schematic arrangement of system will be as per Fig. 3. This system will be superior to other mechanized handling systems from several angles.

- a. It is fully automatic.
- b. The quenching equipment is screw discharge or scraper chain type which is simple, sturdy and less susceptible to breakages. This system is most appropriate to handle ash size upto ± 100 mm.



- c. Belt conveyor receives comparatively drier ash and has a proven record about service life for any material.
- d. Ash bins storing the ash will have better capacity utilisation.
- e. Approximate installed cost will be Rs. 5,00,000/-
- f. Appropriate power consumption will be 10
- ii. Fully automatic and mechanised plants are preferable.
- iii. Due to uncertainty about performance of equipment, new industries seem reluctant to provide the automation.
- iv. If ash handling plant with relatively simple construction is provided, the above difficulties can be tackled.
- v. Since this ash has commercial value (making cementing material for use in building industry) mechanization would restrict wastage to a least value.

CONCLUDING REMARKS

- i. From humanitarian grounds, atleast partial mechanisation is essential to handle ash.