

# **“PENT HOUSE ASH REMOVAL THROUGH HYDRO EJECTOR IN TTPS”**

## **A CASE STUDY OF LEARNING THROUGH MISTAKE.**

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### **INTRODUCTION:**

Talcher Thermal power station is having four units of 60 MW capacity and two units of 110 MW units . The 110 MW units are of M/s BHEL make , commissioned in 1982-1983. These units are overhauled every year for Boiler license renewal . The case study under discussion relates to the ST-II 110 MW units.

Substantial quantity of ash accumulation is observed in the pent house due to ash ingress through burnt out portions of skin casing. During unit overhauling it is required to remove the ash from the pent house area to carry out subsequent work. Manual removal of this huge quantity of ash is time taking, expensive and hazardous also. So, as per earlier practice ,the ash removal is done through vacuum by providing a hydro ejector which is located at Zero meter near the bottom ash hopper. Dry Ash is drawn through vacuum from pent house to Bottom hopper through a 150 NB line. HP water discharge at 15 to 17 kg/cm<sup>2</sup> is used in the ejector to extract the ash. The ash slurry mixture is discharged to ash slurry sump through bottom ash disposal line.

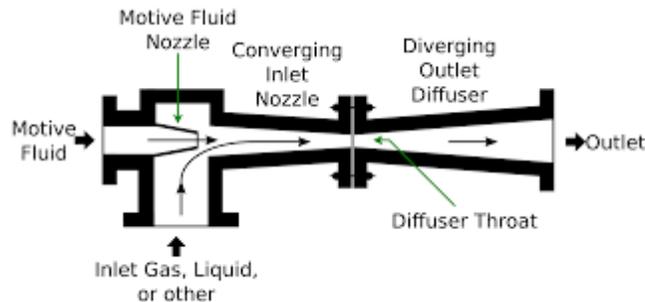
### **BACK GROUND:**

The arrangement for hydro ejector had been made long back. With this arrangement it takes about 7 to 8 days after unit shutdown for ash evacuation. Ash removal rate remains effective for initial 3 to 4 days when ash is in hot condition. As ash temperature drops , removal rate gets reduced with intermittent choking of ash evacuation line.

Unit-5 was stopped for annual overhaul in July 2016 . Relatively more ash was observed in pent house, As per the usual practice, hydro ejector arrangement was made through for ash evacuation ( The hydro ejector assembly has been changed with a new one) . While starting the system , it was observed that vacuum is inadequate (Fluctuating vacuum) at the pent house end. No ash was getting removed. A lot of trial done to improve the vacuum , viz. washing of the line for possible blockage, changing the ejector assembly and increasing HP water pressure up to 20 ksc. Since the system did not work, the ash evacuation line was connected to the ejector assembly below the clinker grinder. There the vacuum developed was adequate for ash extraction. But the system worked for 2 to 3 hours and failed to maintain the vacuum ( Later it was observed that the ejector suction was getting choked due to water ingress through ejector end suction flange which was immersed in water ). This way 5 days lost , without any ash removed from pent house. Seeing the quantity of ash in pent house , it had been anticipated that

removal of ash and repair of the ash ingress point in pent house would be in critical path. The ineffectiveness of ejector was only adding to the level of disappointment. Manual cleaning was cumbersome in handling the volume of ash and shifting it to ground floor. Even a tractor load of ash had been removed and stacked at drum floor. Tension was building up as the delay in this activity may delay the overhaul duration.

**BASICS OF EJECTOR:**



Ejectors are designed to convert the pressure energy of a motivating fluid to velocity energy to entrain suction fluid and then to recompress the mixed fluids by converting velocity energy back into pressure energy. This is based on the theory that a properly designed nozzle followed by a properly designed throat or venturi will economically make use of high pressure fluid to compress from a low pressure region to a higher pressure. This change from pressure head to velocity head is the basis of the jet vacuum principle.

**IDENTIFICATION OF THE ROOT CAUSE:**

**Earlier set up without throat**



Fig- 1

As there was no improvement in ash evacuation, the complete ejector assembly was changed with diffuser throat increaser ( This was missing in the previous arrangement – Fig 1). The discharge line was modified for smooth flow of ash mixed water. The system was then put in service . Vacuum developed was in the range of 200 to 250 mm and found to be working even at 12 Kg water pressure. In previous arrangement , the ejector was found to be effective at water pressure of 15 to 17 kg. To maintain water pressure , one has to stop the pent house cleaning for bottom ash deashing of other unit . But with the modified arrangement , it was observed to be equally effective even at 12 kg pressure ( Pressure drops

when both units ejector are taken into service). Vacuum got maintained till the end of cleaning activities . Pent house ash removal could be completed in 3 to 4 days , which in future would help in potential saving in power and water consumption. The issue found to be the diffuser throat which forms the part of the venturi , which was missing in the earlier arrangement ( Fig 2).

**Throat  
added to the  
existing  
ejector set**



Learning: Every failure is another way of getting a work done.