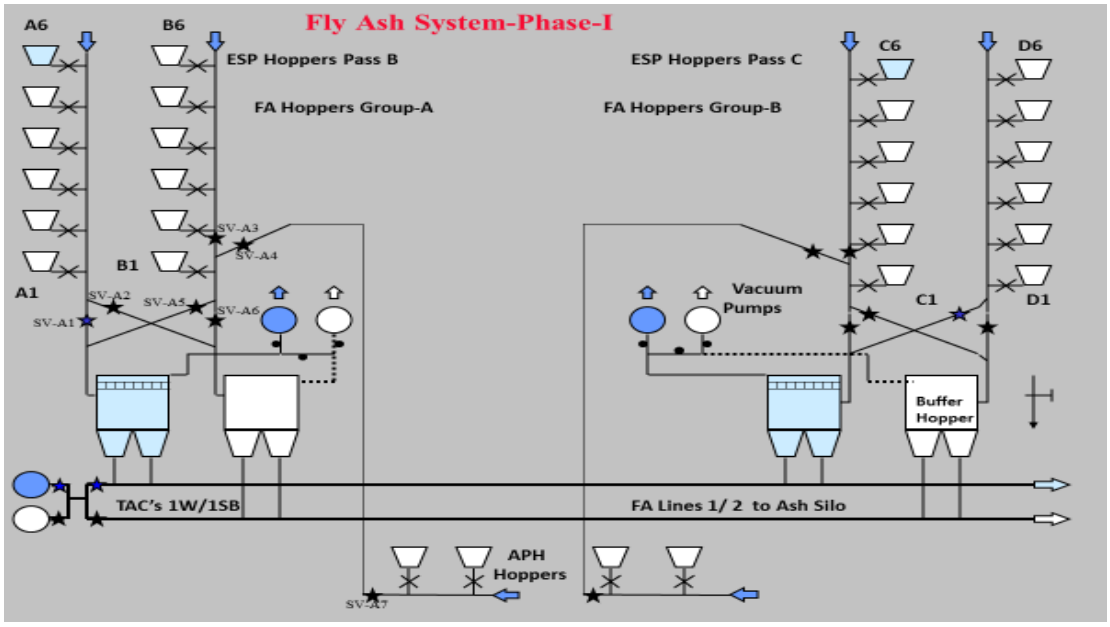
Synopsis on Dry Ash Handling System

In coal fired units, ash is removed for five different locations at Boiler, Bottom Ash hopper, Economizer hoppers, Air Pre Heater hoppers, DUCT & ESP hoppers. Normally, ash is transported from BAH & ECO trough slurry system and ESP, APH & DUCT hoppers through dry pneumatic System.
Dry ash is transported in two phases, 1) ESP, APH/DUCT hoppers to Buffer Hopper by vacuum extraction system and 2) Buffer Hopper to Silo by pressure transportation.



Philosophy of pneumatic conveying system:-

- Air only DP, DP_{air}, of conveying air=$4fldc^2/2D$
  Where f=frictional loss of pipeline, 0.005
  l= length of the pipe line including each bend of equivalent 10m
  d= density of air
  c= velocity of air
  D= diameter of pipe
- Volume of air reduced at ash pickup zone with pr, $P_1V_1=P_2V_2$
- Accordingly velocity reduced and c_{min}=15m/sec in dilute phase system
- Conveying phase density, $PhD=(DP_{conv.}-DP_{air})/ DP_{air}$
- $DP_{conv.}$ =ava. Vacuum in vac. system or ava. pr. In pressure mode during ash conveying
- Mass of product flow=Phase Density, PhD X Mass of Air, M_{air}
  M_{air} in $50m^3$/min at 300mmhg vacuum($0.6kg/cm^2$ abs.) =50X0.6X1.25X60/1000Ton/hr=2.25Ton/hr.
  M_{air} in $100m^3$/min TAC = 100X60X1.25/1000=7.5Ton/hr.

At NTPC-Dadri & new projects, there is no alternate other than pneumatic conveying system for evacuation of ESP/APH hoppers ash. For vacuum extraction, water ring vacuum pumps are provided. These vacuum pumps are at the range of 50 to 65 M^3/min up to 400mm of Hg vacuum. Vacuum is DP between hoppers outlet and Buffer Hopper. Air is the media to transport ash from hoppers to Buffer Hopper. This quantity of air flow must be ensured through selected vacuum line air intake. To maintain proper vacuum and air flow, following defects are attended regularly or intermittently:-

- Segregating/branch valve passing
- Material Handling valve passing
- Vacuum line coupling leakages
- Vacuum line/bend erosion leakage
- Buffer Hopper different elevations flange joint & manhole leakages
- Buffer Hopper valves passing
- Chocking of bag filters
- Vacuum Pump seal water pr. & flow
- Vacuum Pump belts looseness
- Vacuum Pumps internals erosion
- Timely detecting & clearing of MHV chocking

Similarly, in pressure transportation, TAC is provided at the range of 100 M^3/min up to HCSD Silo. For dilute phase conveying system it will give 10m/sec min. pickup velocity up to 1kg/cm^2 pr. in 300mm pipe dia. And in dense phase conveying system it will give more than 6m/sec pickup velocity up to 3.5kg/cm^2 pr. in 250mm pipe dia. To get min. pickup velocity in required pr./phase density, loosing of transport air is stopped by attending following defects :-

- Passing of transport air crossover valves
- Passing of Fly Ash line cross over valves
- Passing of Buffer Hopper valves(ALV inlet valve, ALV discharge valve, ALV vent valve & ALV equalizing valve)
- Chocking of Silo bag filters.
- Chocking of TAC suction filters

In pr. transportation, loosing of transport air invites line pressurization, line chocking, line leakages including damage of line supports. It also creates several hours of system outages. As a result, ash evacuation rate deteriorates and generation loss due to AHP created. Ash is a very abrasive material and few spares of ash handling valves eroded within three months. To overcome all of above, following subjects are taken care off:-

- Deployment of efficient manpower with proper training
- Procurement of right spares with right quantity in right time
- Awarding of right contract in right time (may be O&M contract to OEM in initial years)
- Close monitoring and analysis.

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