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ASH PNEUMATIC TRANSPORT UNDER ELECTROFILTERS OF UNIT 5 THERMAL POWER PLANT TUZLA

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ABSTRACT
Ash pneumatic transport is basic on fact that at suitable ash turbulence velocities in pipeline, ash solid particles is carried out in desired direction.
Choice and efficiency system work of pneumatic transportation depends of the physical – chemical characteristics of ash. Through modernization of unit 5 of thermal power plant Tuzla it will be built new electrofilter facility.
New pneumatic system of ash transport will be built under electrofilter hoppers.
Most of ash (80- 90 %) is extracted in electrofilters. Rest of the ash is extracted under concave part of boiler, under air heater and water preheater, and under chimney. Europe standards allowed max.50 mg/Nm^3 of ash in gas smoke on the exit of the thermal power chimney, so that electrofilters must provide it. Pneumatic transport system works automatically and it's simple for work. This system is proved to work in many thermal power plants.
Key words : thermal power plant, pneumatic transport, electrofilter, ash

1. INTRODUCTION
Through modernization of unit 5 thermal power plant Tuzla it will be built new electrofilter facility. Under electrofilter hoppers new pneumatic system of ash transport will be built and includes following basic parts:

- compressor station and compressors
- air blowers for fluidisation intermediate silo bottom of 100 m^3
- pipeline installation for distribution of compressed air
- compressed air cooler
- pressure vessels and all equipment for collecting ash under electrofilter hoppers
- pipeline for ash transport from electrofilters to existing silo of 1570 m^3
- mixing station with its installation for hydraulic ash transport in existing slurry station of unit 5
- pipeline installation for control air (6 bar)
- pipeline bridge for ash pipeline from unit 5 to existing ash silo of 3000 m^3
- electrical part of ash pneumatic transport system
- drive, control, measuring and regulation of ash pneumatic transport

2. TECHNICAL DATA

- Ash transport capacity is 90 t/h
- Ash bulk density $\rho = 0,7$ t / h
- Existing ash silo $V_{et} = 1570$ m^3
- Route of transport pipeline ,is going through new parts of pipeline bridge and through parts of existing pipeline bridge , that needs to be reinforced and painted again

3. SYSTEM DESCRIPTION

It is used the pneumatic transport system. In first and in second field of electrofilters will be installed pressure vessels of 3,3 m^3 , and in third field of electrofilters of 0,5 m^3 .
Transport pressure vessels are joint on following way:
In first and second field of electrofilter, three pressure vessels are joint on common transport line forming two transport lines. In third field of electrofilters ash quantity is small, so all six pressure vessels volume of 0,5 m^3 are joined on one common transport line. By this way it will be 5 transport lines. Each of this transport lines has one unloading valve and all are connected on one common transport pipe. Pipeline for ash transport after exit from electrofilter facility is separate on two directions by electro motor bend, one pipeline goes to existing ash silo of 1570 m^3 while the other one goes to mixing station.
Transpose work of ash transport through silo of 1570 m^3 or to work through to intermediate silo of 100 m^3 is doing with manual control in ash control room of unit 5 (flow sheet).

3.1. Detailed description of one group

Pressure vessels in first and second field are equipped with switches for ash level so it could be provide an automatic operation. In beginning all valves on vessels are closed. After the system is started valves are opening and valves for ash inlet. Starting filling pressure vessels with ash. If one of the level switches on pressure vessels give signal of high level all inlet valves for ash delivery like dedusting valves in that transport group are closing. Common group valve is opening for transport air and pressure vessel are charging on pressure of 3,2 bar. Air quantity needed for each vessel on different inlet points will be regulated with manual valve during facility transfer.
When the pressure of 3,2 bar is reached signal for opening common unloading valve is given for that transport group, so the ash transport begin.
Transport pressure during transport time is stable and when pipeline is unloaded pressure drops to 0,5 bar. When pressure reached low requested value (adjusted little bit above pressure value when system is in resting) air flow stopped on local transport line. Ash loading begins again.
In meanwhile other group of pressure vessel is loaded with ash and ash transport from this group starts. Compressor work is regulated by frequency regulator.
For ash transport through long distance pipeline two compressors are needed in operation. Air quantity needed for transport can be fixed in test run. When air flow stops, number of compressor turns falls on minimum (resting state). By this way energy consumption can be reduced.

3.2. Compressor station

Air for ash transport is supplied from compressor station.
Next compressors are chosen by 3,5 bar pressure :

- three compressors of Q = 1950 m^3/h with frequency regulator for each compressor.

Working capacity	2 x 1950 = 3900 m^3/h
Reserve	1 compressor of 1950 m^3/h
Total installed capacity	3 x 1950 = 5850 m^3/h

Compressors units can be combine per need, apropos need of air produce with very important notice that compressors have not limitation in stopping number and starting because start current is equal nominal current .This is very important in extreme case if disappearance of current happened.

- When ash is transported to silo of 1570 m^3/h then two compressors working all the time of 1950 m^3/h each.
- If ash is transported into intermediate silo of 100 m^3, than just one compressor of 1950 m^3/h will work and rest two will be in reserve. Compressors have installed air cooler who cooled air on 100^{o}C. Also each compressor have installed working hours gauge. Compressor runs with PLC of compressor and by PLC in command room of ash transport.
- In compressor station by three air compressor there is two air blowers for bottom fluidisation of intermediate silo of 100 m^3, one is working, and the other one is in 100 % reserve.
  Capacity is 246 m^3/h; Pressure 0,6 bar; Electromotor power is 7,5 kW.

3.3. Instrumental air

Instrumental air serves for controlling pneumatic valves and cleaning filter's bags on the intermediate silo of 100 m^3. Instrumental air is taking from unit 5 of thermal power Tuzla. It should have pressure till 6 bar over pressure. In constitution of new facility for ash transport it is predicted installation of instrumental air drier with filters , one is working and the other one is in 100 % reserve and they are placed in compressor station.
Instrumental air is transmited from drier to consumer and is consisted of pipeline network, armature and preparing groups (filter, regulator and oil pump).

4. CONCLUSION

This pneumatic ash system is reliable. It's also and most economic system for dry ash transport, because it is spending minimum energy per tons of ash transport. Because this is closed system, it doesn't pollute environment. Ash is very abrasive and waste basalt bends which are changing every 3 years of working. This system has no hazard of fire because air and ash aren't flammable. Efficiency of this system is proveded in working of many thermal power plants.

5. REFERENCES

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