STUDY ON GENERATION AND STORAGE SLAG AND ASH TO CLASSICAL POWER PLANTS

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ABSTRACT: The paper is based on a case study on the generation and storage of ash and slag to the largest power plant in Romania, Turceni thermal power plant. Central consists of 330 MW power units running on lignite mining basin of Oltenia.

KEY WORDS: storage, slag, ash

1.INTRODUCTION

Turceni power plant is designed as a basic national energy system that produces electricity using fossil fuels and is part of Oltenia Energy Complex. Turceni Thermal Power Plant is located in the county of a plains region, about 16 km from the Filiaşi between Turceni village and the river Jiu.

Combustion of fuels in power boilers resulting slag and ash, which is currently discharged hydraulic two related deposits: No deposit ash and slag. One used in normal operation, located in the Valley Ceplea about 3.3 km from the power plant site. Figure 1 shows the schematic diagram of power generation of 330 MW in the energy group.

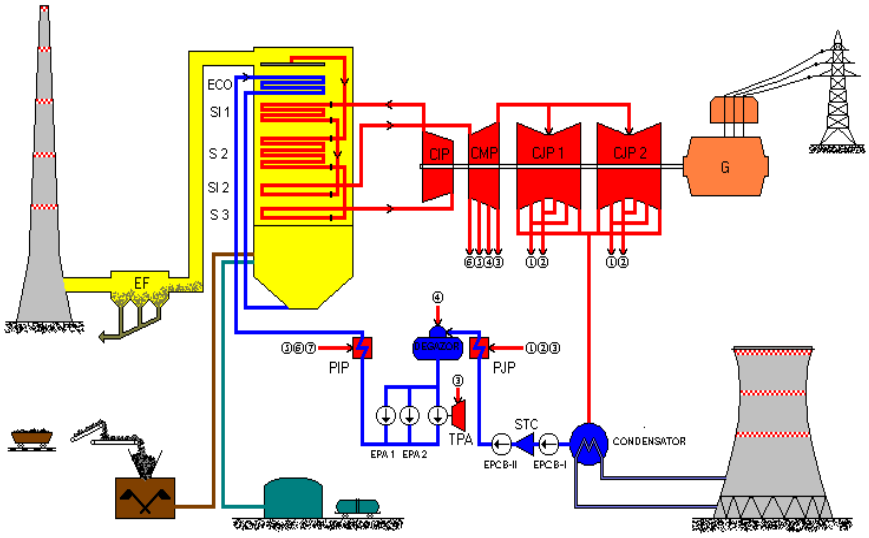

Fig. 1. Schematic diagram of power generation of 330 MW in the energy group

2. LARGE COMBUSTION PLANTS OF THE POWER PLANT TURCENI

Large Combustion Plants of Turceni power plant are:

- IMA 1 , consisting of energy blocks no. 1 and 2 , each with a rated thermal input of 789 MWth , block No. 1 will work 20,000 hours in 2008-2015 , block no. 2 is withdrawn from service in 1998 and according to HCA no. 2/27.02.2008 is proposed for recovery .

- IMA 2 made no power blocks . 3 and 4 , each with a rated thermal input of 789 MWth ;

- IMA 3 , comprising power blocks no. 5 and 6 each with a thermal power of 789 MWt ;

- IMA 4 , formed in the power unit no. 7 with a heat output of 789 MWt , which will operate 20,000 hours between 2008 ÷ 2015.

The boiler of 1035 t / h is Benson type with crossed single force with a single flue gas path and intermediate overheating . It was made in Romania , the Vulcan Works , after a Babcock .

The tower construction is suspended from a platform located at the rate + 92.0 m in the combustion chamber is lower and in the upper part of the heat exchange surfaces .

The boiler is sealed with membrane walls with thermal insulation on the outside light and metal coating. It is located in a room with the roof closed at the rate + 45.0 m , the remaining boiler being outdoors.

Electrical equipment used for holding ashes from the combustion gases discharged from the chimney (electrostatic) are mounted on the platform to share + 92.0 m Figure 2 shows a schematic diagram of steam boiler and auxiliaries .

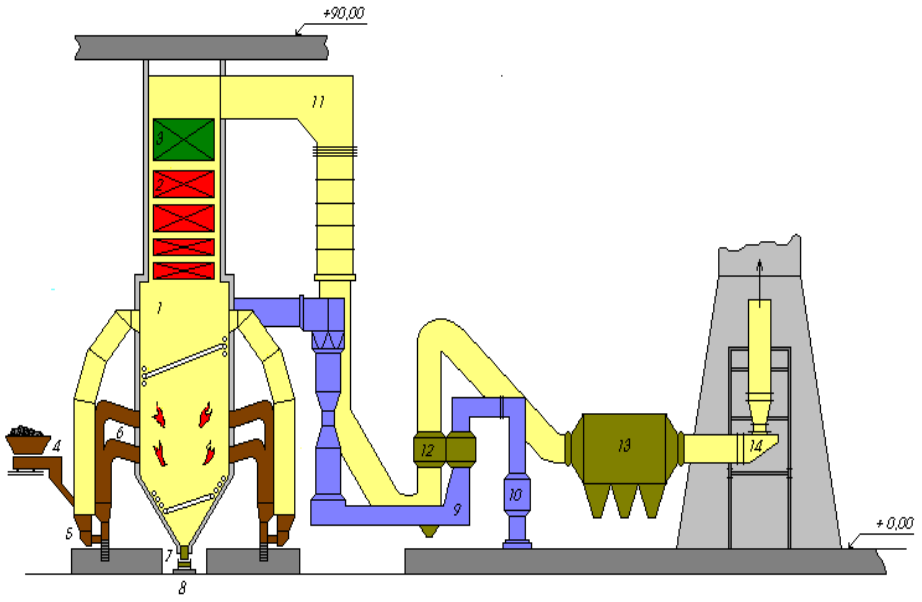

Fig.2 The boiler and auxiliaries

Preparation plant and coal combustion contains six die type DGS 100, of which five are in operation and one in reserve. Feeding each die is achieved through a tape dispenser type ERKO that extracts coal from bunkers in the intermediate body .

The first of two overlapping coal burner has been replaced by a modern

burner with a substantial reduction of the

Plant Combustion ignition and flame holder is made of burning oil and mixed oil - gas burners grouped into three functional groups : group to share + 12.00 front group back boiler and boiler group . Initial burners were replaced with modern burner jet tertiary air in order to reduce the formation of nitrogen oxides.

The air necessary for the combustion is introduced with the aid of two air fans , axial type , in horizontal construction . To raise the temperature of the air are two rotary air heaters , Ljungstrom type . The waste gas flow is discharged outside through the two flue gas fan , axial type , vertical .

The supply of combustion air and exhaust gases is designed in two parallel lines, which can be operated independently up to 70 % of the rated capacity of the boiler .

Disposal of the slag is carried out on the basis of the boiler plant by means of a scraper type conveyor (Kratzer) in a water bath . Hardened clay is then crushed and stored in the hopper , where it is sent through pipes Hydraulic Bagger pumps stations .

Steam soot blowing system is provided for the removal of ash deposits on the heat exchange surfaces of the boiler .

For powder ash resulting from the combustion gases are two cyclones , electrostatic type .

Water needed in the boiler is fed by a turbo pump in normal operation and two electro power .

The flue gases are discharged into the atmosphere by four reinforced concrete chimneys , each connected to two steam boilers of 1035 t / h (power unit no. 1 chimney 1; energy blocks no. 3 4 to cart 2; energy blocks no. 5 and 6 to chimney nr. 3 unburned carbon and oxides of nitrogen . and the energy block No. 7 to No. chimney . 4).

3. EXHAUST SYSTEM OF SLAG AND ASH

Every steam boiler of 1035 t / h , clay rezultată from burning cărbunelui is concasată and hydraulic transportată 1:10 dilution through channels Bagger aferentă pump station boiler. Lignite contains 24-32 % ash in the initial mass . From the amount of ash , about 5% of the combustion chamber is separated in the form of ash and slag which falls into the hopper furnace , where it is discharged with a scraper conveyor (Kratzer) . Kratzer discharging slag and ash in a sieve with mesh sizes of 30 mm , which fine particles are separated from the coarse particles of slag .

Coarse particles are sent to a crusher, and then , by means of ejected water , the slag is discharged to the sludge pump station (Bagger) .

Slag discharge system is designed to cool the hot slag falling from the hopper furnace in a water bath and draining . This system ensures the setting of immersion in a water bath and sealing the furnace from the bottom .

The water level in the bath is maintained by means of an overflow . Water bath of slag evacuator wash water is fed continuously so that the temperature does not exceed 600C Kratzer . Falling in a water bath , heat the slag is absorbed by the cooling water . The cooling is usually carried out so rapidly that large lumps of slag particles becomes small , friable . The slag particles are carried from the water bath by means of scrapers fixed on a calibrated chain . Figure 3 shows the exhaust system of the boiler furnace slag and ash .

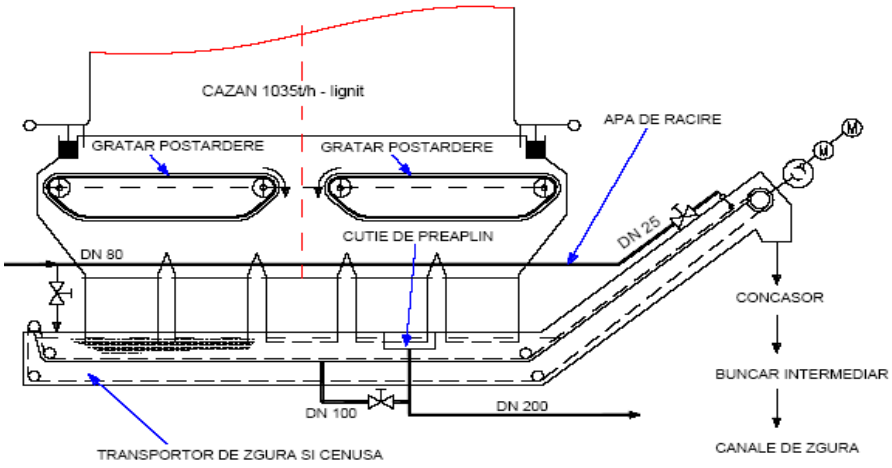

Fig.3 The air outlet of the boiler furnace slag and ash

For crushing slag up to size 30 mmm , there are two one roller crushers and crushing jaws , the flow rate of 10-20 t / h
After the crushing , crushed clay is introduced into the intermediate hopper and into the slag channel . Slag and ash ejection is taken by a transported using hydraulic pressure to the outlet channel .
Fly ash , which leaves the furnace with the flue gases is partially retained and collected in funnels air preheaters , electrostatic funnels and funnel chimney , where it is discharged through freefall through large diameter pipes (400 mm or 600 mm) fitted with high inclination
In the preheaters of air funnels in the ash is conducted by a free fall through the pipe up to the level 0 m , where it is mixed with the wash water in a tank and then discharged to the effluent slurry pumps . Electro hopper ash is discharged by means of valves with counterweight , led to water - ash mixers (kettles) and then to the pump station channels bagger .
Bagger pumps stations to evacuate the boiler slag and ash . Bagger pump station serves two boilers and pumping has three lines of a line in operation , a line and a line rezervă repair.
A line of Bagger pumps include centrifugal pumps in series două each pompă having the following characteristics:
- D = 1100 m3 / h
- H = 80 mcw
Slag and ashes hidroamestec high dilution (1:10) transported to warehouses and cenuşă zgură the boiler . For storing slag and ash drained out of Turceni Thermal Power were down two storage namely:
- No deposit ash and slag . 1 - arranged as basic deposit located approximately 3.3 km from the power plant in the Valley Ceplea , the ash and slag disposal hidroamestecului is now in solution with two-stage pumping system serially in " pump the pump " .
- No deposit ash and slag . 2 - arranged as buffer or damage deposit , located about 1 km from the power plant in the old riverbed of the river Jiu, the ash and slag hidroamestecului storage is limited , at times when it is not possible to evacuate the store no. 1 of Valley Ceplea .
In accordance with Directive 1999/31/EC on waste disposal and storage of burning processes in boilers, translated by GD 349/2005 , it is mandatory to abandon the current system of waste disposal and storage of excess water . In order to align with European environmental standards and energy efficiency technology is required in addition to the rehabilitation of coal plants , namely the achievement of flue gas desulphurisation installations and replacing existing disposal facilities , transport and storage of products resulting from burning coal in boilers energy groups

, with clean facilities . The current system of collection, transportation and storage of ash and slag has some drawbacks among which:

- Require large amounts of water to transport hidroamestecului , which leads to high costs of operation,
- Excess water from unsafe storage , ie local and general stability of the deposit,
- A number of harmful substances contained in the slag and ash is dissolved in water and a part of which penetrates into the soil.

4. CONCLUSIONS

Based on the presence of the ashes of the following chemical compounds : SiO_2 , CaO , MgO , Fe_2O_3 , Al_2O_3 and heavy metals , the main environmental factors affect the current situation and possible effects are discussed below. Affect groundwater seepage from storage and basement leaks due to improper drainage, its tank . These have the effect of increasing mineralization phreatic and soil salinisation , taking into account the cumulative appearance . Surface water quality is affected by discharges of water from storage or ash and slag hidroamestec incident or damage. Fine particulate ash from the surface wind-blown deposits dry compartments , affecting all environmental factors : water, vegetation , organisms, soil , human settlements . Fine-grained powders , in principle, affect the animal and foliage of the plant system , the distance of the deposit . Medium and large grain powders are deposited near the surface deposits of soil and plants. Flora of the deposit , both the spontaneous but cultivated especially suffer negative effects from entrainment by air currents fine ash fractions , which brings vitality and reduce crop yield . Another effect of pollution is the accumulation by plants to elevated concentrations of heavy metals (chromium, lead , arsenic , molybdenum) to toxic levels , with implications for health consumatorilor. Solutions applied been doing environmental deposits , including: drainage partial recirculation of clarified water , splashing surface wetting compartments under reserve or binders to secure it with ashes , had been expected results.

To reduce pollution from conventional technology is necessary to adopt the technology of dense slurry evacuation .

Exhaust technology slurry density, is the process of preparation of the mixture of slag / ash with water in order to obtain a two-phase mixture (solid -liquid) homogeneous , slurry , on the one hand, and on the other hand , the process involves the storage slurry solidification based on two phase mixture (slurry) storage dumps , resulting in so-called "rock ash " . This technology can be implemented both in power plants new and existing ones . From the boiler to the collection point of the ash , the ash is provided in the form of dry solid abrasive representing coarse and fine ash ash coming from the electrostatic precipitators of the channel and the flue gas dedusting.

Summary of dense slurry technology constă the continuous mixing of boiler slag under wet and dry electrostatic precipitator ash with water , the movement hidraulică intense , relative solid / liquid ≥ 1 , which has the effect of activating chemicals in ash and cementitious type creating a thick homogeneous slurry which is pumped to storage , which , over time.

Starting from very favorable characteristics of dense slurry , exhaust technology and storage in liquid slag and ash dense mainly involves :

- making facilities capture , transport and storage of dry ash from electrostatic precipitators
- development of reception facilities , transport and separation (concentration) of slag from Kratzer ;
- making plant by movement hidraulică intense mixing water , ashes and slags for producing thick slurry ;
- making facilities pumping, transmission and distribution of dense fluid at the warehouse.

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