

PILLARD burners fitted to coal fired fluidised bed boilers ALSTOM: Thermal Power Stations for TAMUIN (Mexico) and BAIMA (PR of China)

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Fluidized bed type steam generators constitute a modern solution for the clean combustion of solids fuels, such as coal or pet coke, able to limit pollutant emissions, notably SO_2 .

1 - The TAMUIN plant (Mexico)

This plant comprises 4 sets of FB boilers (+) turbine each producing 130 MW (electric).



Fig.1 : General view of the TAMUIN plant (Mexico)

Each FB boiler is fitted with the following PILLARD equipment :

1.1 - PILLARD burner, GRC INDUCT type

The purpose of such burners (2 combustion heads) is to preheat the fluidizing air when starting the (cold) boiler. When the bed temperature increases, the air preheater located on the flue gas circuit starts to act, then the burner heat release is progressively reduced. The burner is stopped when the FB boiler reaches its nominal operational temperature, but the fluidizing air then at $\approx 300\text{ }^\circ\text{C}$, continues to cross it, its pressure drop being limited to $\leq 100\text{ daPa}$.

Burner characteristics :

- Fuel : Diesel oil
- Max heat release : 38 MW (19 MW per head 1 635 kg/hr D.O.)
- Atomisation : by compressed air
- Air temperature upstream to the burner : 20 to $300\text{ }^\circ\text{C}$
- Fluidizing air temperature downstream from the burner : 500 to $900\text{ }^\circ\text{C}$ (distribution $\pm 50\text{ }^\circ\text{C}$ at bed inlet)
- Maximum air flow when the burners stopped : $126\ 400\text{ Nm}^3/\text{hr}$
- Pressure inside the burner duct : 280 mbar
- Burner removal : possible thanks to rails and side door

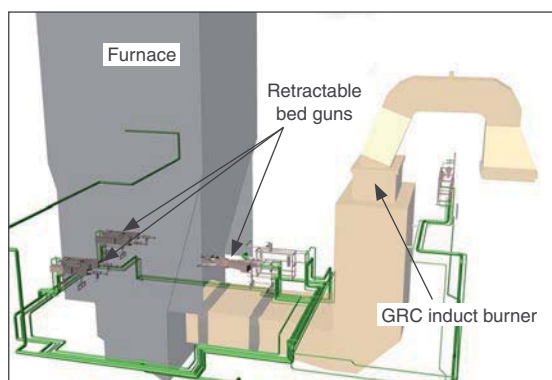


Fig.2 : Position of burner and retractable bed guns

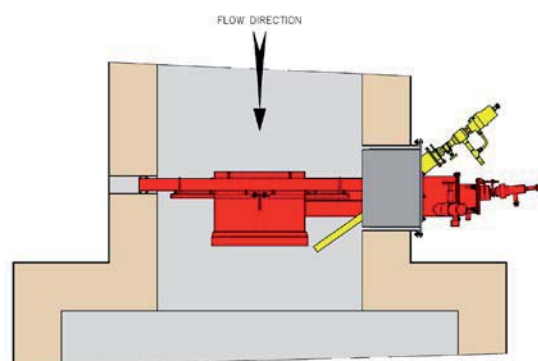


Fig.3 : PILLARD burner type GRC INDUCT (38 MW in 2 heads) positioned vertically (PILLARD patent n° 97/02586)

Such a burner (made with 2 heads) is derived from the PILLARD GRC type burner (already fitted to thousands of boilers) and is inserted in the fluidizing air duct. Each head can be easily removed for maintenance purposes thanks to a system of rails and side door.

Optimizing flows :

Several deflectors allow to homogenize the air velocity distribution across the burner, which is located immediately downstream from an elbow. A modeling thanks to Fluent® software has been used to optimize the shape and dimension of deflectors (see fig. 4).

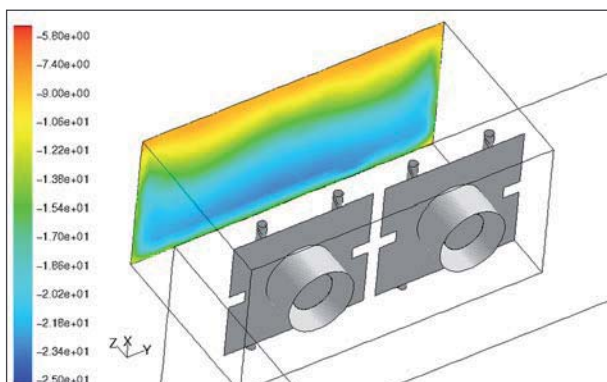


Fig.4 : Velocity distribution upstream to the burner and deflectors

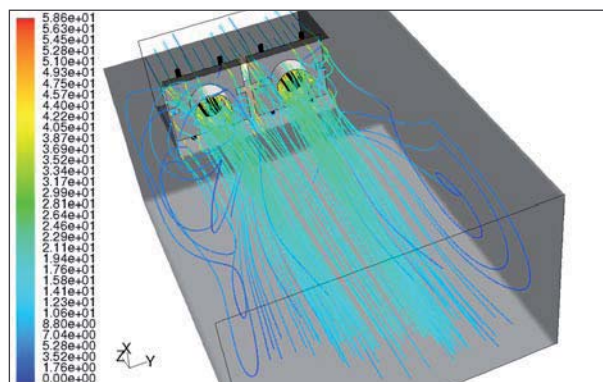


Fig.5 : Flow line shape downstream from the burner

Pressure drop :

The burner pressure drop is low since there is no air windbox and the flow discrepancies have been eliminated. This point is very important to avoid increasing the power consumed by the fluidizing air fan.

Burner gun :

Diesel oil atomisation is by compressed air (7 bar, 20 °C, actual flow 15 % of the diesel oil flow). Although the air pressure in the duct is rather high (280 mbar), it is possible to remove each burner thanks to a safe removal system. The burner is protected by US patent ref. 98430005-3.

1.2 - Retractable bed guns

Each FB boiler is equipped with 6 retractable bed guns injecting diesel oil in the bed, located at its lower level. Their purpose is to preheat the bed before introduction of the solid fuel as well as sustaining the combustion during some transitory conditions.

Since Diesel oil lighting up is by self-inflammation, the use of the retractable bed guns is possible only after preheating of the bed has taken place.

Characteristics of the retractable bed guns :

- Fuel : Diesel oil
- Max flow : 1 700 kg/hr D.O. per retractable bed gun
- Atomisation : By steam or compressed air
- Automatic retraction and isolation of each retractable bed guns

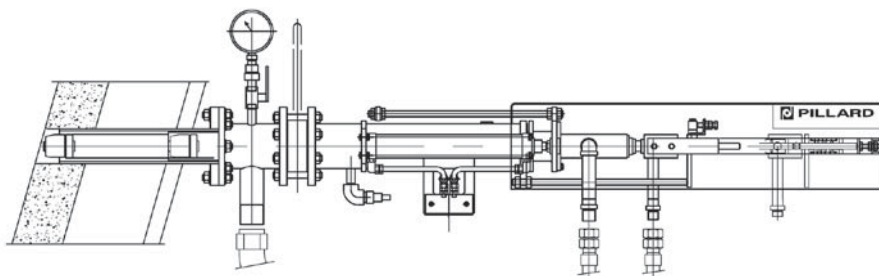


Fig.6 : Retractable bed guns

Retraction of the bed guns :

The retraction system is of main importance since it is designed to avoid fast wear of the gun tips by abrasion due to the movement of solid particles in the bed.

Moreover, the passage of each retractable bed gun through the bed wall is efficiently blown/cooled to avoid deposits and to cool the gun tip.

Isolation of each bed gun when retracted :

Each bed gun is equipped with a mechanical shutter which stops any solid particles entering inside the internal gun channels.

1.3 - Pumps and valve sets

PILLARD's supply also includes Duplex diesel oil pumping sets with accumulators allowing to switch over pumps automatically, as well as the valve sets for flow control and safety shut-off.

All such sets have been supplied pre-wired with junction boxes protecting the junction plugs.

2 - THE BAIMA Plant (PR of China)

The TAMUIN FB boilers were started up in 2002. Then ALSTOM France concluded a new contract in 2003 for a FB boiler producing 300 MW electric power, destined for BAIMA (China).

Such new FB boilers comprise 2 x PILLARD GRC INDUCT burners (x2 heads each) of 46 MW per burner, as well as 12 retractable bed guns (of the same capacity as TAMUIN's).

All the burners will be delivered in July 2004.