Feedback from 7 years experience on PILLARD burners & incinerators at the TOTAL Leuna refinery (Germany)

By L.Ricci, Deputy Head of R&D Dept, PILLARD EGCI, Marseille - France

In order to anticipate the forthcoming emission requirements for refineries, PILLARD has developed and patented a new generation of very low NOx gas burner, forced air or natural draught, called LONOxFLAM®.

For the TOTAL Leuna refinery (near Liepzig, Germany), PILLARD supplied the following equipment :
- 4 LONOxFLAM® burners for the FOSTER WHEELER Visbreaker furnace
- 1 LONOxFLAM® for the LOREATT regenerative furnace of the sulfreen unit
- 2 incinerators, PILLARD "H type" for Claus process "tail gas"

1 - THE PILLARD VISBREAKER LONOxFLAM® BURNERS

The 4 LONOxFLAM® burners (fig.1), each of 10MW, fire a refinery gas containing 50% hydrogen and have an auxiliary channel fitted for "stripping" type gas. This furnace is fitted with a combustion air heater for 155°C.

Emissions, verified by TÜV during production, are :
- NOx = 85 mg/Nm³ @ 3% O_2 dry (Air temp.= 155°C)
- CO < 10 mg/Nm³ @ 3% O_2 dry

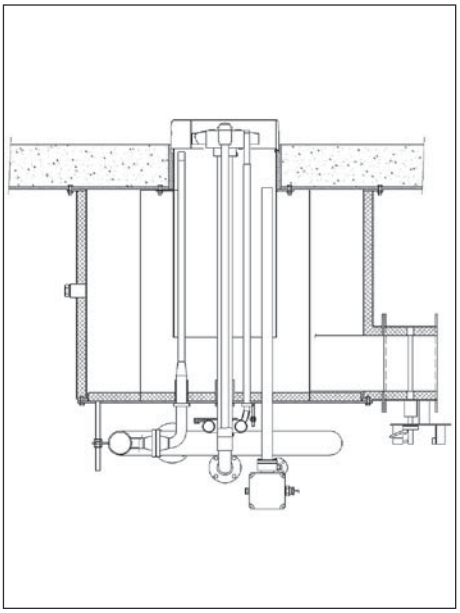

Fig.1 : One of 4 Visbreaker burners

Fig.2 : One of the Visbreaker flames

Such performance with hot air is obtained thanks to the combined efficiency of the following three techniques:
- Internal recirculation of the furnace flue gas
- Fuel staging
- The flame separation principle (6 single flames increase the radiating surface and reduce local oxygen).

These three techniques reduce thermal NOx. Furthermore, these solutions improve the thermal flux regularity by reducing flame temperature peaks.

Photo in Fig.2 shows the absence of a hot zone at the base of the burner.

Not using a high temperature refractory quarl contributes to burner reliability.

2 - THE PILLARD LONOxFLAM® BURNER SULFREEN REGENERATIVE FURNACE

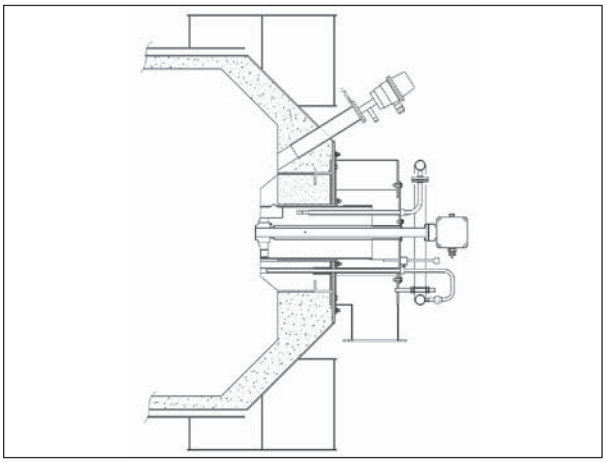

Fig.3 : Burner for sulfreen furnace

The LOREATT sulfreen unit regenerative furnace is fitted with a 2.5MW refinery gas LONOxFLAM® burner, with combustion air at 20°C (fig.3).

In addition to the low NOx techniques specified before, the burner has a tertiary gas channel to increase the fuel staging effect.

Emissions measured at 100% load are :
- NOx = 50mg/Nm^3 @ 3%O_2 dry (Air temp.= 20°C)
- CO < 15mg/Nm^3 @ 3%O_2 dry

Apart from the environmental performance, reliability at ignition plays a major role, taking into account the cyclic batch operating periods of the unit. Reliability of the burner is essential, as well as for its ignitor (electric/gas PACKSCAN® type).

3 - THE 2 INCINERATORS PILLARD "TYPE H" TAIL GAS

The tail gas flow rate from the Claus process is 20 000 Nm^3/h for each incinerator (see fig.4) at low calorific heating value (around 80 kcal/kg), since it is mainly composed of water vapour and nitrogen, as well as residues from H_2S, H_2 and CO.

Fig.4 : View of a "TYPE H" incinerator

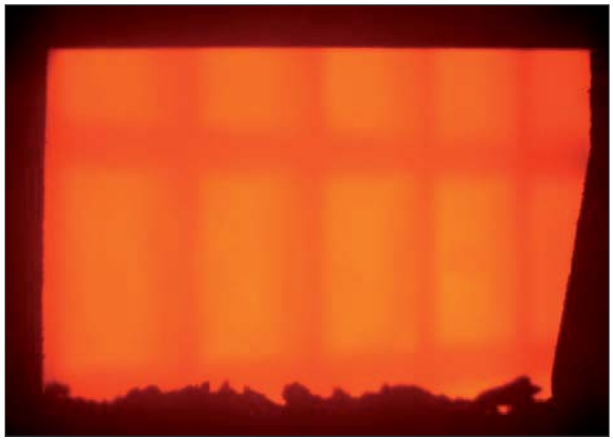

Fig.5 : View of "Honeycomb" wall

Incineration efficiency is assured thanks to the conditions : residence time / temperature / turbulence, associated with a high temperature "honeycomb" wall (see fig.5)

The emission results are :
- NOx = 64mg/Nm^3 @ 3%O_2 dry
- H_2S < 1mg/Nm^3

Incinerator operation is stable.

4 - CONCLUSION

After 7 years of site operation, the plant managers for the above units confirm their satisfaction of PILLARD burners and incinerators.