

# PILLARD GRX V2 type burners, dual fuel NG/Diesel Oil ultra low NOx for 36 t/hr firetube boilers

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## 1 – CONTEXT OF THE PROJECT

The EMIN LEYDIER papermill factory at Nogent-sur-Seine (10) France, is fitted with 3 STEIN ENERGIE boilers CFS superheated steam type, 36 t/hr at 15 bar, simple firetube.

These monotube boilers are the most powerful that exist to date.

The objective set by PILLARD was to develop and supply dual fuel diesel-oil / natural gas burners able to meet the statutory emission level limits (ELL) @ 3% O<sub>2</sub> (dry basis):

- Natural gas: NOx < 120 mg/Nm<sup>3</sup> CO < 100 mg/Nm<sup>3</sup>

- Diesel oil: NOx < 200 mg/Nm<sup>3</sup> CO < 100 mg/Nm<sup>3</sup>



Fig.1: Outside view of the EMIN LEYDIER boiler house  
Nogent-sur-Seine factory, (10) France

## 2 – BURNER CONCEPTION



Fig.2: PILLARD GRX V2 ultra low-NOx type burners

The GRX-V2 burner is the subject of a PILLARD patent (n° FR 03/14694). The technology uses combustion air injection staging together with flue gas recirculation (FGR) without an air fan - the flue gas duct being integrated in the burner.

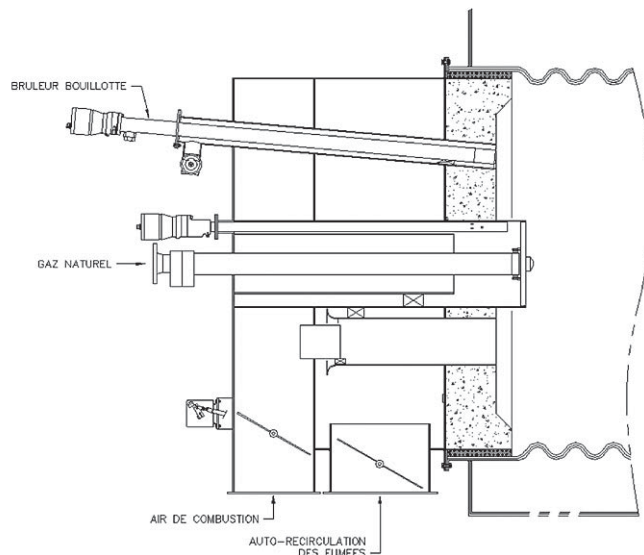


Fig.3: Sectional diagram of the PILLARD GRX V2 ultra low-NOx type burner

#### Combustion characteristics and efficiency

- Fuel: Natural gas or diesel-oil
- Power per burner: 24MW with natural gas, 23MW with diesel-oil
- Combustion air temperature: 70°C thanks to an integrated air heater
- Diesel-oil atomisation: by compressed air
- Turn-down ratio: 1 to 7 with natural gas, 1 to 5 with diesel-oil
- Boiler thermal efficiency: 95 ± 2 % for both natural gas and diesel-oil

### 3 – COMBUSTION RESULTS WITH NATURAL GAS

Performance obtained during start-up on natural gas in March 2005.

	Results of readings taken at site (natural gas)						Guarantees (ELL GAS)
	%	20	40	60	80	100	
Boiler load	%	20	40	60	80	100	
Gas flow-rate	Nm <sup>3</sup> /h	740	1060	1561	1960	2300	
Combustion air temperature	°C	31	33	70	70	70	
Furnace pressure	daPa	43	90	180	340	410	
Oxygen	% V dry	5,3	4,1	3,2	3	2,7	
Carbon monoxide (CO)	mg/Nm <sup>3</sup> @3%O <sub>2</sub>	0	8	0	0	2	< 100
Nitrogen oxide (NOx)	mg/Nm <sup>3</sup> @3%O <sub>2</sub>	78	79	93	97	101	< 120

The combustion results are identical for the 3 boilers.

Diesel-oil operation was checked, but will be finalised later according to the customer requirements.

### 4 – CONCLUSION

The emissions measured are very much lower than the ELL, which is good for the non-polluting image of the user, amply complying with the new European regulations either in force or to come. All this is for a very competitive GRX-V2 burner cost compared to competitors burners due to the fact of the absence of an outer fan based FGR channel.