

## PILLARD NANO<sub>x</sub>FLAM<sup>®</sup>

Fives Pillard  
M. Fouad SAID  
Research&Development Manager – Head of Research Center  
13 rue Raymond Teissère – 13008 Marseille – France  
+336 74 72 12 95  
fouad.said@fivesgroup.com



Solvay Polyamide & Intermediates  
M. Loïc Piriou  
Steam plant Manager - BU Performance Fibers  
220 Avenue des Auréats, 26000 Valence  
+334.75.57.61.27  
loic.piriou@solvay.com



### Abstract :

Solvay is a global chemical company whose chemicals and plastics products serve diversified markets worldwide, from consumer goods to energy.

The group is established in 53 countries and owns 15 units in France.

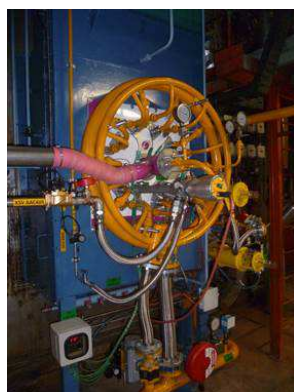
In 2014, Fives Pillard provided 1 PILLARD NANO<sub>x</sub>FLAM<sup>®</sup> natural gas burner of 11,1 MW to fit a 13 t/h Foster Wheeler AGM 144 water tube boiler.

The main target of this revamping project was to match with the environmental French regulation, especially NO<sub>x</sub> and CO pollutants (< 100 mg/Nm<sup>3</sup>@3%O<sub>2</sub>).

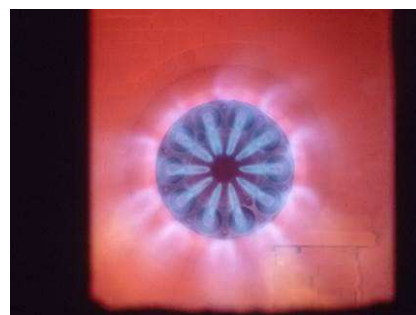
The commissioning results are **NO<sub>x</sub> = 47 mg/Nm<sup>3</sup>@3%O<sub>2</sub>**, CO = 0 mg/Nm<sup>3</sup>@3%O<sub>2</sub>.

### Technology :

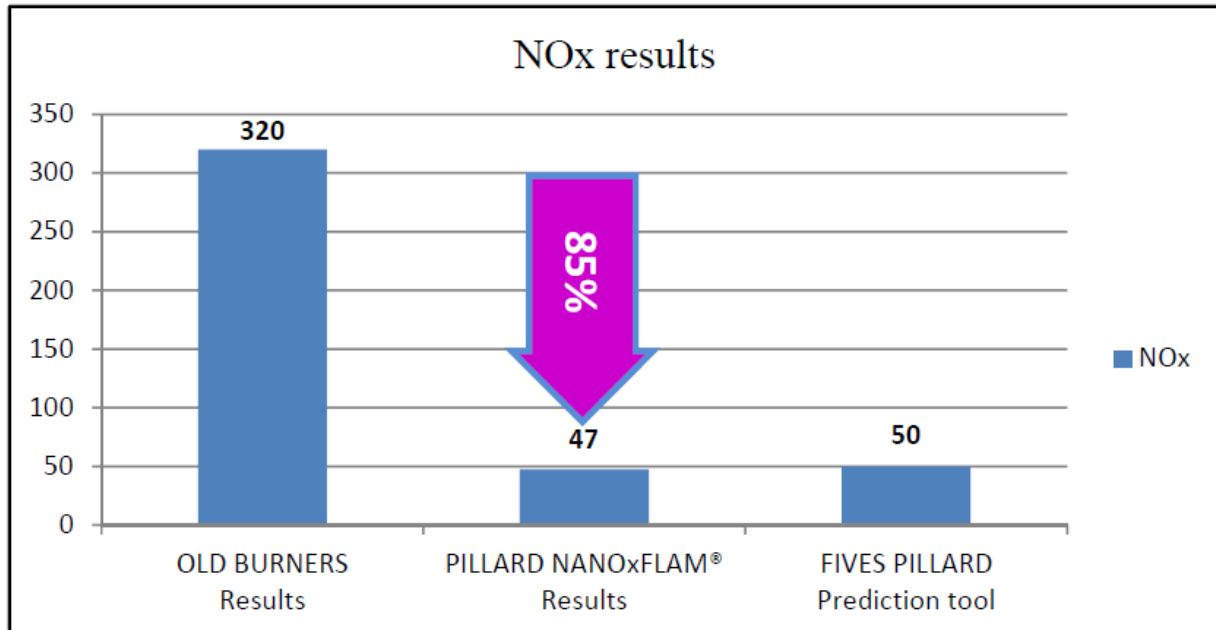
The PILLARD NANO<sub>x</sub>FLAM<sup>®</sup> burner is new generation of Ultra low-NO<sub>x</sub> burners based on a lean premix combustion and dedicated to boiler applications. NO<sub>x</sub> emissions of a lean premix combustion burner (before fuel staging injection) in a gas boiler depend on the excess air levels and on the quality of the mix between air and gaseous fuel. NO<sub>x</sub> emissions are very sensitive to excess air levels. An excess air level of 40–80 % is needed in order to achieve very low NO<sub>x</sub> emissions (less than 20 mg/Nm<sup>3</sup>). Below this threshold of 40 %, NO<sub>x</sub> emissions promptly increase and reach usual NO<sub>x</sub> values. Above 80 %, the flame temperature is very low and the stability of the lean premix combustion may be affected. NO<sub>x</sub> levels below 50 mg/Nm<sup>3</sup> are generally achieved with this technique.



Fives Pillard Patent  
N°WO2014162074



Results :



Emissions				Boiler Load
Natural gas	NOx (mg/Nm <sup>3</sup> @3%O <sub>2</sub> dry basis)	CO	O <sub>2</sub> (%)	
Guaranteed	100	100	≤ 3	95
Measured	47	0	3,0	

Development status :

The PILLARD NANOxFLAM® burner is a new technology which is already applied on boilers in France, Germany and South Korea.

- 2012 : experimental development through a 5 MW prototype mounted on a water-tube boiler in our Research and Tests Center
- 2013 : experimental development through a 5 MW prototype mounted on a fire-tube boiler in our Research and Tests Center
- 2014 : 11 MW burner achievement «first industry» on a water-tube boiler through an industrial partnership in France (NOx < 50 mg/Nm<sup>3</sup>@3%O<sub>2</sub>)
- 2015 : launch on the market
- 2015 – 2017 : last design including 5% NOx reduction and cost effectiveness

Between 2012 and 2014, the innovative PILLARD NANOxFLAM® development has received a funding and has been supported by the French Environment and Energy Management Agency (ADEME).

Applicability :

This technology can be used on water-tube and fire-tube boilers with natural gas.

Economics :

The use of PILLARD NANOxFLAM<sup>®</sup> technology has shown that the NOx value of 50 mg/Nm<sup>3</sup>@3%O<sub>2</sub> is achievable without external flue-gas recirculation, avoiding the expense of higher capex and opex.