FIRETUBE BOILERS :
LOW NOX BURNERS AT HEILBRONN (GERMANY)

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1 - AUXILIARY BOILERS

EnBW Kraftwerke AG Company manages a 1 000 MW power station in Heilbronn (Germany) for the generation of electricity and district heating. Auxiliary boilers are used when one of the main boilers is out of service.

Fig.1 : The two auxiliary boilers

The new auxiliary unit, called “Unit 3” (UCA 3), when completed, shall consist of 5 boilers, each producing 30 t/hr of superheated steam, at 22 bar, 350°C.
The first step consisted in installing of two new firetube boilers in 2004. The purchase order for two 30 t/hr twin boilers was awarded to OMNICAL GmbH (Germany). Each boiler is fitted with two PILLARD GRX-V2 burners, dual-fuel fired (natural gas / diesel oil).

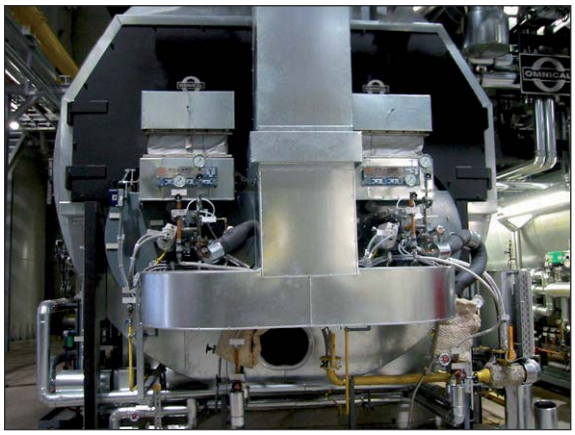

Fig.2 : Two PILLARD GRX-V2 burners

2 - CHARACTERISTICS OF THE FIRETUBE BOILERS

Manufacturer	OMNICAL GmbH
Type	OMNIBLOC DDHT 30-25 with economizer
Steam	30 t/hr, 22 bar, superheated to 350°C
Dimensions (each)	Internal diameter : 1 325 mm, length : 7 000 mm

Fig.3 : Boiler n°2 with gas station

Fig.4 : Boiler n°3 with oil station

3 - PILLARD GRX-V2 BURNERS

Fig.5 : Fire tube and burner view

The two GRX-V2 burners (for each boiler) fire on the same fuel and at the same load. The main fuel is natural gas, diesel oil being a “back-up fuel” in the case natural gas is not available. This new PILLARD technology consists in simultaneous combustion air staging and self-induced FGR without the need of a recirculation fan (PILLARD patent n° FR 03/14694)

Burner technical characteristics	
Fuel	Natural gas or diesel oil DIN 51603 ($N_2 \leq 0{,}014$ %)
Capacity per burner	12 MW (gas), 11,6 MW (diesel oil)
Combustion air temperature	+ 5 to + 40°C
Diesel oil atomising medium	Superheated steam or compressed air
Turndown ratio	1 to 7 (gas), 1 to 4 (diesel oil)
Fuel/air control	O_2 guided digital control, with variable speed air fans

4 - TÜV EMISSION MEASUREMENTS, COMPARED TO CONTRACTUAL GUARANTEES

Emission measurements where carried out by the German Organism "TÜV" on November 10 & 11, 2004.

Boiler n°1, natural gas firing, 2 burners in operation

		Measurements by TÜV				Contractual guarantees
Boiler load	%	25	50	75	100	
Fuel gas flow	Nm^3/h	604	1214	1847	2244	
Burner power	MW	6,1	12,2	18,5	22,3	
O_2	Vol.-%	4,7	2,8	2,6	1,9	
CO	mg/Nm^3 @ 3% O_2 dry	4	13	6	34	≤ 50
NOx	mg/Nm^3 @ 3% O_2 dry	66	58	56	54	≤ 100

Boiler n°1, diesel oil firing, 2 burners in operation

		Measurements by TÜV				Contractual guarantees
Boiler load	%	25	50	75	100	
Fuel oil flow	kg/h	393	867	1454	1779	
Burner power	MW	4,7	10,3	17,3	21,1	
O_2	Vol.-%	5,5	3,9	3,2	3,8	
CO	mg/Nm^3 @ 3% O_2 dry	5	4	5	4	≤ 80
NOx	mg/Nm^3 @ 3% O_2 dry	113	112	118	115	≤ 150
Dust	Bacharach index	0,2	0,3	0,4	0,9	≤ 1

Boiler n°2, natural gas firing, 2 burners in operation

		Measurements by TÜV				Contractual guarantees
Boiler load	%	25	50	75	100	
Fuel gas flow	Nm3/h	540	1209	1870	2285	
Burner power	MW	5,4	12,1	18,7	22,9	
O_2	Vol.-%	4,7	3,2	2,6	2,6	
CO	mg/Nm^3 @ 3% O_2 dry	4	4	8	4	≤ 50
NOx	mg/Nm^3 @ 3% O_2 dry	60	59	55	58	≤ 100

Boiler n°2, diesel oil firing, 2 burners in operation

		Measurements by TÜV				Contractual guarantees
Boiler load	%	25	50	75	100	
Fuel oil flow	kg/h	476	916	1482	1833	
Burner power	MW	5,7	10,9	17,6	21,7	
O_2	Vol.-%	6,3	4,4	3,3	3,1	
CO	mg/Nm^3 @ 3% O_2 dry	3	4	6	4	≤ 80
NOx	mg/Nm^3 @ 3% O_2 dry	112	115	120	120	≤ 150
Dust	Bacharach index	0,9	0,3	0,4	0,6	≤ 1

5 - CONCLUSION

NOx, CO, and dust emissions measured by TÜV, for natural gas as well as for diesel oil firing, are lower than the contractual values guaranteed by PILLARD, and are among the lowest ever achieved; they are in compliance with the new EC regulations, in force or pending.

Such progress has been made thanks to a new patented PILLARD technology (patent n° FR 03/14694), which allows burners to be supplied at very attractive prices since they don't require an external FGR fan.