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## **The Determination the Pollution Emissions of $SO_2$ , $NO_x$ , $CO$ , $CO_2$ And $O_2$ From the Channels of Burnt Gas on Boiler Of 420 T/H – Steam, in the Sight Application Proceeding to Reduce of These**

**Abstract:** *The work present the results obtained after dynamic analyze the pollution emissions of  $SO_2$ ,  $NO_x$ ,  $CO$ ,  $CO_2$  and  $O_2$  on evacuation channels of burnt gas on boiler of 420 t/h steam, having right the basic combustibile the lignite, and auxiliary combustibile the fuel oil and the natural gas. The values of pollution emission was analyze beside the admissible maxims values required by European legislation for Romania in the year 2005. The conclusions elaborated it adverted to: the values of oxides azoth, carry they frame in the limits provide in Environmental Authorization, under 600 mg/Nmc on 6 % oxygen, the concentration values of  $SO_2$ , which was bigger in report with one authorized comprised between 3500-3900 mg/Nmc confronted by 3400 mg/Nm. For integration in the foresee Government Decision 541/2003 aren't sufficient just proceeding of below reduce  $SO_2$ , must take and another measures such as: get the fuel with quantity of sulphur 0,5% and with a content of ash below 35%.*

**Keywords:** *reduction of pollution emission of  $SO_2$ ,  $NO_x$ ,  $CO$ ,  $CO_2$  and  $O_2$ .*

### **1. GENERAL CONSIDERATION**

Boiler with 420 t/h steam is by type CRG 1870, have right the basic combustibile the lignite, and auxiliary combustibile the fuel oil and the natural gas. The thermic efficiency of boiler on nominal task, to ambience temperature of 20°C to the operation on combustibile lignite is of 85 %.

A characteristic of combustibile which was used is presented in the table 1.

The measure was making in February and March month 2005. Like apparatus measure was use Analyzer of evacuation gas DELTA 2000CD-IV, made by MRU GmbH, firm specialized for

research, produce and to sale the analysis system of high quality for emissions. In table 2 are presented the principal characteristics of apparatus DELTA 2000CD – IV.

The apparatus have approval of model and valid metrological approbation.

Measurements they accomplished on the channels of burnt gas. On the left channel the measurements was accomplished forward and after the preheated of rotative even air PAR, and on the right channel the measurements was did before the preheated of rotative air

Table 2. The principal characteristics of apparatus DELTA 2000CD – IV.

No. crt.	Specification	U.M.	Values
1	The area of measure: -Oxygen (O <sub>2</sub> ) - Monoxide de carbon (CO) H <sub>2</sub> – comp - Mon oxide de carbon (CO) H <sub>2</sub> – comp - Monoxide de carbon (CO) - Monoxide de carbon (CO) - Dioxide de sulphur (SO <sub>2</sub> ) - Monoxide de azoth (NO)  - Oxidize de azoth (NO <sub>x</sub> ) - Dioxide de azoth (NO <sub>2</sub> ) - Temperature of the air of burning - Temperature of the gas of evacuation - Draught	% vol ppm ppm optional % ppm ppm ppm ppm ppm ppm °C °C mbar	0-21,0 0-4.000 0-10.000 0-10 0-20.000 0-2.000 0-2.000 0-4.000 0-2.000 0-2.000 0-100 0-650 ±20,0
6.	Sensors for: -Oxygen -Monoxide de carbon -Dioxide de sulphur -Monoxide de azoth -Temperature - Draught	-	- electrochemical cell - electrochemical cell - electrochemical cell - electrochemical cell - thermoelement NiCrNi - sensor of pressure piezoelectric
7.	The display of the date	-	screen and on roll of paper (the thermic printer)
8.	Sounder	-	sounder of take-off gas, device of catch and the demountable tube, the length of the tube sounder 1000 mm, Φ 10 mm.

## 2. MATERIAL AND METHODS RESEARCH

## 3. RESULT OBTAINED

The emissions of pollution evacuate in atmosphere, just in month March 2005 is presented in the table 3. environmental according no. 750/11.06.2002, valid as far as In the figures 1 ÷ 6 are presented graphic the variations of the elements and substances pollution, in period February – March 2005, comparative with the admissible value required

of Environmental Accord no. 750/11.06.2002 and Government Decision no. 541/2003

The limits maxim admissible as per:

- 11.06.2007:

\* SO<sub>2</sub>/6%O<sub>2</sub> 3400 mg/Nm<sup>3</sup>;

\* CO 250 mg/Nm<sup>3</sup>;

\* NO<sub>2</sub> 800 mg/Nm<sup>3</sup>;

- Government Decision no. 541/2003, valid from 2007:

\* SO<sub>2</sub>/6%O<sub>2</sub> 1028 mg/Nm<sup>3</sup>;

\* NO<sub>2</sub> 600 mg/Nm<sup>3</sup>;

Table 3. The emissions of pollution evacuated in atmosphere in month March 2005.

Measure values	UM	The measure date				
		8	19	20	29	30
Gas temperature	C	148,1	169,8	201,4	129,9	131,6
Ambient temperature	C	0,2	3,5	3,9	3,2	-0,9
O2	%	13,7	17,7	12,3	12,5	12,7
CO2	%	6,6	3	7,9	7,7	7,5
Air excess		2,88	6,36	2,41	2,47	2,53
CO	ppm	125	50	103	126	110
CO/6%O2	mg/ Nmc	321	282	222	277	248
CO	mg/mc	156	62	129	157	137
NO	ppm	170	55	157	157	141
NO/6%O2	mg/ Nmc	469	336	362	371	342
NO	mg/mc	228	74	210	210	189
NOx	ppm	179	58	165	165	148
NOx/6%O2	mg/ Nmc	754	541	584	598	549
NOx	mg/mc	367	119	339	339	304
SO2	ppm	665	286	775	706	720
SO2/6%O2	mg/ Nmc	3907	3718	3820	3562	3719
SO2	mg/mc	1901	818	2216	2018	2058
Draft	hPa	-8,68	-7,9	-9,13	-7,12	-7,99
S	%	0,37	0,27	0,43	0,49	0,29
Qi coal	kcal/kg	1565	1889	1680	1774	1553
Coal	to	2906	2014	2452	1277	2430
Gas	mc	79290	73023	78765	99145	72410
Qi gas	kcal/mc	8181	8181	8181	8181	8181
Ai	%	38,25	42,95	44,89	47,08	43,77
Wi	%	30,8	22	22,3	19,9	25,6
Inburnt	%	1,96	2,7	1,83	2,18	1,9
Ash	to	1112	865	1101	601	1064

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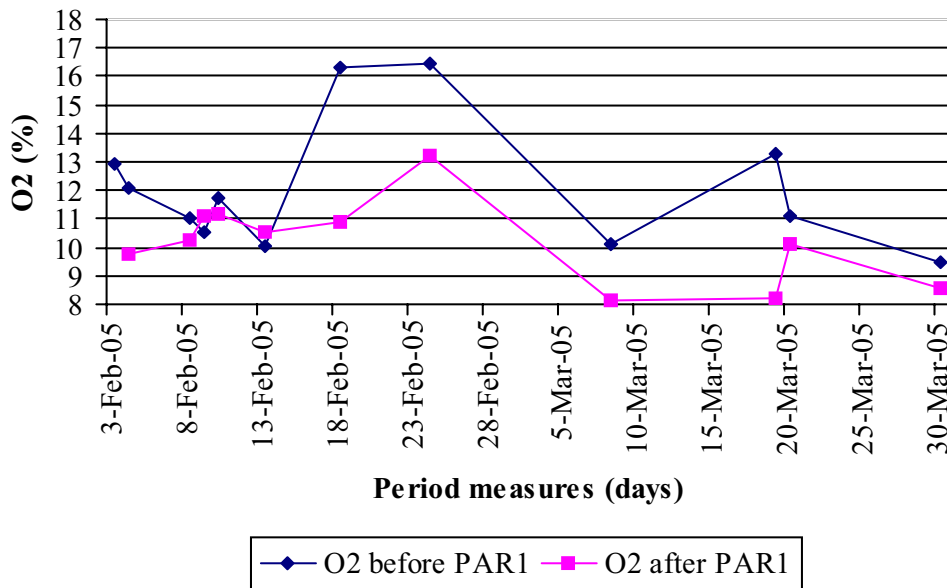


Figure 1. The variation of O<sub>2</sub> concentration measured before and after PAR1 on the left part, in period February – March 2005.

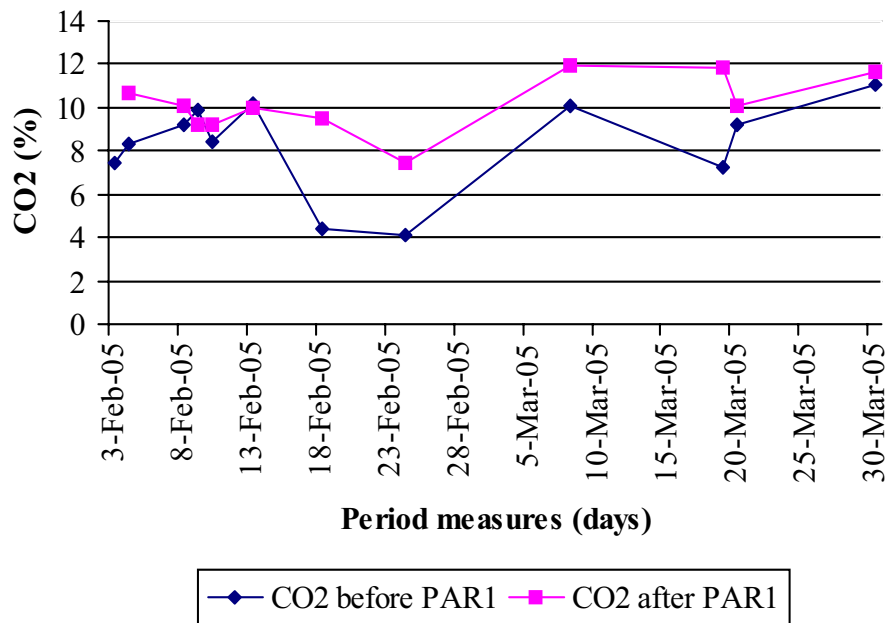


Figure 2. The variation of CO<sub>2</sub> concentration measured before and after PAR1 in the left part, in period February – March 2005.

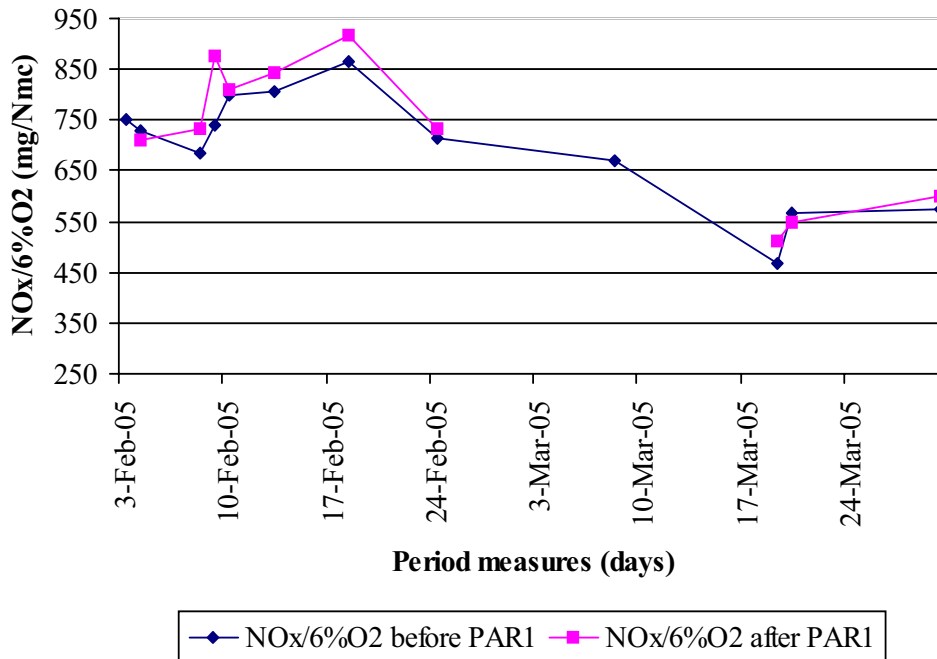


Figure 3. The variation of NO<sub>x</sub>/6%O<sub>2</sub> measured before and after PAR1 in period February – March 2005.

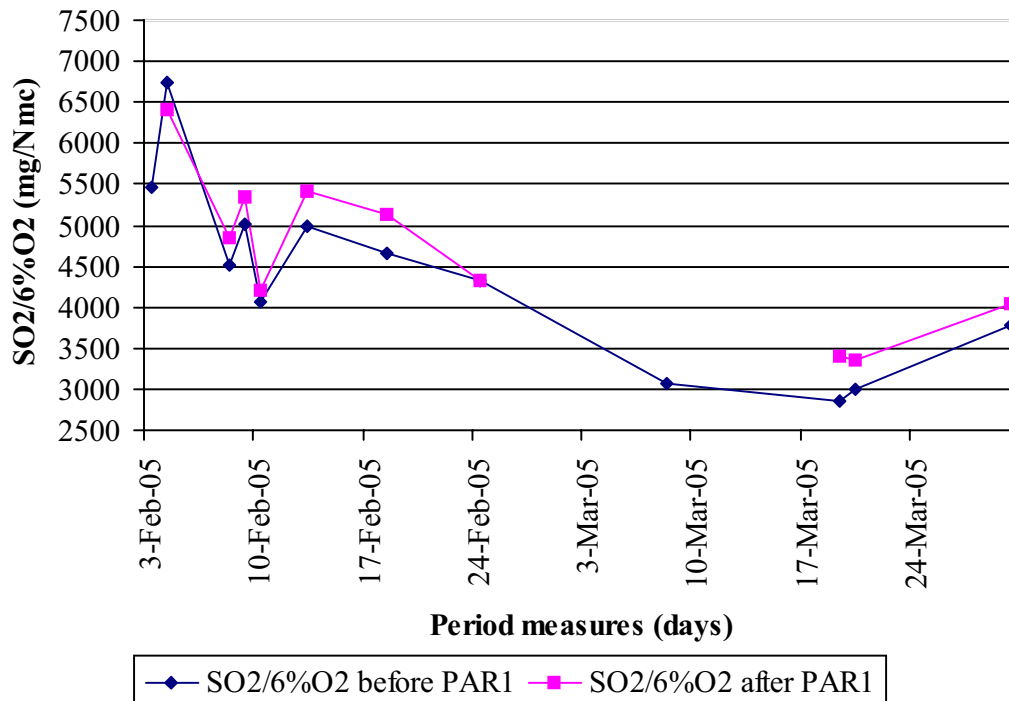


Figure 4. The variation of SO<sub>2</sub>/6%O<sub>2</sub> measured before and after PAR1 in period February – March 2005.

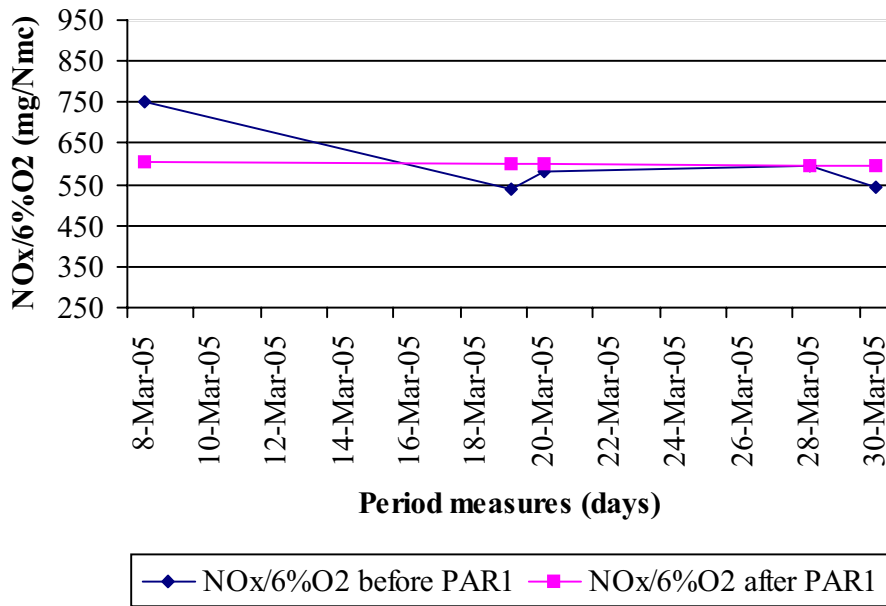


Figure 5. The variation of emissions  $NO_x/6\% O_2$  evacuated in atmosphere in month March 2005.

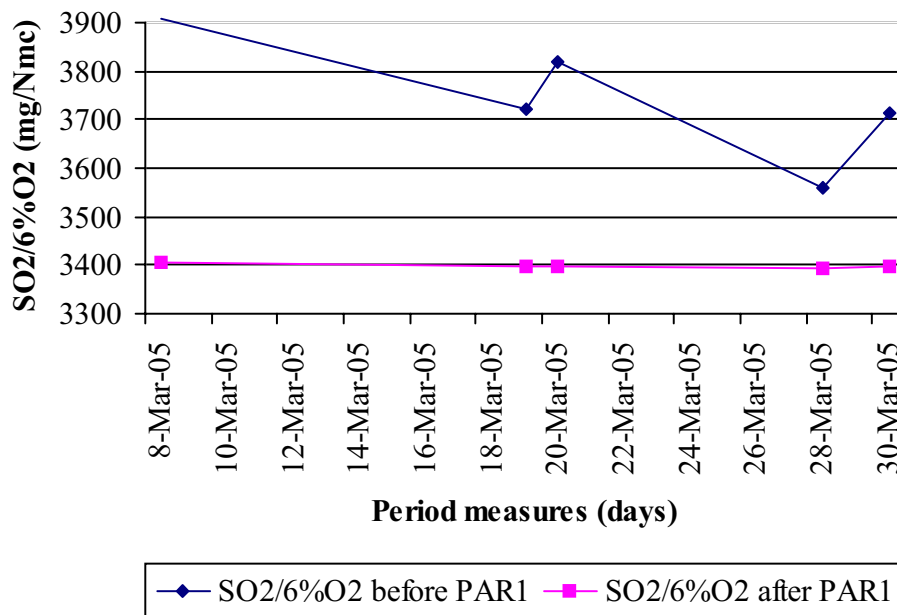


Figure 6. The variation of emissions  $SO_2/6\% O_2$  evacuated in atmosphere in month March 2005.

#### 4. CONCLUSION

- The comparative diagrams made between the values entrances and go out of preheaters of rotative air (PAR) lead to the conclusion as the inside of PAR still have phenomena of burnt, righteous of the growth quantity of CO<sub>2</sub> and diminish the oxygen. Therewith he takes place increase concentration of NO<sub>x</sub> and SO<sub>x</sub>. It observed a diminution an excesses of air in gas of after EVEN, what justifies still a date a continuation a burning;

- The values register after PAR, for principally pollution are the bigger than the admissible limit to evacuation on Authorization of Environmental Protection in month February and little in month March what leads to the next conclusion, respectively to necessity management in a burning system base on the measurers continuously of parameters burning. Concentration of sulphur oxide is in general proper quantity of sulphur from coal and depends on the report between quantity coaly and one of used-up gas.

- In the table no. 3 are presents the values of pollution emissions the in atmosphere on the chimney of fume. Consisted the big value of oxygen what presupposes untightness on the route electro-filters and channels of gas.

- The values of the oxides of azoth was framed the in limit provided in the Environmental Authorization, below 600 mg Nmc to an 6% oxygen of, but the values concentration of SO<sub>2</sub> is bigger in report with one authorization, contained between 3500-3900 mg/Nmc against 3400.

- Is recommended utilization the proceedings of reduce SO<sub>2</sub> with precinct 30% (till result the integration below limit maxim admitted).

- For the integration in provide Government Decision 541/2003 don't was sufficient just proceeding of reducer SO<sub>2</sub>, must take and another measures such as: the acquest of a fuel with an sulphur quantity below 0,5% and with a content of ash below 35%;

- In the conditions in which the recommendations of excelsior are not possible is necessary to realization of an installation to wash of gas up with carbonate of calcium for decrease as far as

admissible limit of SO<sub>2</sub> concentration;

- A best solution, which are solve the problem of pollution is the change combustibile which are used and produce in co-generate thermic the energies through gas turbine, which have the many superior efficiency and pollution emitted is more little.



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