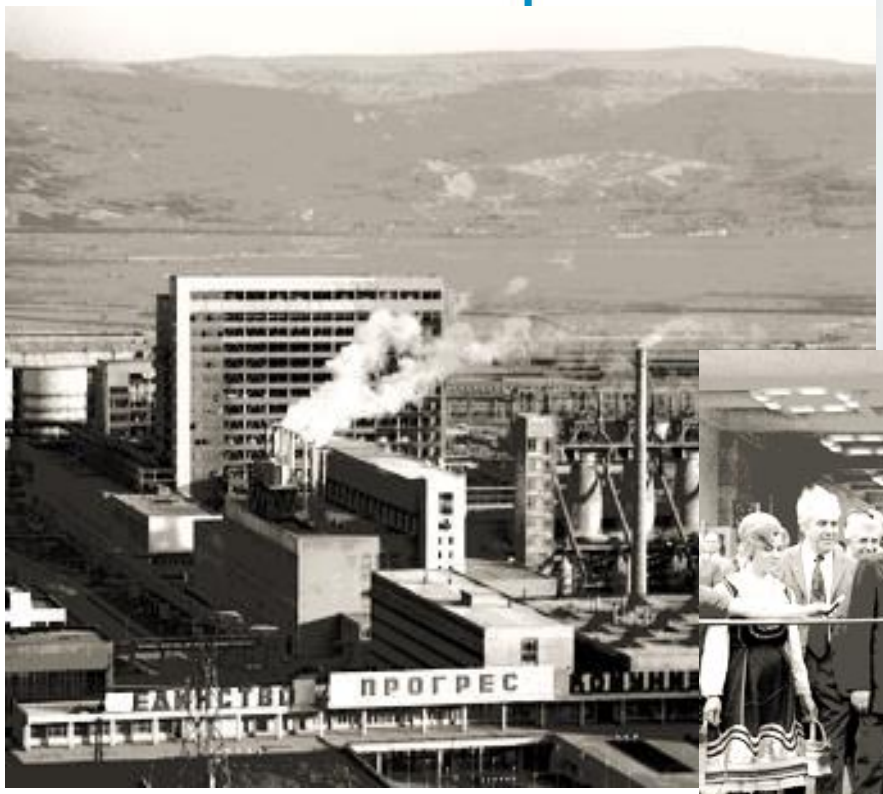
20 ГОДИНИ СОЛВЕЙ В БЪЛГАРИЯ

SOLVAY SODI



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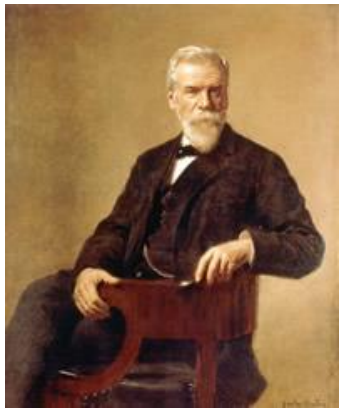
Good practices for reduction of industrial pollutants

Circulating Fluidized Bed Boiler (CFBB) and low levels of air emissions

The SOLVAY Group



Solvay Sodi is part of the Solvay Group.

Ernest Solvay founded Solvay in 1863, based on a technological breakthrough; Today Solvay is an:

International chemical group with headquarters in Brussels, represented in 58 countries, which employs over 27,000 people worldwide;

- A global leader in the production of chemical products.
- 21 global centers of research and innovation.
- The group has a total of 7 soda ash plants (6 in Europe, one in the US) and is the world number ONE producer of soda ash and sodium bicarbonate.

Soda Ash production in Bulgaria

08/29/1954: Commissioning of the first soda ash plant in Devnya with a capacity of 80 000 tonnes

31/12/1973: Commissioning of the new soda ash plant; Expansion of capacity to 1.2 Mt/y

04/14/1997: The Government of Bulgaria and SOLVAY sign Privatisation contract of Sodi, Devnya. Major shareholders in Solvay Sodi: SOLVAY (~ 75%) and SISECAM (~ 25%)

2000: Solvay Sodi acquires suppliers of basic raw materials for soda ash production: TPP Solvay Sodi, Provadsol, Devnya Limestone

Solvay Sodi today

- ✓ With a capacity of 1.5 Mt/y., Solvay Sodi is the **largest site in Europe** and within the Solvay Group for the production of synthetic soda ash.

- ✓ Direct employer of 600 people and indirectly more than 1,000 in subcontractors. Safety is **№ 1 priority** (as within the Group)

- ✓ During the period 1997-2017 Solvay Sodi and affiliates have invested about **1.5 billion BGN** in the construction of new / upgrading of existing installations

- ✓ Investments achieved optimisation of the use of natural resources, higher energy efficiency, reduction of emissions and others.

- ✓ Of 12.09.2017 another **large-scale investment** was inaugurated: a new state-of-the-art circulating fluidized bed boiler

Investments

In 2015, Solvay Sodi put into operation a new vacuum distillation group (DSV project) and at the Power Plant construction works started for a second circulating fluidized bed boiler.

DSV project → - 15 % steam consumption

CFBB 8 (250 t/h instead 400 t/h) ←

CFBB at Solvay Sodi power plant
Technology with low emissions rates

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CFBB advantages

- High efficiency rate
- Less unburned carbon in the ashes
- Flexibility for different types of fuels
- Combustion of low-quality fuels
- Combustion of wastes (SRF/RDF)
- Low emissions of SO_2 and No_x
- Low air excess
- High reliability
- Lower maintenance costs

CFBB at Solvay Sodi power plant
Technology with low emissions rates

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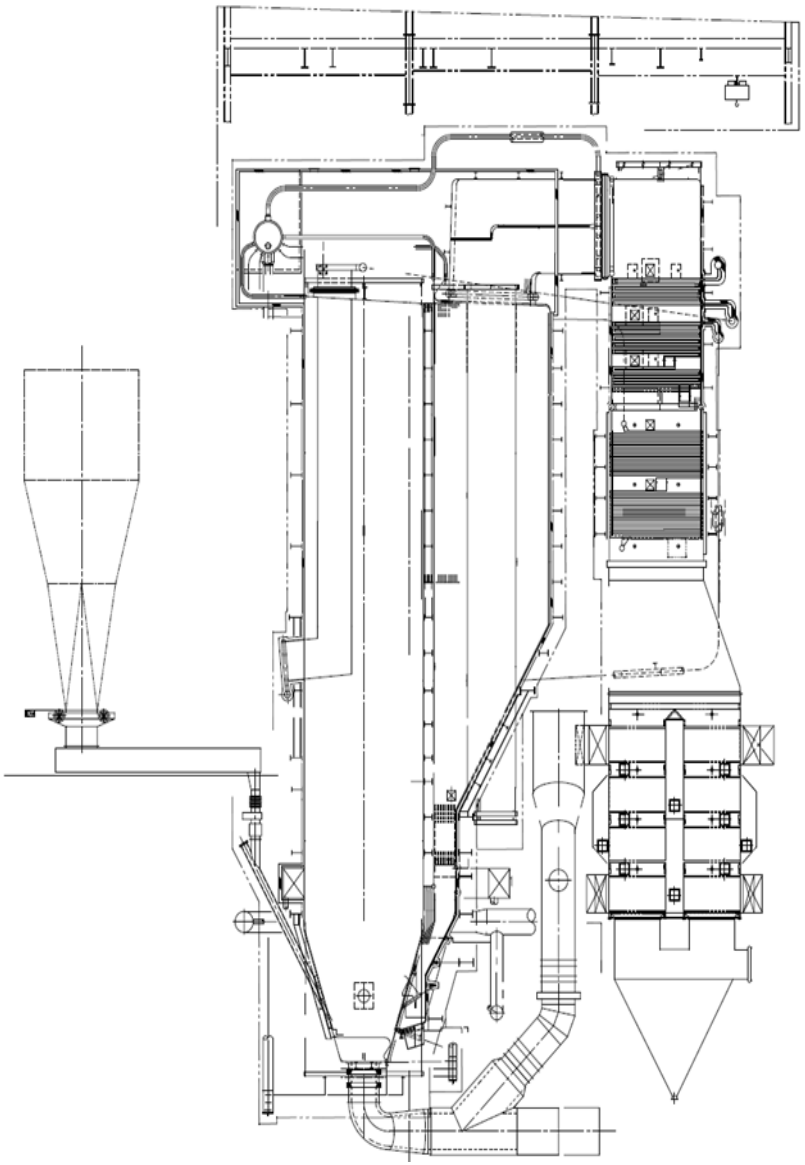
Total investment costs: 75 000 000 €

Official start-up: 1.12.2009



• Characteristics of the first boiler (CFBB №7)

Steam production capacity: 400 t/h;

Fuel consumption: 45 t/h;

Tipical fuel type: mix of petroleum coke and coals

Alternative fuel: biomass (up to 10 % or 55 000 t/y)

There is a technological option for combustion of RDF/SRF, tires and other wastes

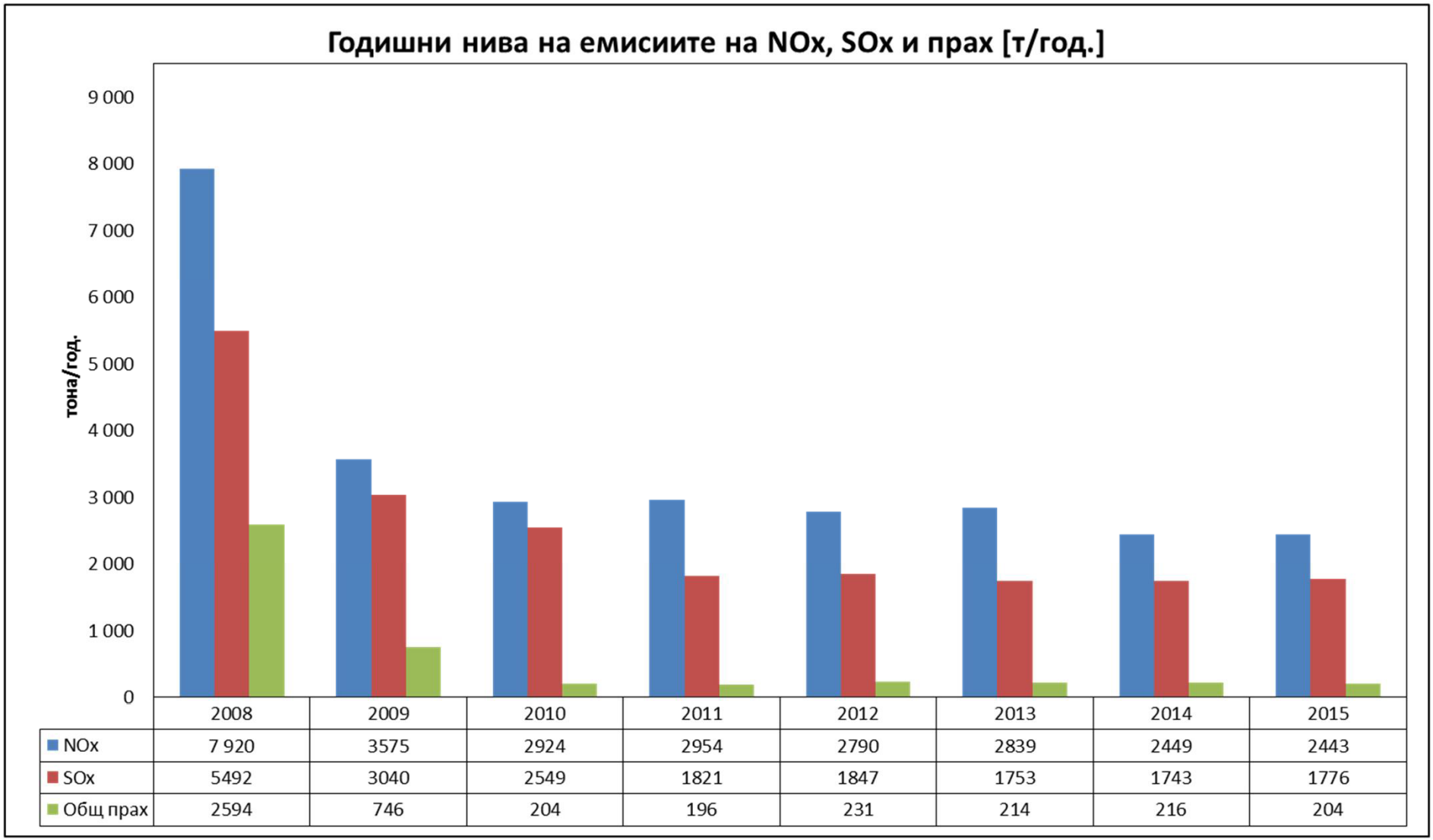
Limestone consumption: 11 – 20 t/h

NOx emission: Due to low operational temperature in the furnace ~ 900 ^{o}C , emissions generally are kept in frame of required limits. NSCR system with ammonia injection is installed for emergency cases

SOx emission: It is managed by direct injection of micronized limestone in the furnace

Dry separation of fly and bottom ash

Annual emissions rates – before and after start-up of CFBB 7



	2008	2009	2010	2011	2012	2013	2014	2015
NOx	7 920	3575	2924	2954	2790	2839	2449	2443
SOx	5492	3040	2549	1821	1847	1753	1743	1776
Общ прах	2594	746	204	196	231	214	216	204

SECOND CFBB at Solvay Sodi power plant
Technology with low emissions rates

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•Characteristics of the new boiler (CFBB №8)

Total investment costs: **45 000 000 €**

Official start-up: **10.10.2017**

Steam production capacity: 250 t/h (185 MW);

Fuel consumption: 35 t/h;

Tipical fuel: mix of petroleum coke and coal

Alternative fuel: biomass (up to 20 % or 50 000 t/y)

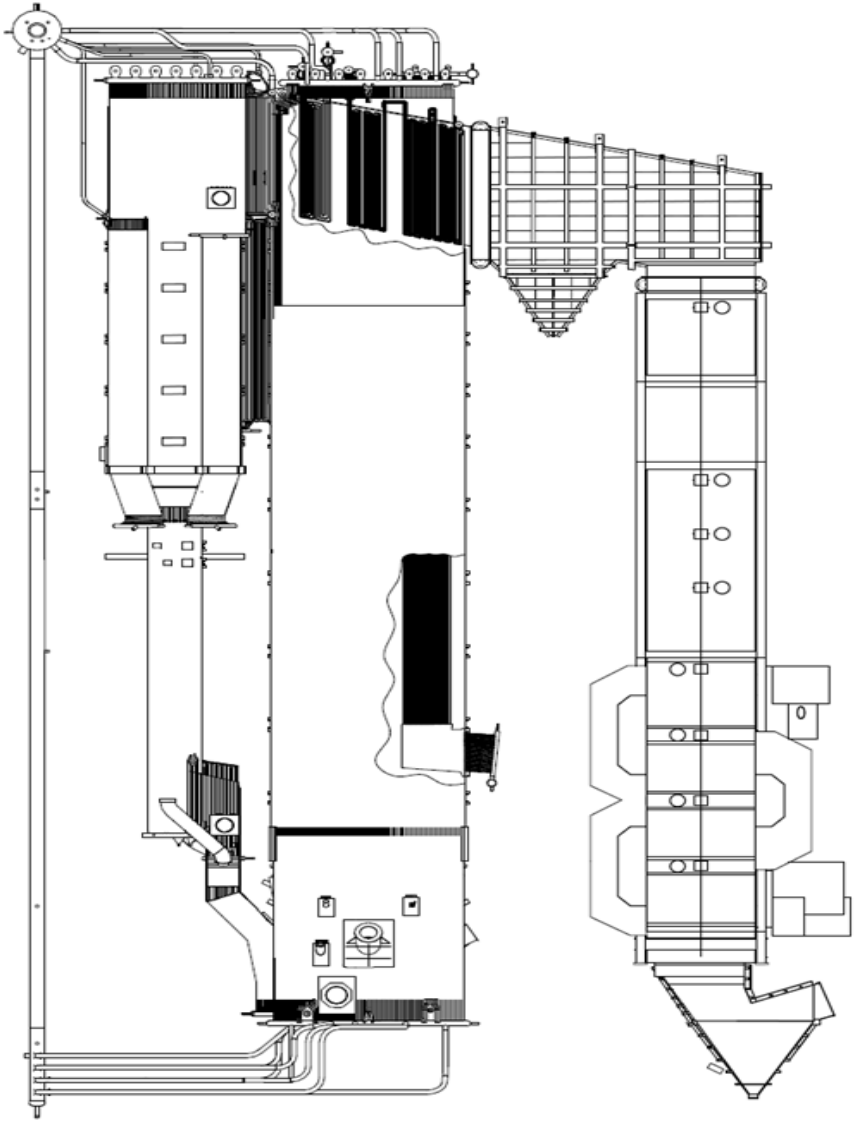
There is a technological option for combustion of RDF/SRF, tires and other wastes

Limestone consumption: 14,4 t/h

NOx emission: Due to low operational temperature in the furnace ~ 900 ^{o}C , emissions generally are kept in frame of required limits. NSCR system with ammonia injection is installed for emergency cases

SOx emission: It is managed by direct injection of micronized limestone in the furnace

Dry separation of slag and bottom ash



SECOND CFBB at Solvay Sodi power plant
Technology with low emissions rates

The capacity of the new CFBB № 8 is 185 MW and it is implemented as substitute capacity of the old boilers, which will be out of exploitation in 2023 regarding requirements of Directive 2010/75.

Individual emissions limit values			
Parameter	**Common stack (Boilers 2, 3 and 6)**	**CFBB 7**	**CFBB 8**
Sulfur dioxide	< 800	< 200	< 200
Nitrogen oxides	< 1200	< 200	< 150
Total dust	< 100	< 25	< 10
Carbon oxide	< 100	< 100	< 100
Ammonia	-	< 5	< 5

Expected annual emissions values – before and after the start-up of CFBB № 8

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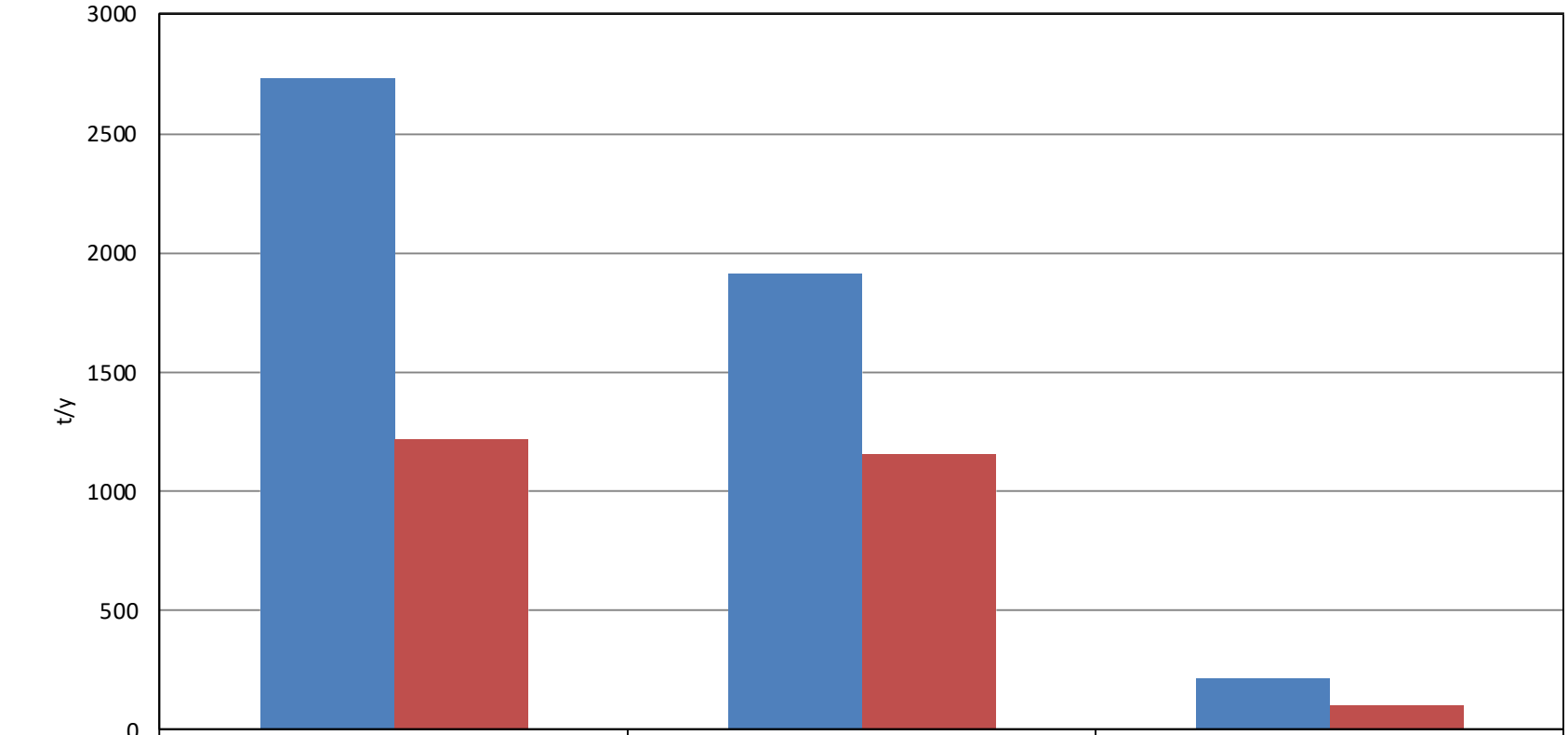
Expected emissions values for NOx, SOx and dust [t/y] after the start-up of CFBB № 8



	NOx	SOx	Total dust
CFBB 7&old	2733	1915	211
CFBB 7&8	1217	1156	97,5

SECOND CFBB at Solvay Sodi power plant
September 2017