CLEAN COAL TECHNOLOGY 2017

Cagliari
08. – 12.05.2017

SNCR for Large Combustion Plants

Most Recent Application at a 380 MW_{el} Lignite-Fired Boiler

Zoltán Teuber Wolfgang Schüttenhelm

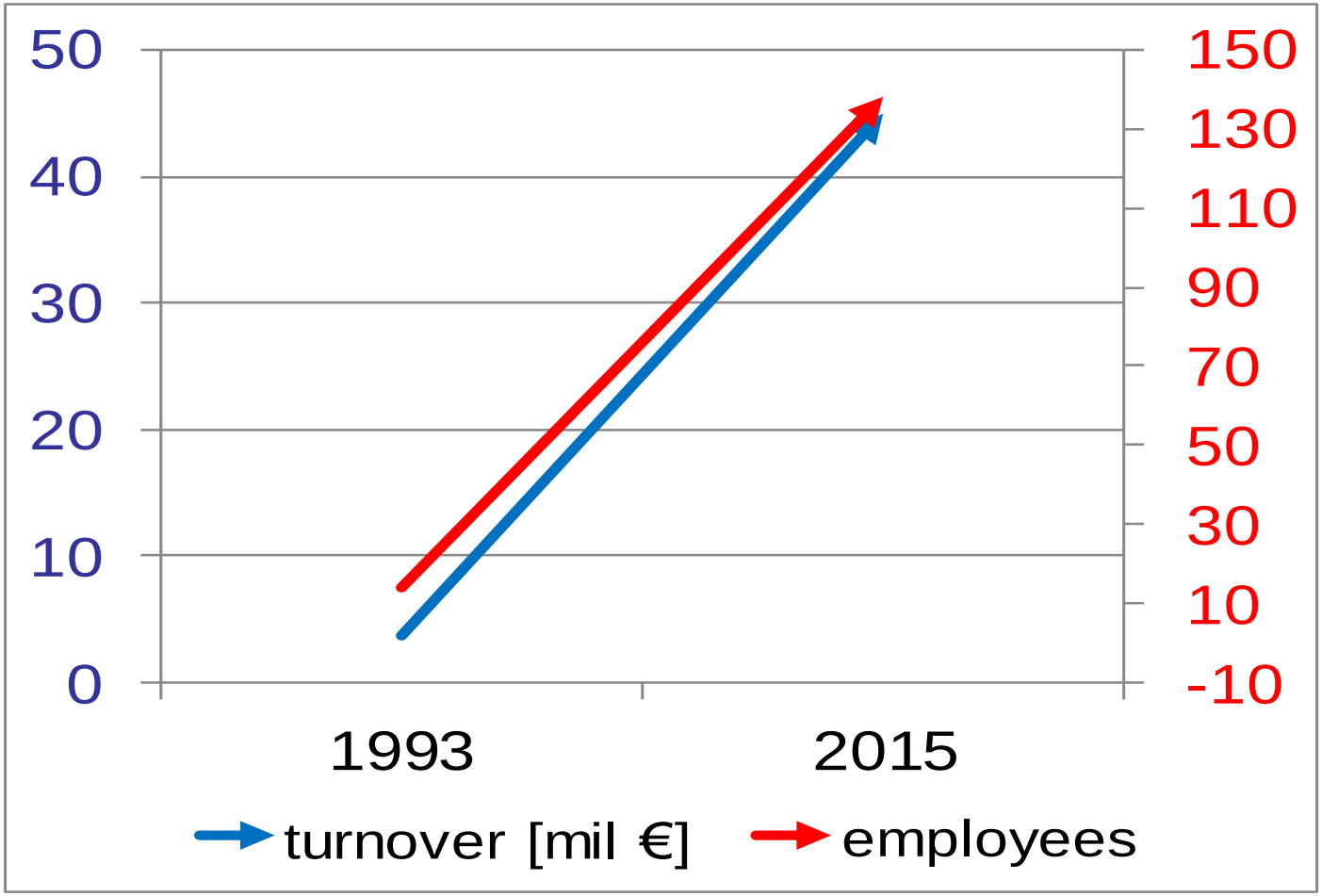
ADDITIVE TECHNIK MSR

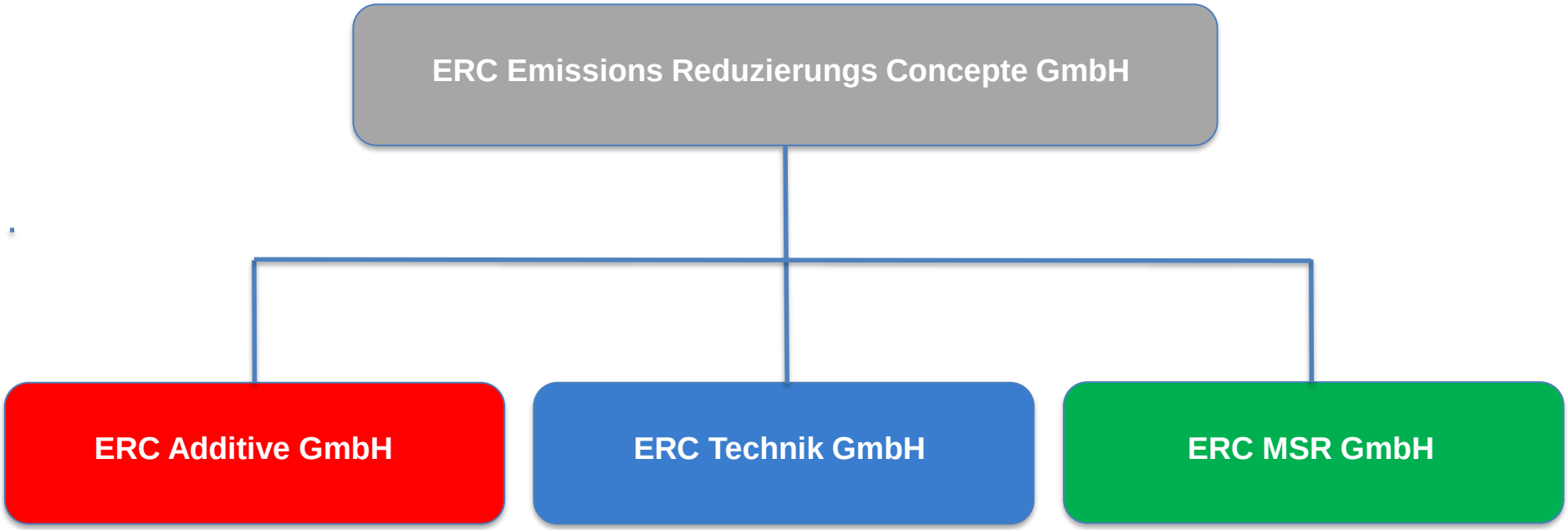
established: 1993
headquarters: Buchholz / Germany
production site: Wahlstedt, Buchholz / Germany
employees: 138
turnover: 45 mil. € / 2015
subsidiaries: ERC s. r. o. Prague / Czech Republic
ERC sp. z o.o. Szczecin / Poland
ERC Chemtrols Ltd Mumbai / India

ERC GmbH Worldwide

Denmark	Cyprus	Luxembourg
Norway	Romania	The Netherlands
Sweden	Greece	Belgium
Finland	Hungary	France
Lithuania	Italy	United Kingdom
Swizerland	Austria	Spain

ERC GmbH Business Development in Time




ERC Emissions Reduzierungs Concepte GmbH
ERC Additive GmbH
ERC Technik GmbH
ERC MSR GmbH

Burners
Flue-Gas Cleaning
Additives

Table of Contents

1. Introduction
2. The Site
3. Execution of the Project
4. Constructive Measures
5. The Secondary Measure – Structure of the Complete SNCR Plant
6. Operational Data
7. Conclusions and Outlook

1. Introduction

Background (current situation)

Large Overcapacities of energy providers in Eastern Europe, because of:

- **Decreasing industriy**
- **Increasing share of renewable energy sources**
- **Decentralised heat generation**

This results in:

- **Decreasing margins for electricity and heat**
- **Puts power plants under high cost pressure**

1. Introduction

Additionally:

planned tightening of the emission limits, also for NO_x

year		since 01.01.2016	later
NO_x emission, as a daily average	[mg/Nm³, dry, 6%O_2]	< 200	evtl. < 150

1. Introduction

For this reason, the energy providers should:

Reduce production costs for electricity and heat, inter alia by

Reducing the investments for further DeNO$_x$ measures

- **Improving existing primary measures**
  - **new burners**
  - **cold flue gas recirculation**
  - **optimisation of air graduation**
  - **etc.**
- **improving existing SNCR plants**
  - **additional injection layers**
  - **improved injection systems**

- **retrofitting the boilers with SNCR plants (where there were none before)**

2. The Site

Elektrownia Bełchatów / Poland

2. The Site

The Bełchatów Power Station

- completed in 1981
- located in central Poland, close to Łódź
- the largest lignite fired power station of the world
- the second largest power station of the world
- provides more than 1/3 of the electricity produced in Poland

2. The Site

The Bełchatów Power Station

- total output 5420 MW_{el}

- 12 blocks with classical steam parameters, 1150 t/h (380 – 390 MW_{el})

- block no. 14 with supercritical steam parameters (858 MW_{el}), efficiency > 42 %

3. Execution of the Project

Time Frame	December 2015 – October 2016
Contract award:	December 2015
Construction on-site adaptations:	till middle of February 2016
Supply of equipment:	till beginming of March 2016
Erection:	till middle of Mrch 2016
Commissioning and optimisation:	till end of April 2016
Customer caused delay:	till end of June 2016
Test run:	till end of August 2016
Performance guarantee measurements:	beginning of September 2016
Handing over:	middle of October 2016

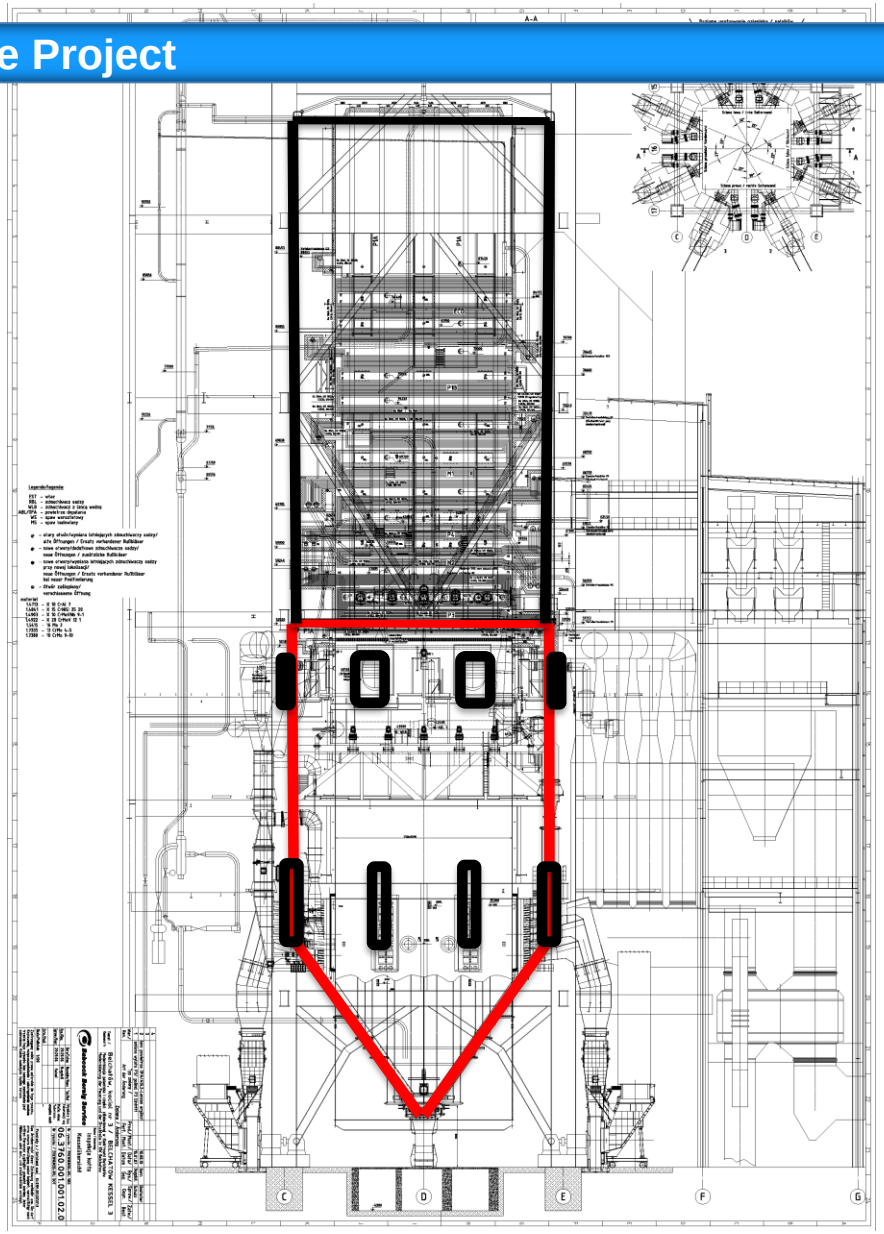
3. Execution of the Project

Design Basis for the SNCR Plant at Block no. 3

Max. steam output:	**1150 t/h**
Capacity range:	**(60 – 100)%**
Max. fuel flow:	**460 t/h**
Heat capacity of the guarantee fuel:	**7750 kJ/kg**
Max. flue gas flow:	**1450000 Nm³/h (dry, 6 % O_2)**
Max. flue gas temperature furnace exit:	**1086 °C**
NO_x baseline value:	**200 mg/Nm³**
Gaol:	**Δ NO_x ≥ 50 mg/Nm³** **NH_3 slip ≤ 5 mg/Nm³** **NH_3 fly ash ≤ 100 mg/kg**

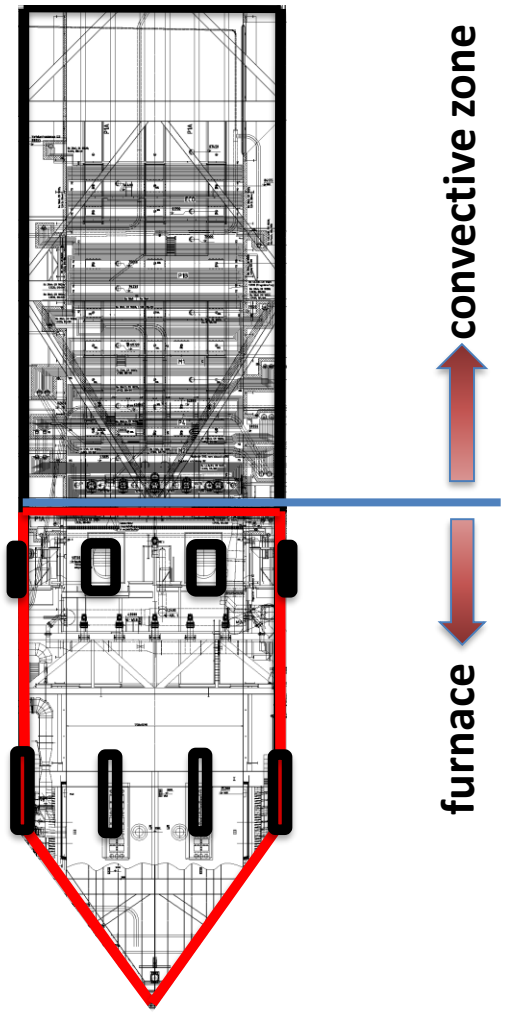
3. Execution of the Project

Block no. 3

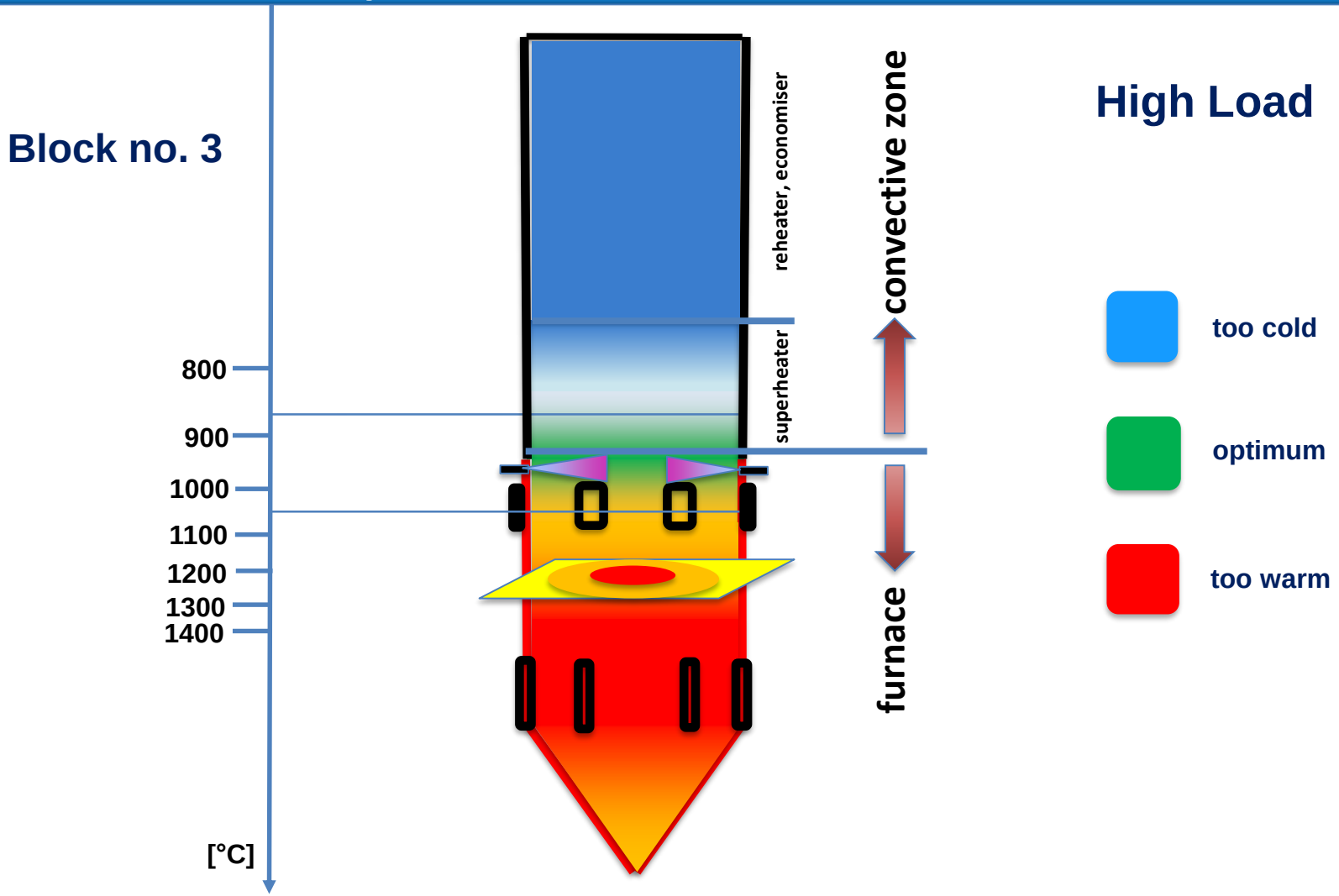


3. Execution of the Project

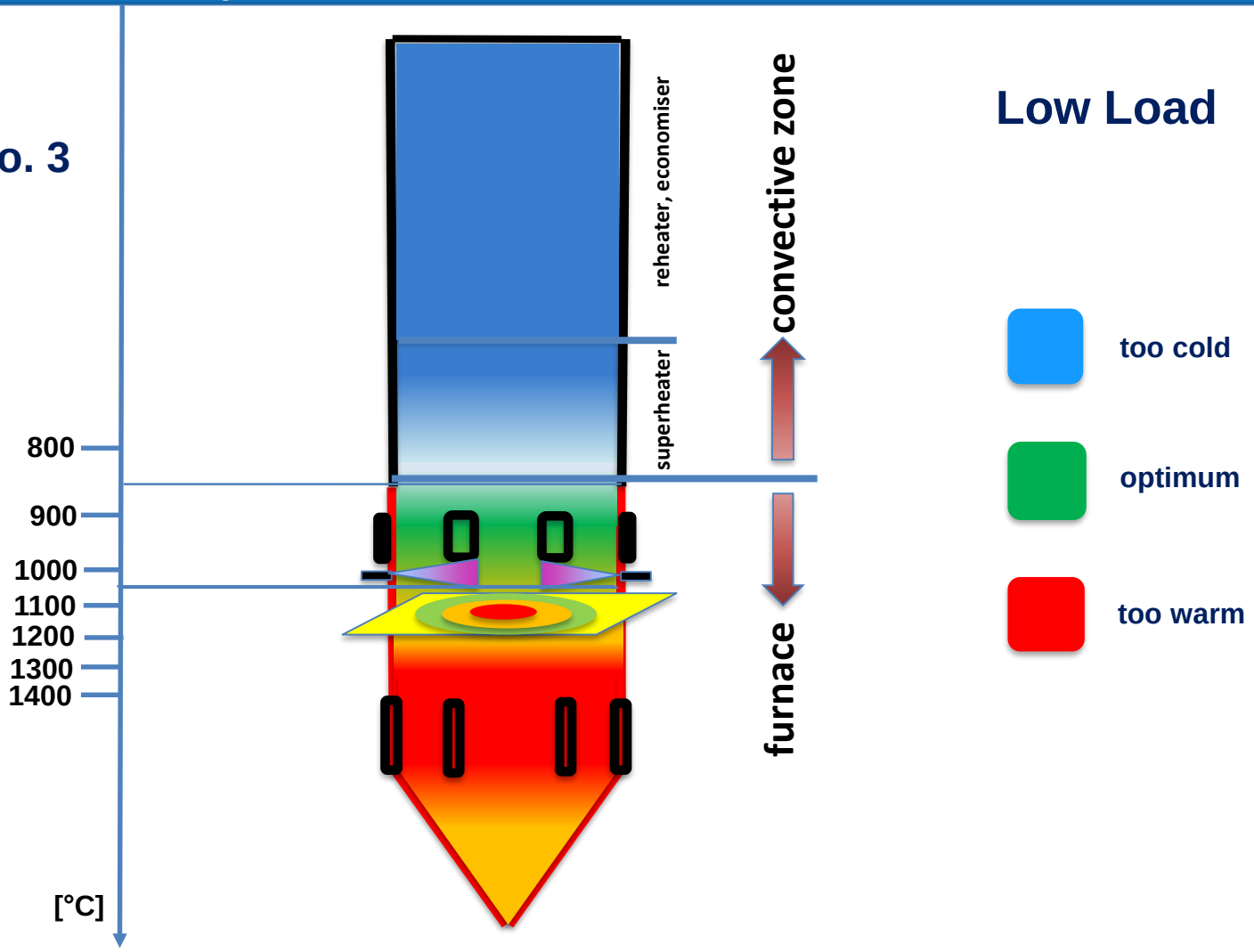
Block no. 3



3. Execution of the Project



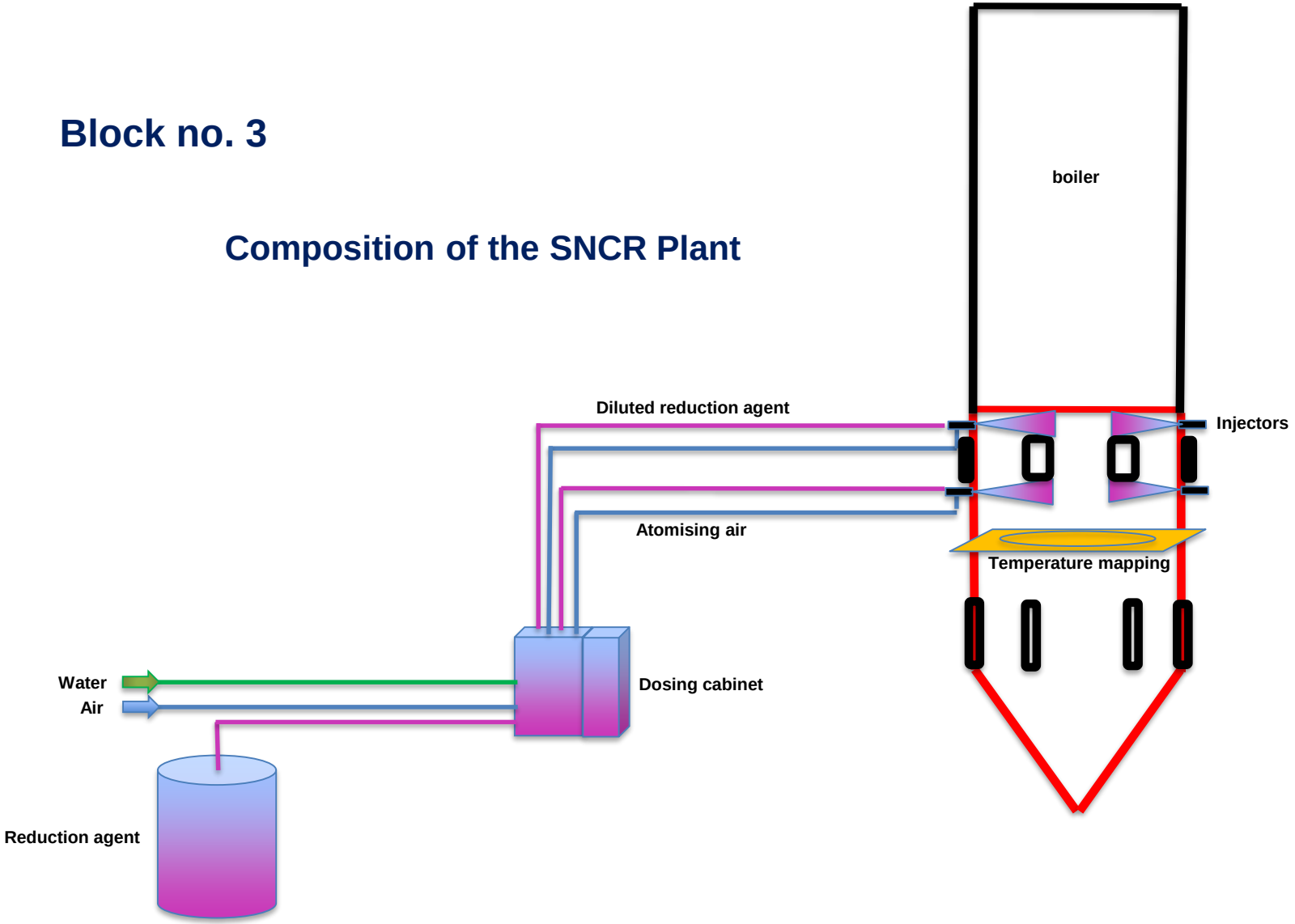
3. Execution of the Project



3. Execution of the Project

Block no. 3

Composition of the SNCR Plant



4. Constructive Measures

Dismantling of Old OFA Shafts

4. Constructive Measures

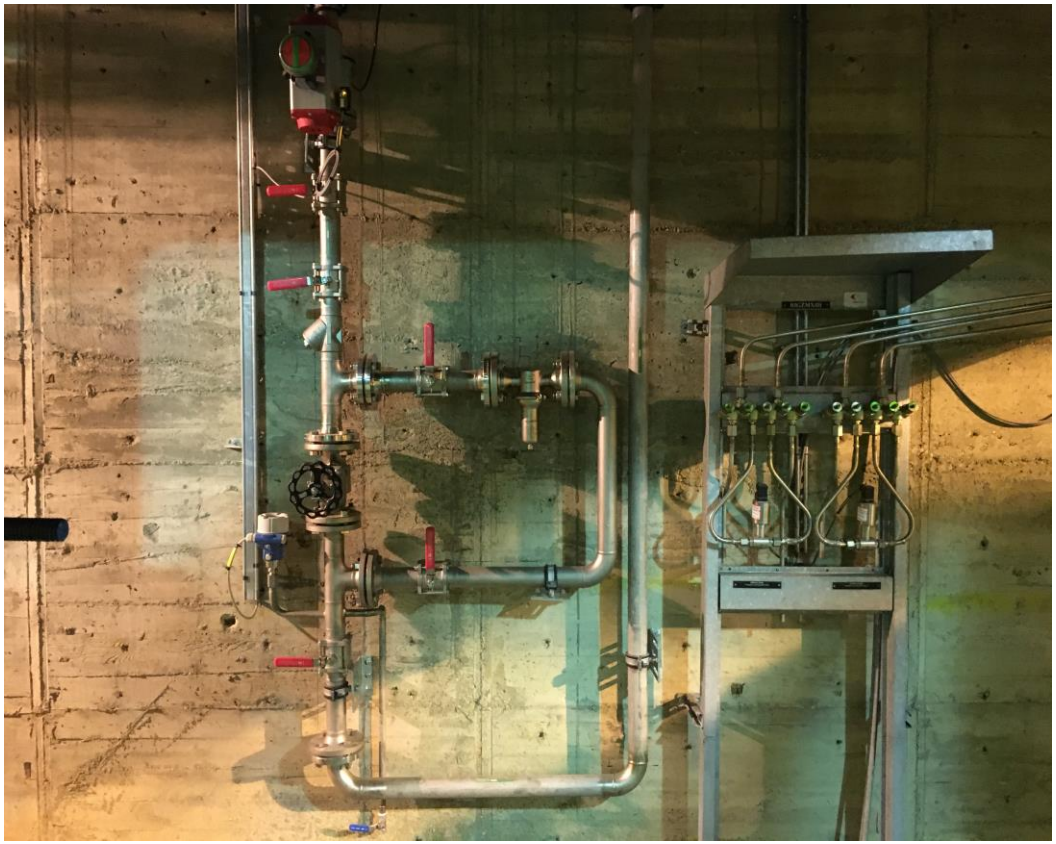
Tube Bends in the Membrane Walls

4. Constructive Measures

Nozzles for Lances and for Optical Pyrometers

5. The Secondary Measure – Structure of the Complete SNCR Plant

Dilution Water Pressure Reduction System



5. The Secondary Measure – Structure of the Complete SNCR Plant

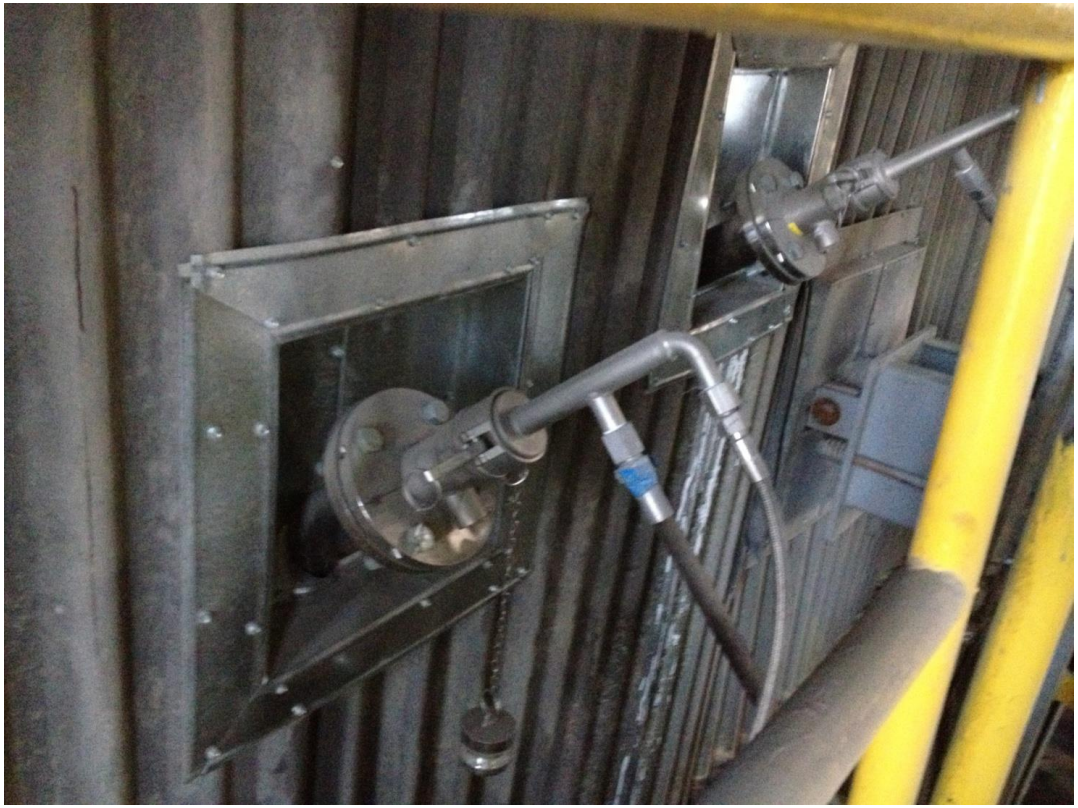
Mixing and Distribustion Modules

5. The Secondary Measure – Structure of the Complete SNCR Plant

Injection Groups and Connecting Pipes

5. The Secondary Measure – Structure of the Complete SNCR Plant

Injection Lances



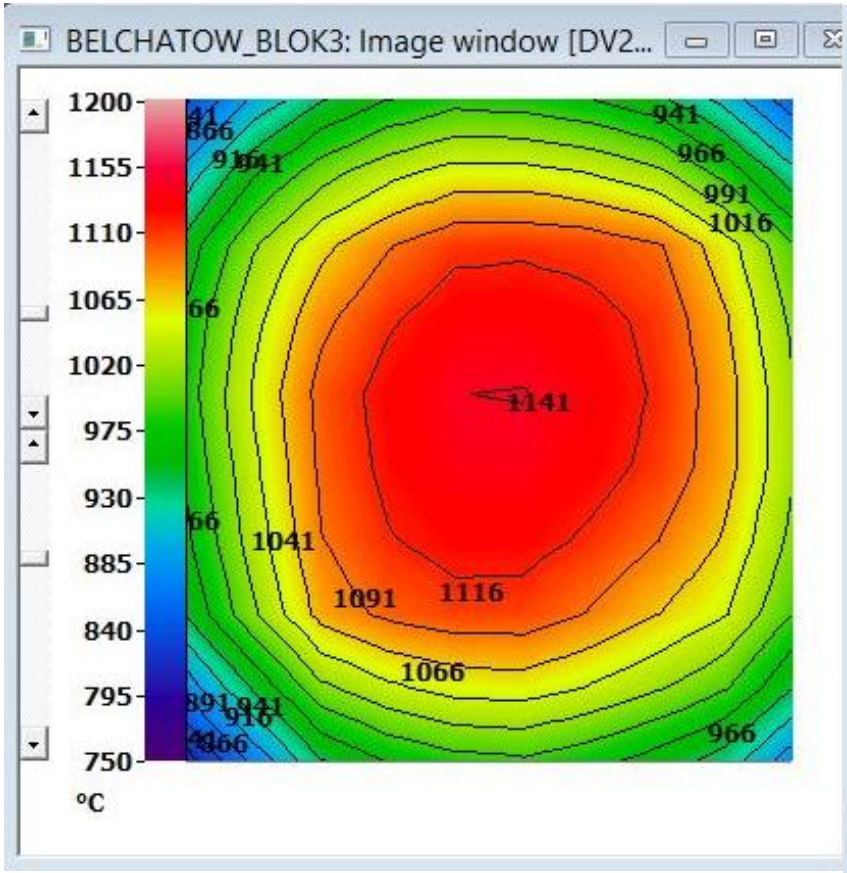
5. The Secondary Measure – Structure of the Complete SNCR Plant

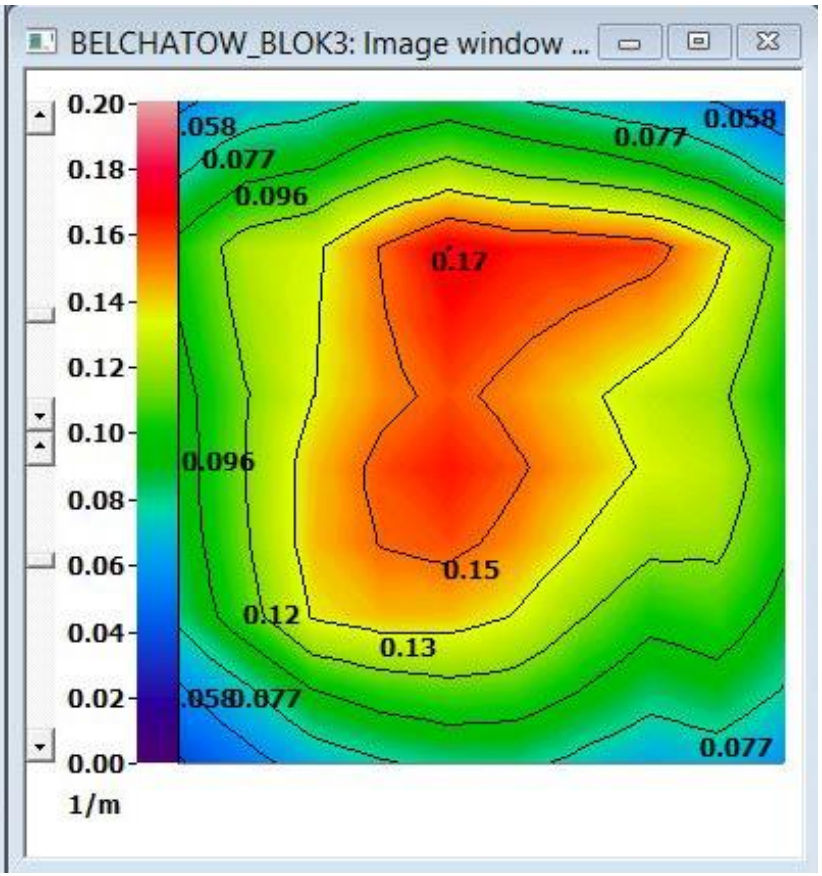
Optical Pyrometers

shockblowers

5. The Secondary Measure – Structure of the Complete SNCR Plant

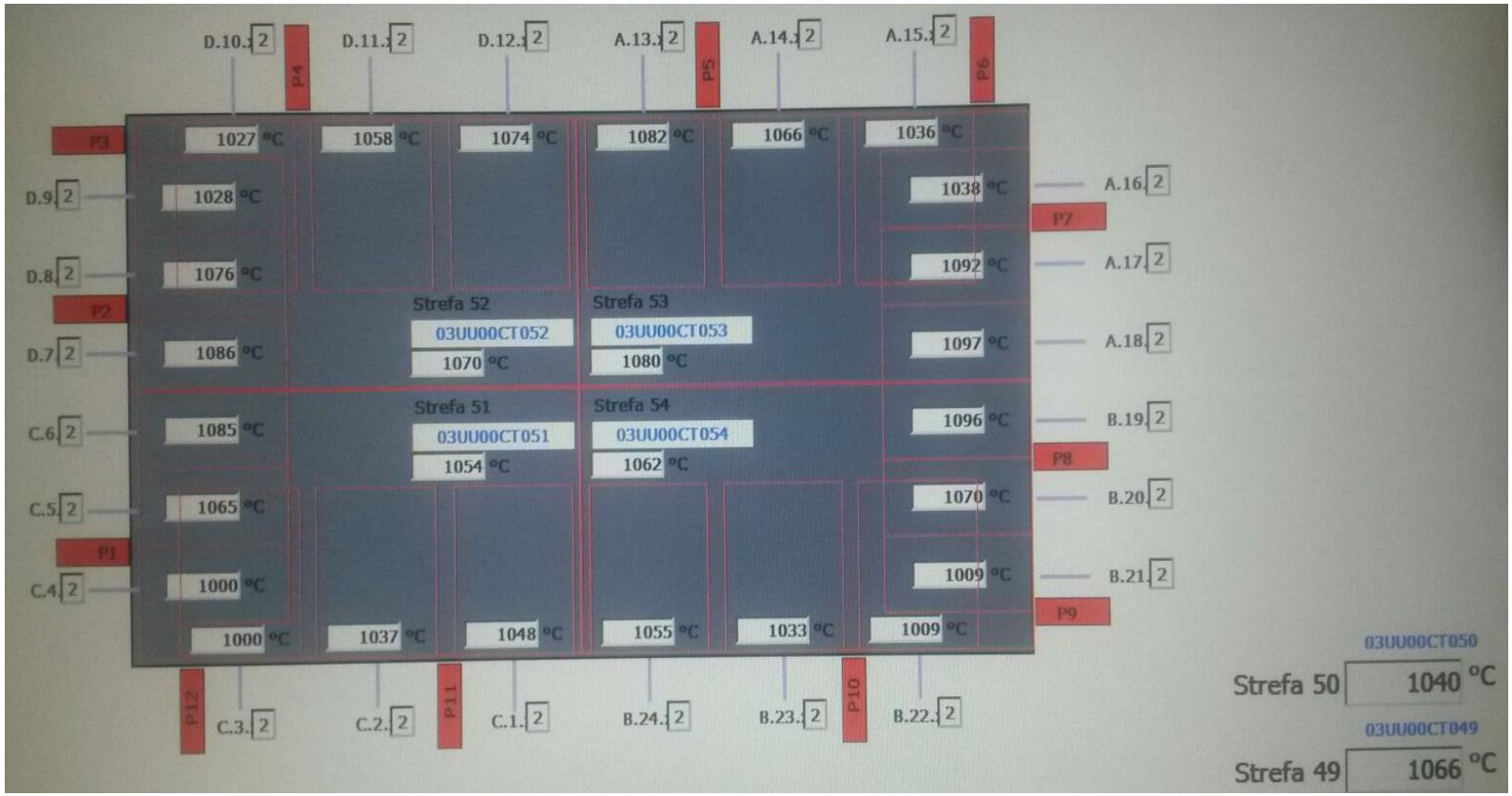
Temperature and Optical Flue Gas Density Distribution Across the Furnace





5. The Secondary Measure – Structure of the Complete SNCR Plant

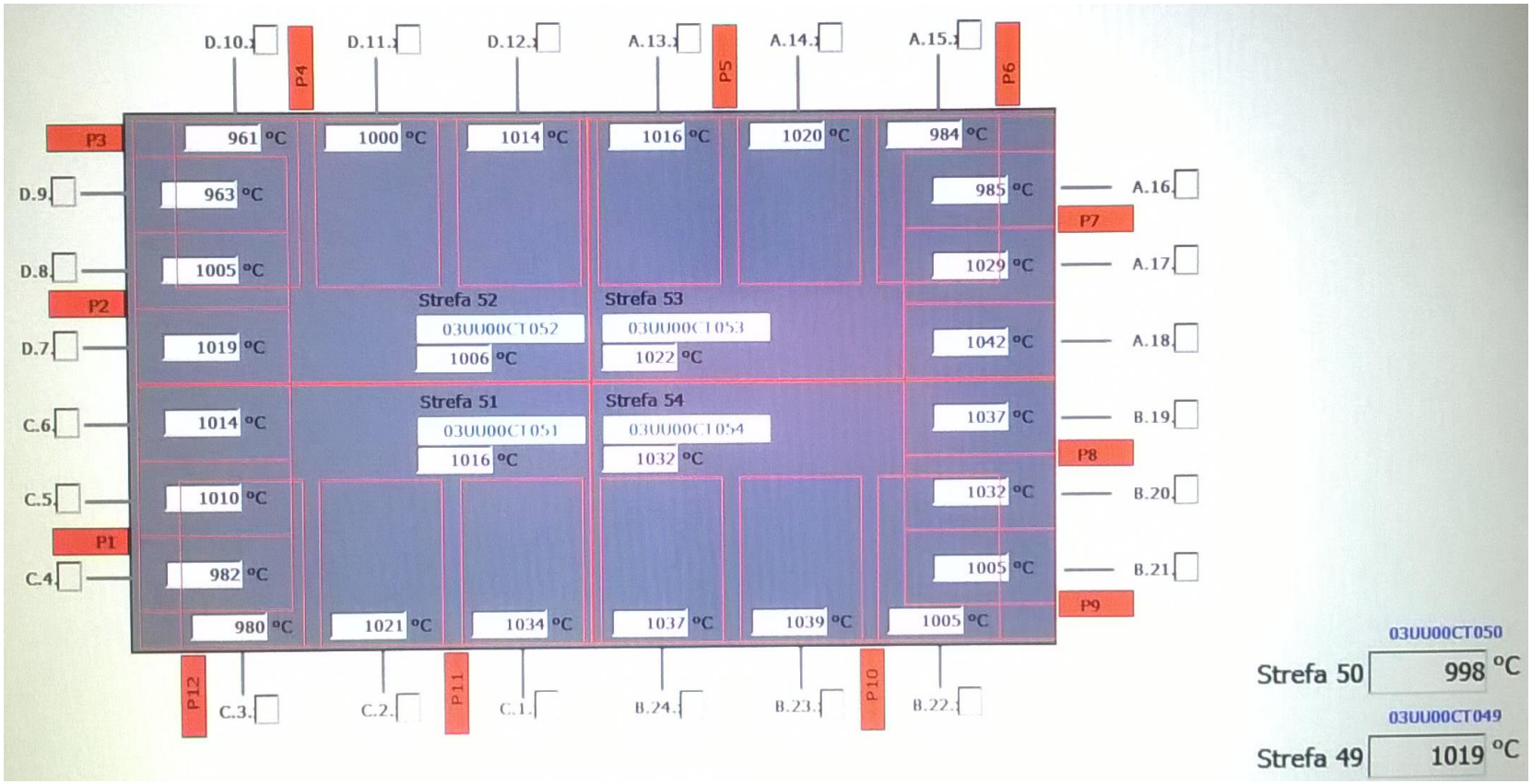
Temperature Indication at the Injection Points



Maximum Load 380 MW_{el}

5. The Secondary Measure – Structure of the Complete SNCR Plant

Temperature Indication at the Injection Points



Partial Load 300 MW_{el}

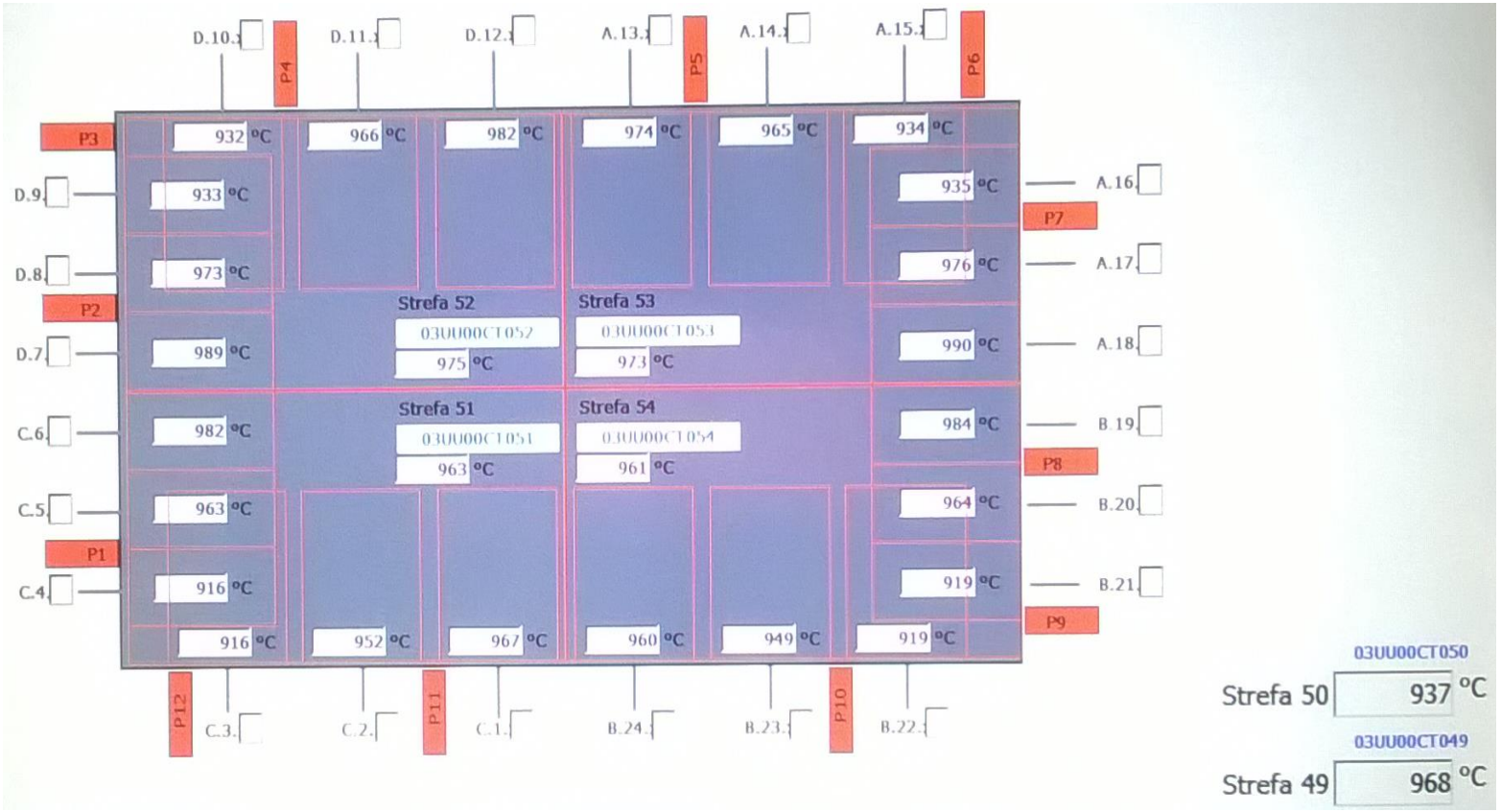
5. The Secondary Measure – Structure of the Complete SNCR Plant

Temperature Indication at the Injection Points

Partial Load 250 MW_{el}

5. The Secondary Measure – Structure of the Complete SNCR Plant

Temperature Indication at the Injection Points



Minimum Load 225 MW_{el}

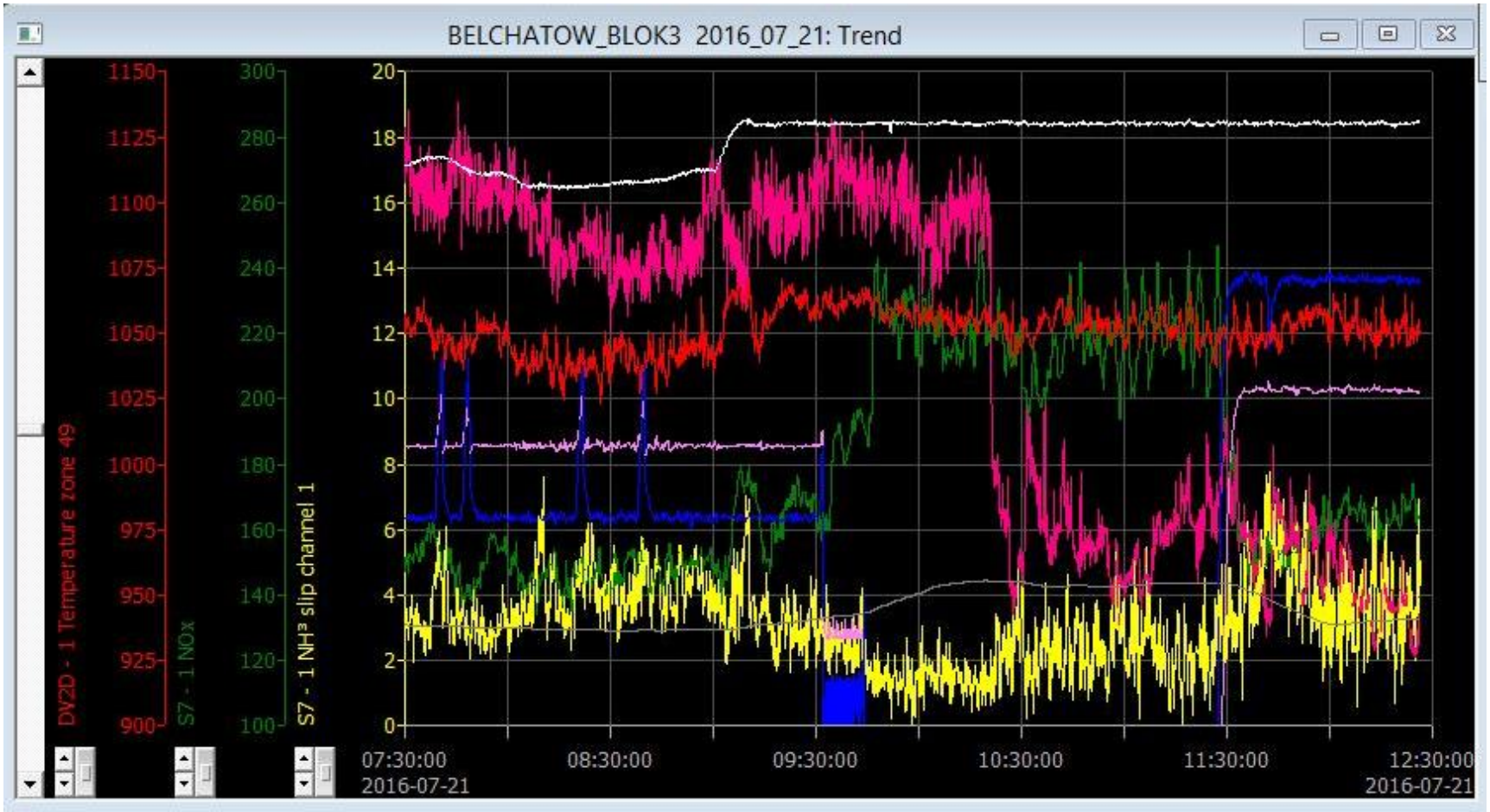
5. The Secondary Measure – Structure of the Complete SNCR Plant

Control Cabinets for the SNCR Plant and for the Temperature Mapping System

5. The Secondary Measure – Structure of the Complete SNCR Plant

In Situ NH_3 Analyzer Upstream Air Preheater

6. Operational Data



7. Conclusions and Outlook

- Power plants must minimize the costs for further flue gas treatment
- Escalating price pressure on sales of electricity and heat

- where primary measures have been already successfully implemented

the SNCR Technology is usually sufficient

to meet even stricter NO_x limits

… and the backup plan, if it wouldn‘t have worked …

... and since, we have no more complaints about emissions!

Zoltán Teuber
+ 49 171 33 04 971
zteuber@erc-technik.com

✓Thank you!

ADDITIVE TECHNIK MSR