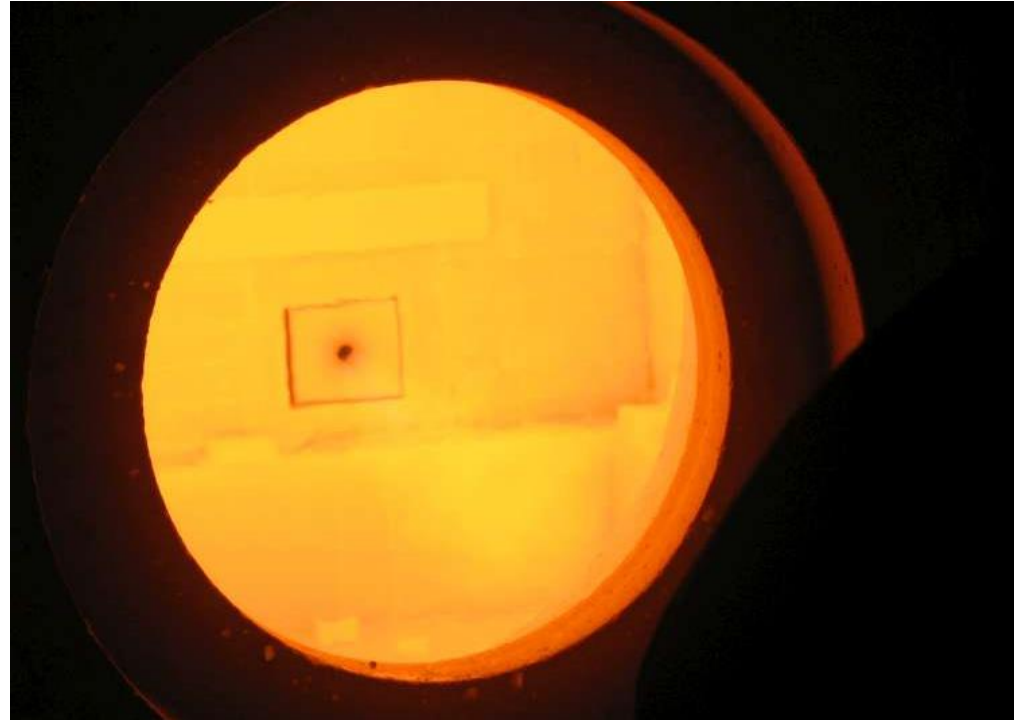


Technical solutions offered by Messer for the Glass Industry

20th of November 2018

Gyula Palmai and Philipp Schindler



Overview

- Company Profile
- Oxipyr Burner technology
- Case studies
 - Emergency and temporary solutions
 - Enrichment
 - Temporary conversion to Oxyfuel
 - Oxyboosting
 - Oxyfuel vs. Oxyfuel
 - Feeder project



Specialist in Industrial Gases

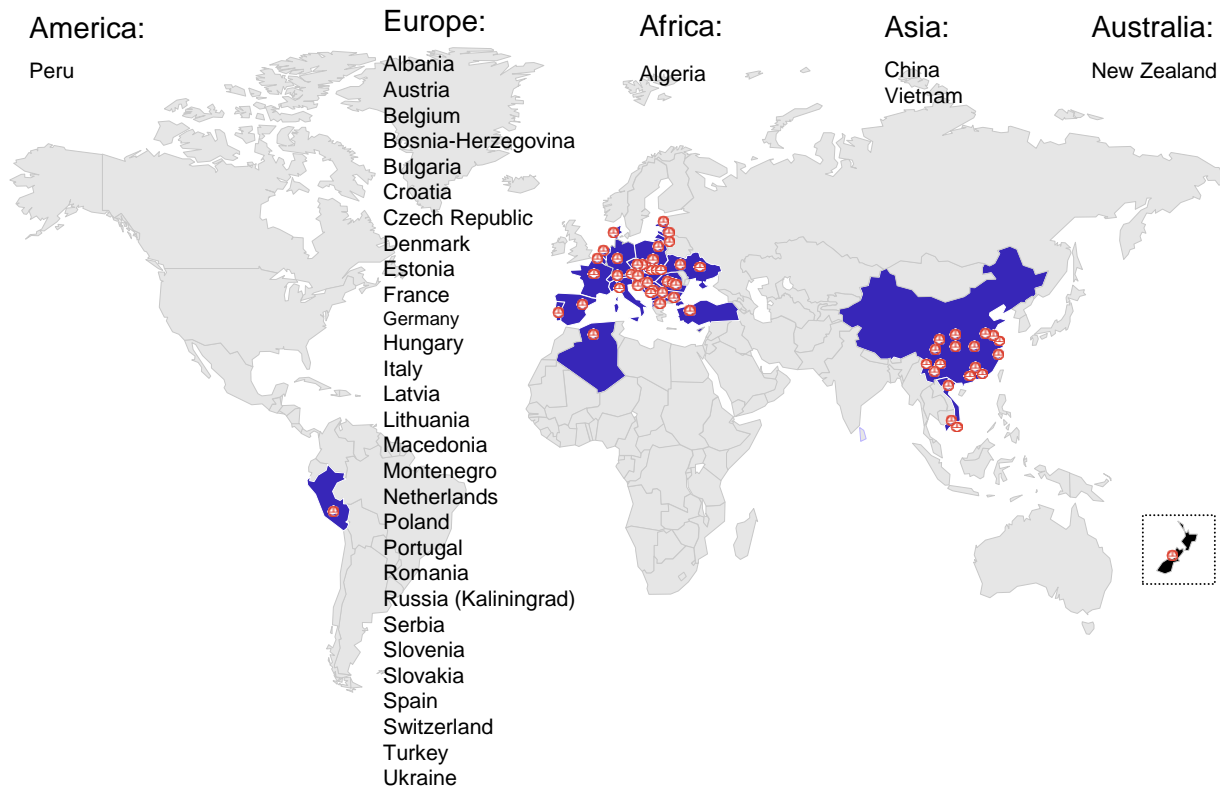


Company

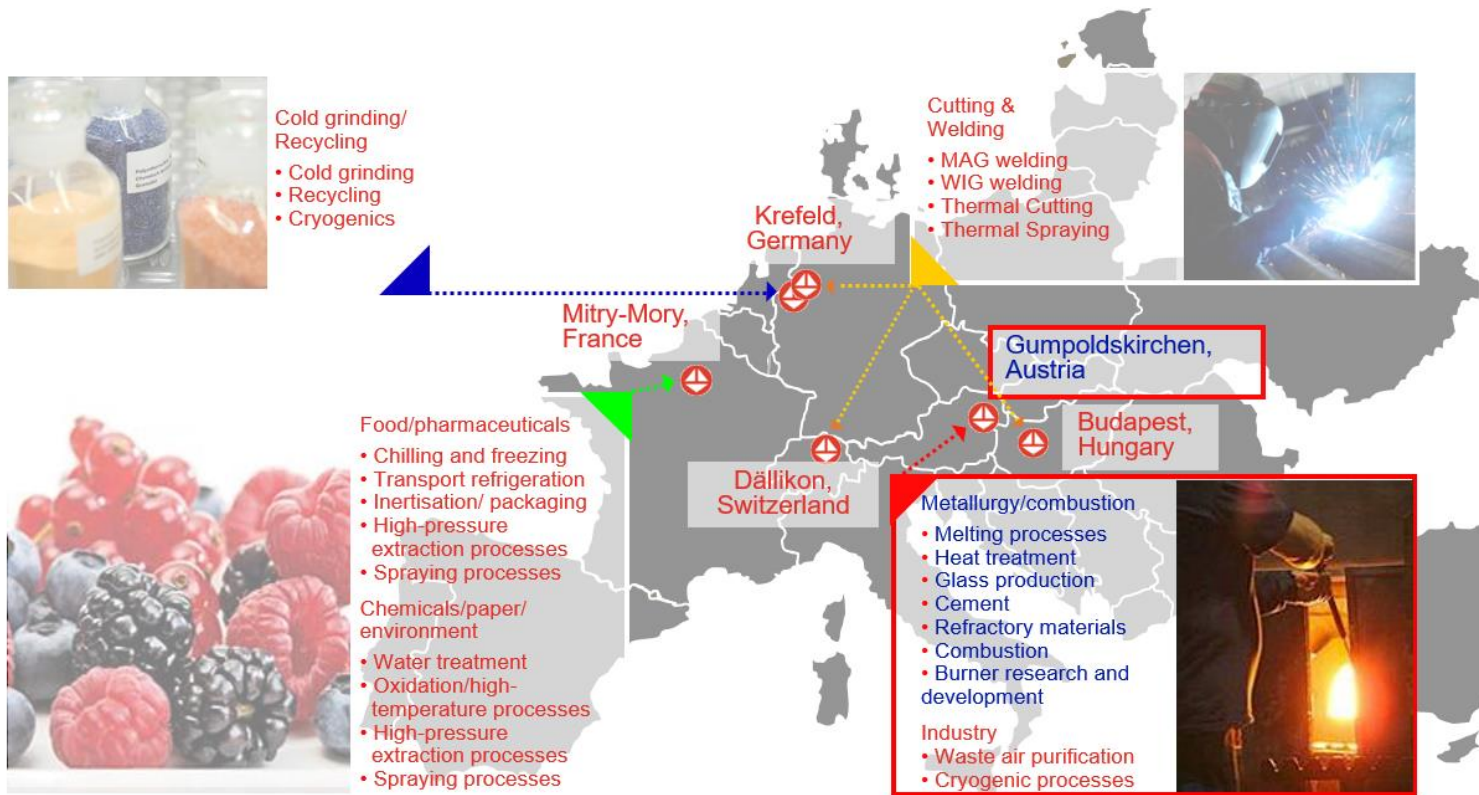
Messer is the largest owner-managed industrial gas company in the world.

Provides not only gases but tailor made Oxipyr®
combustion solutions for the customers

More than 60 locations in over 34 Countries



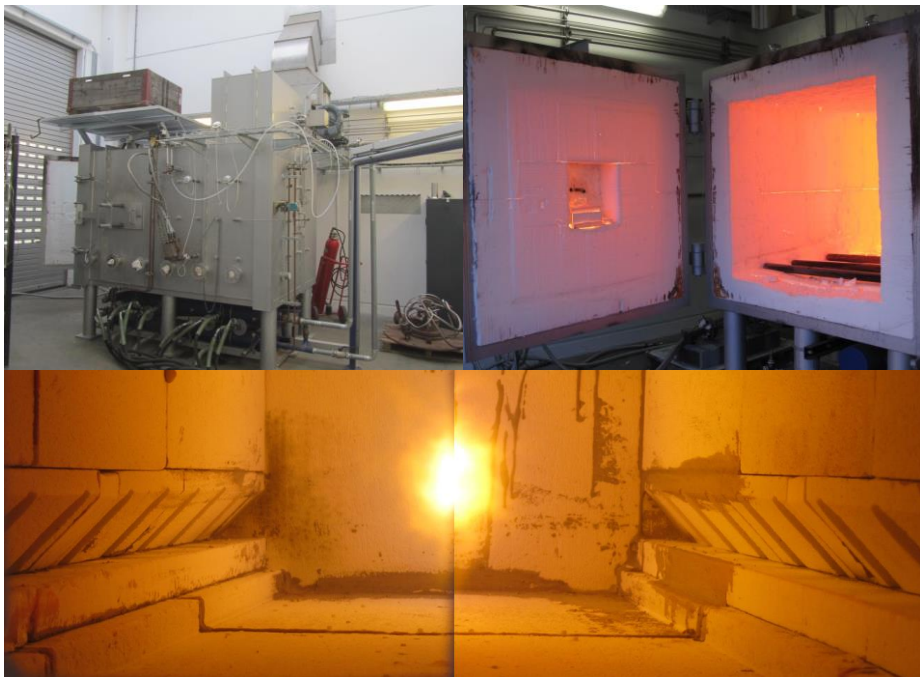
Application Technology: Competence Centers



Competence Center for HTP

Located in Gumpoldskirchen, Austria, since March 2004





Gumpoldskirchen – burner chamber #1

- Inner dimensions: 2,5m x 1,25m x 1,25m
- Maximum burner power 300-500 kW (gaseous fuels only)
- Temperatures up to 1600 °C
- Optional water cooled lances for temperature adjustment
- Off-gas measurement: O₂, CO, CO₂, NO, NO₂
- 21-100% O₂ in oxidator, all gas mixtures possible

Feeder VO3

- A recreation of a feeder for the glass industry
- Maximum burner power 20 kW (max. 20 natural gas burners)
- Temperatures up to 1300 °C
- Around 50 thermocouples
- Comparison of oxyfuel vs. airfuel burners for the glass industry



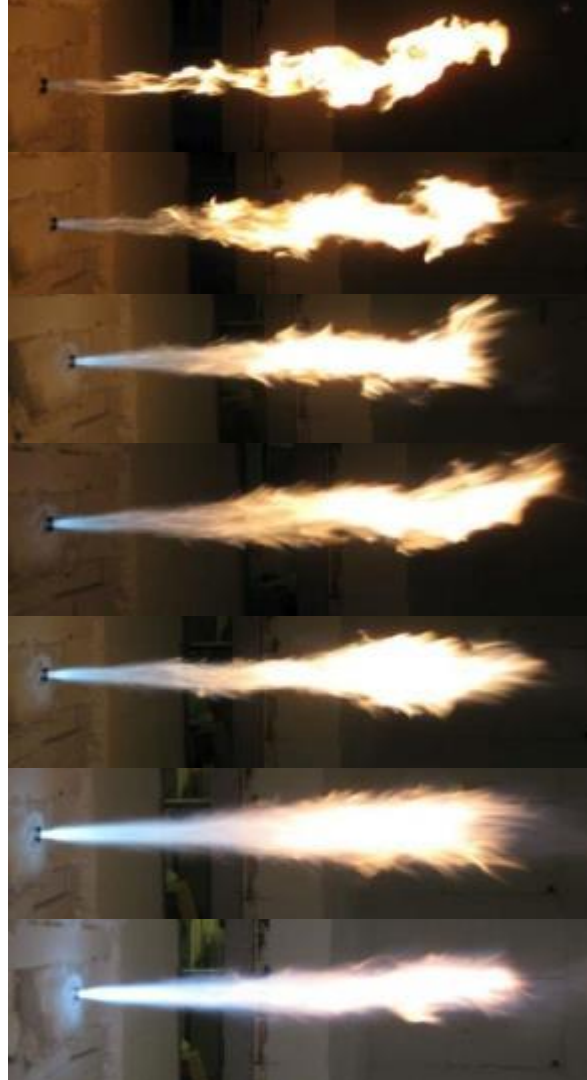
TU Graz (IWT “Institut für Wärmetechnik”) – burner chamber #2

- Inner dimensions: 4,5m x 1,25m x 1,25m
- Maximum burner power 1200 kW
- Also usable for liquid fuels
- Temperatures up to 1430 °C
- Water cooled lances for temperature adjustment
- Furnace pressure regulation
- Off-gas measurement
- 21-100% O₂ in oxidator
- Around 25 thermocouples
- Under finalization

Oxipyr Burner technology

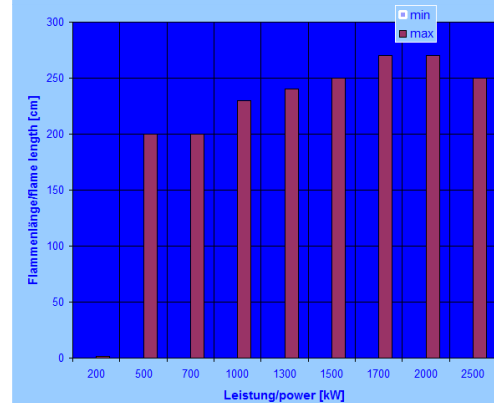
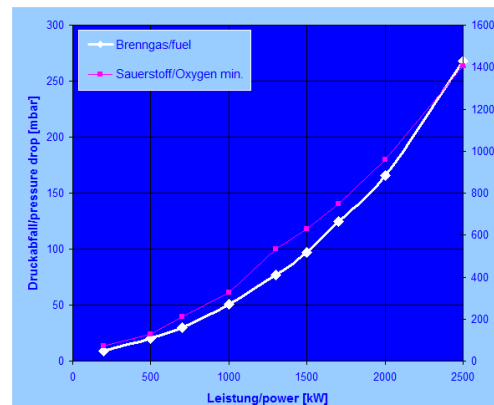
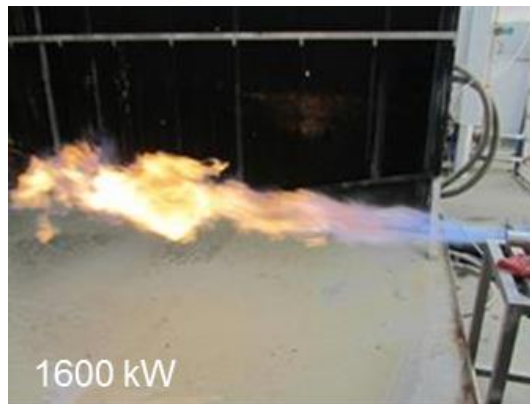
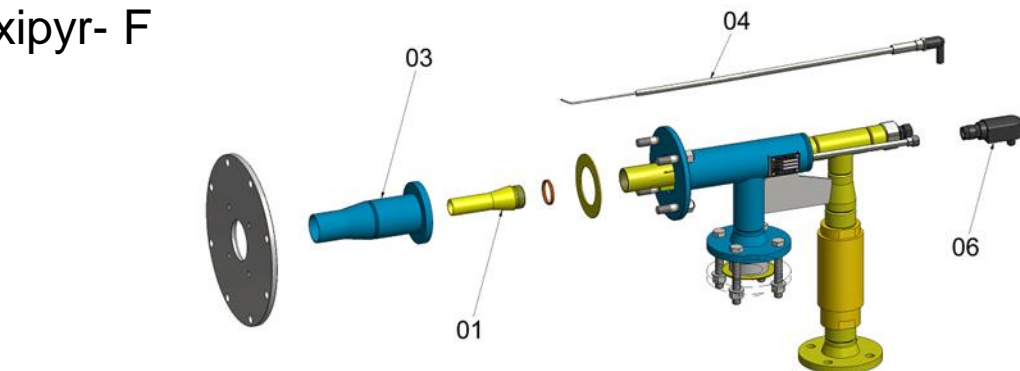
Tailormade burner solutions

- Adjusted to each furnace and mounting
- Adjusted to needed burner power
- Flame length adjusted to furnace
- High heating area can be defined
- Flame length similar over turn down ratio



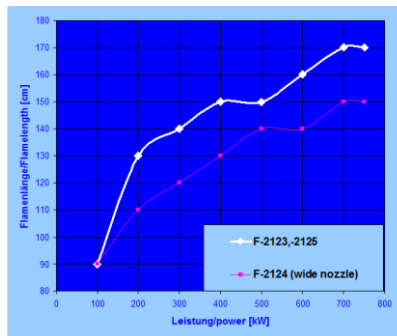
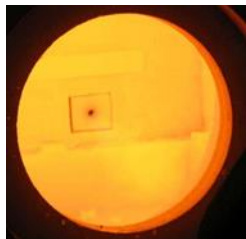
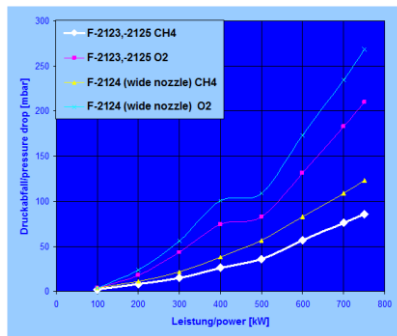
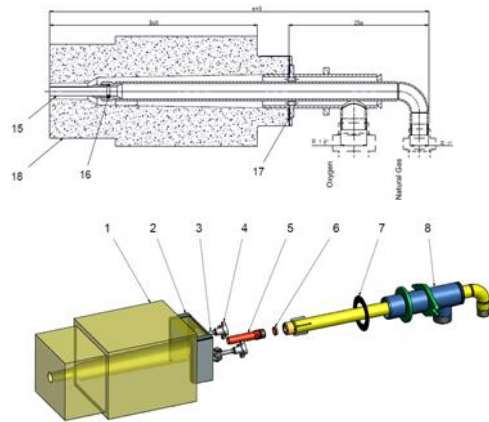
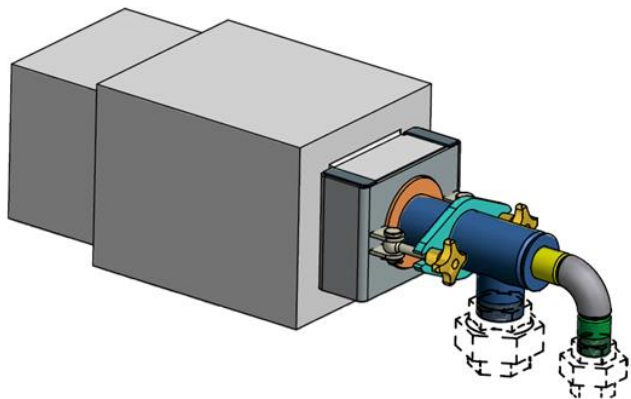
Oxipyr Burner technology

Oxipyr- F

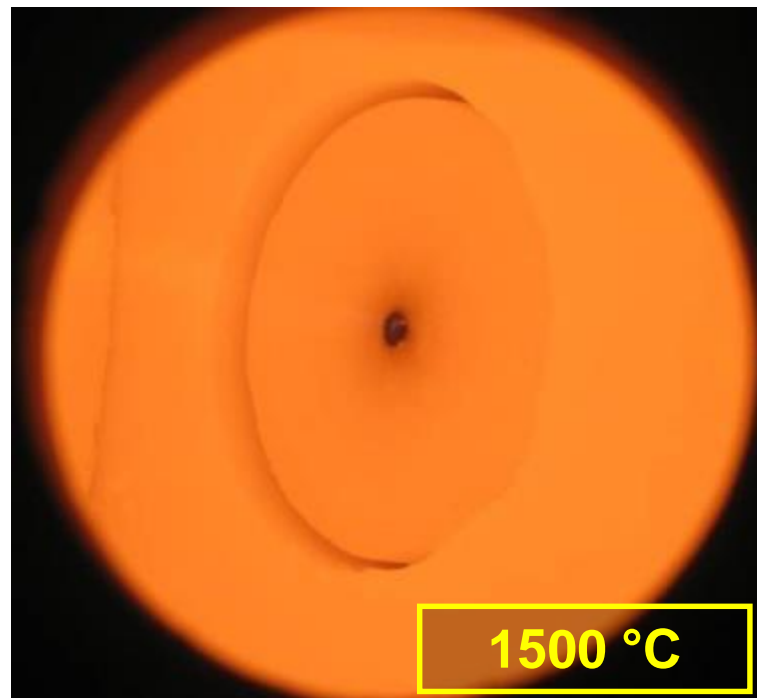
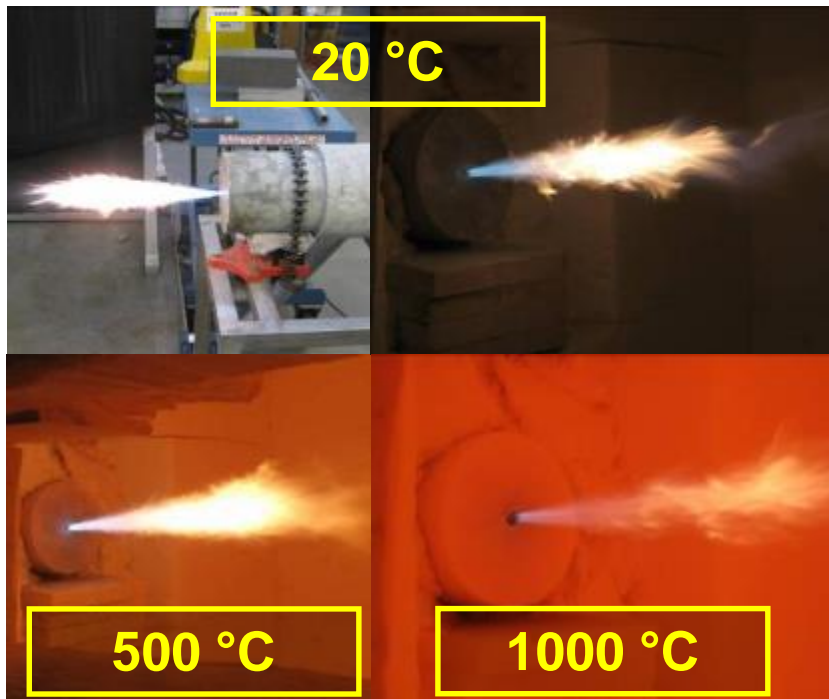


Oxipyr Burner technology

Oxipyr- F



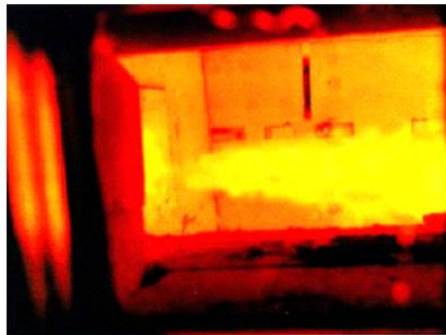
Oxipyr - F – flameless/diluted combustion



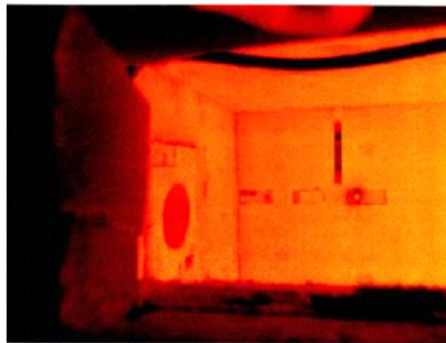
Oxipyr - F – flameless/diluted combustion

Advantages

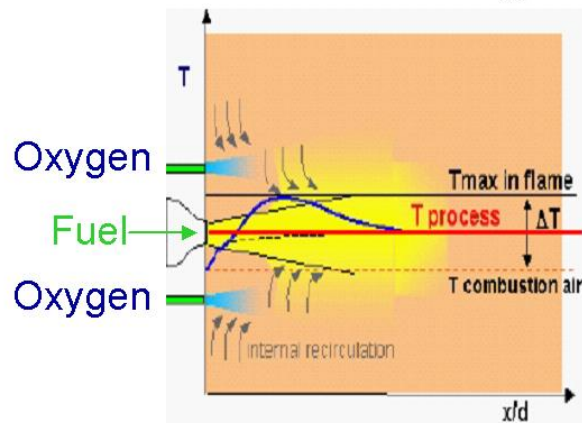
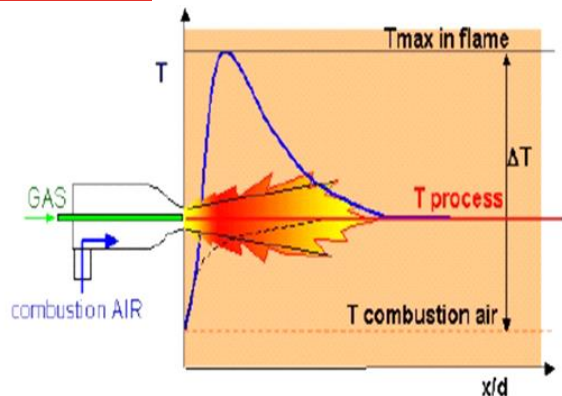
- High impulse
- Long flame – hot spot near the end of the flame
- High off-gas recirculation
- Low flame peak temperature
- Homogeneous temperature distribution = no hot spots



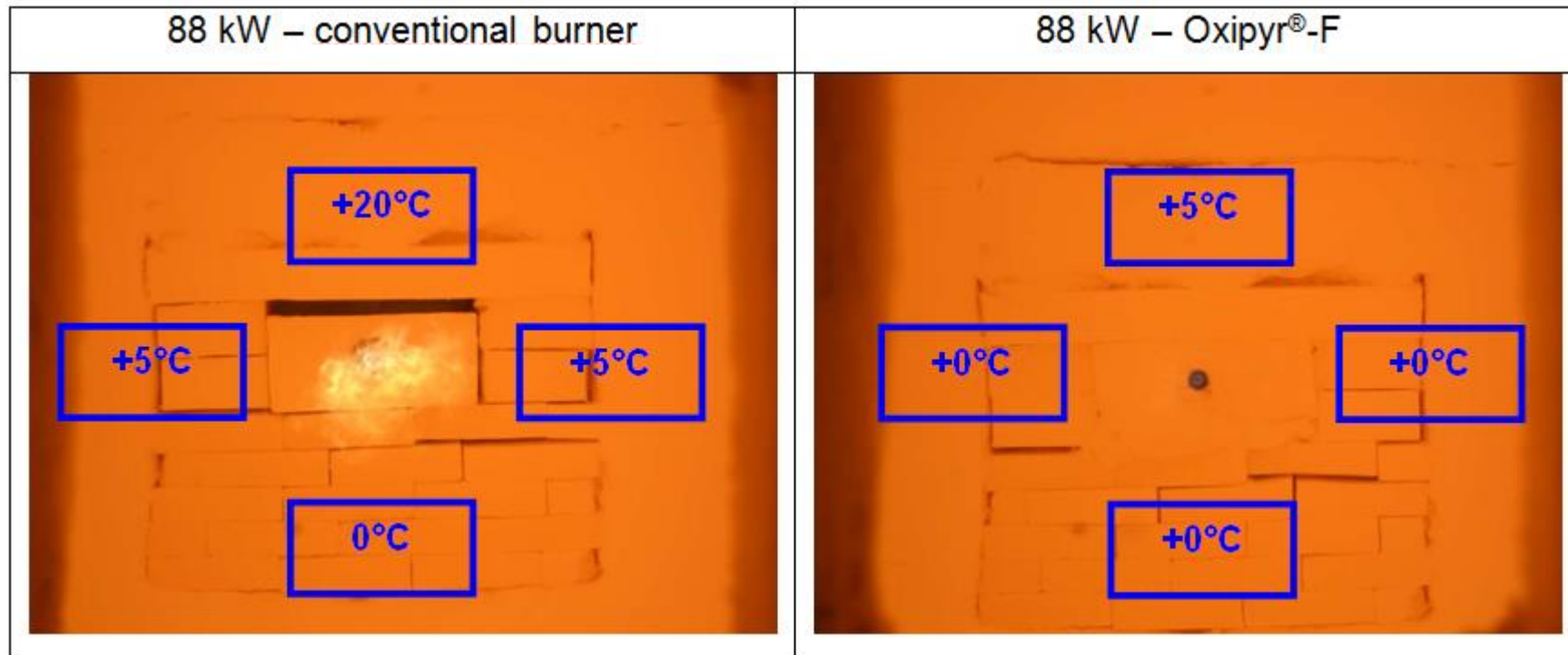
Conventional Flame - 1.5 MW



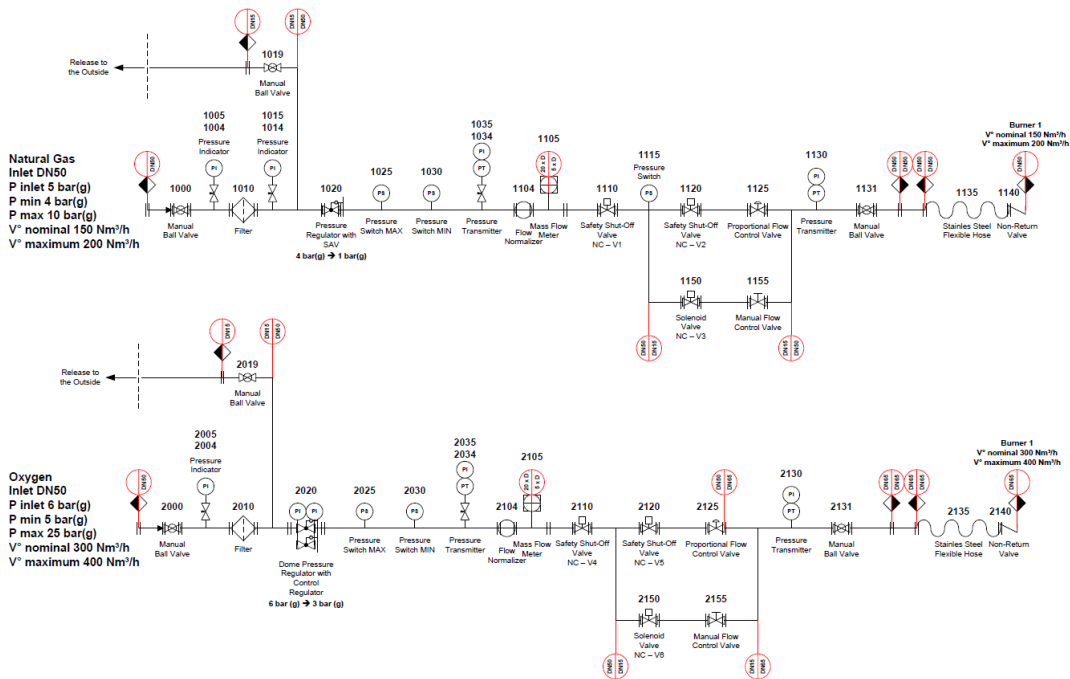
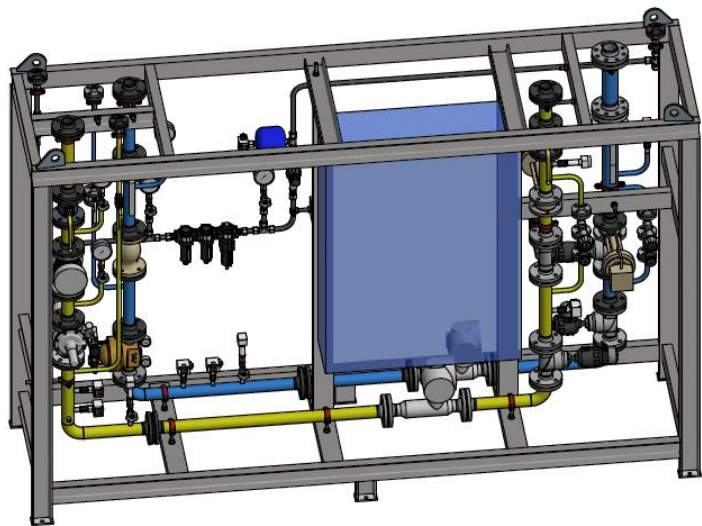
Diluted Flame - 1.5 MW



Oxipyr - F – flameless/diluted combustion



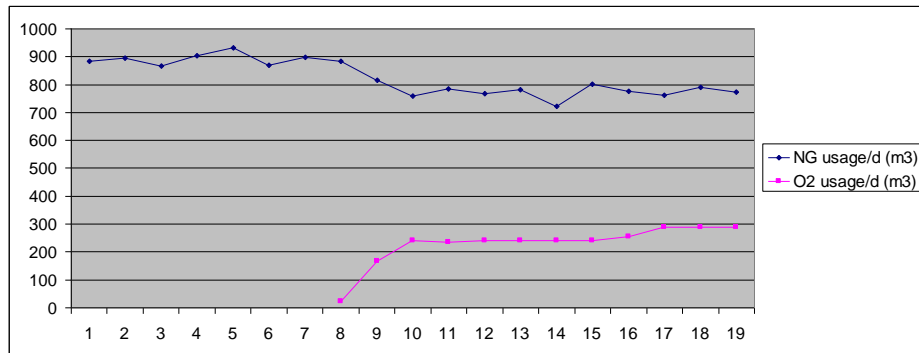
Oxipyr – NG/O2 Regulations



- Emergency and temporary solutions
 - Enrichment
 - Temporary conversion to Oxyfuel
 - Oxyboosting

Enrichment

Tunnel Kiln

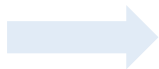


Average of Comb.Air 12-18.11.2012	9 319 Nm3/d
Average of NG 12-18.11.2012	893 Nm3/d
Average of NG 25-30.11.2012	771 Nm3/d
Average of O2 25-30.11.2012	267 Nm3/d
Average of Comb.Air 25-30.11.2012	5 725 Nm3/h
Savings	14 %



Glass Tank

Basic data:		
Furnace area:	48m ²	
Production:	158t/d	
Specific pull:	3,3t/m ² /d	
Fuel:	Heavy oil	
Air preheating temp:	1250°C	
Installed electric boost:	1300kW	



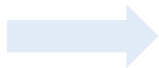
Problems

- Checkers in the right side regenerator chamber collapsed!
- Not enough air to combust the required amount of fuel.
- Air preheat temperature in the right side chamber dropped from 1250 °C to 1050 °C!
- production reduced to 142 t/d



Solution

- Oxygen Enrichment of the combustion air through the regenerator up to 23,4%



Result

- Combustion air quantity was decreased by 14%
- Production was restored to the original level

Enrichment

Glass Tank

Implementation

- Implementation of the Regulation into the Control system

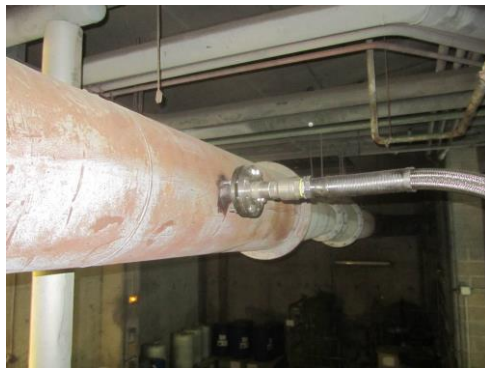
Regulation

- O2 Regulation Panel delivered by Messer



Oxygen lance

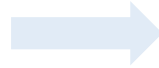
- O2 lance and flexible hoses installed by Messer



Temporary conversion to Oxy-fuel

Glass Tank

Basic data:		
Furnace area:	56,4m ²	
Production:	120t/d	
Specific pull:	2,13t/m ² /d	
Fuel:	NG	
Glass temperature	1380°C	
Total burner capacity:	7000kW	



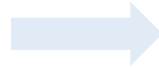
Problems

- The separation wall between the regenerator chambers collapsed.
- Efficiency of air preheating reduced, production capacity must be reduced.
- While rebuilding the regenerator production should be continued with approx. 75 t/day



Solution

- Installation of 4 tailormade Oxipyr Burners
- Burners designed to fit in existing burner blocks



Result

- During the „full Oxyfuel“ operation of the glass furnace they were able to reach a constant pull above 75 t/day
- The temporary Oxyfuel operation lasts for 1 month without any technical or quality problems

Temporary conversion to Oxy-fuel

Glass Tank



The original burners



Tank and evaporator erected



Making piping



The new oxy-fuel burners



Skid and control



Temporary chimney



New burners installed



Closing the throat

Temporary conversion to Oxy-fuel

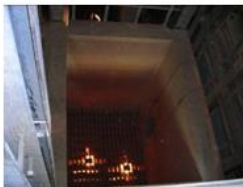
Glass Tank



Oxy-fuel burners under operation



Parameters on the screen



New checkers in progress



Job is finished

Glass Tank

Basic data:		
Glass Type:	Optical	
Furnace area:	33m ²	
Production:	80t/d	
Specific pull:	2,42t/m ² /d	
Fuel:	NG	
Melting temperature:	1550°C	
Installed electric boost:	770kW	
Total burner capacity:	4400kW	

Solution

- First step, enrichment of combustion air up to 36% for 5 Months
- Second step, additional Oxyboosting, @ the hotspot with two Burners. (800 kW)

Problems

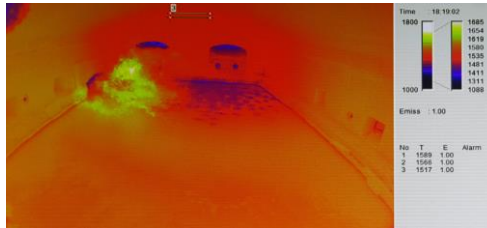
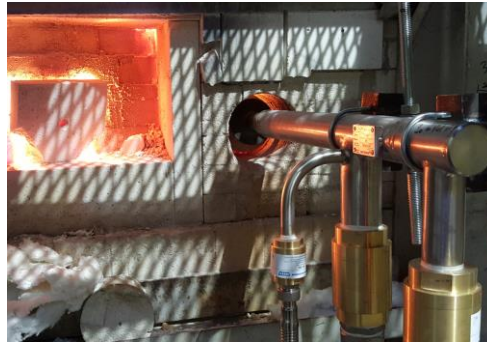
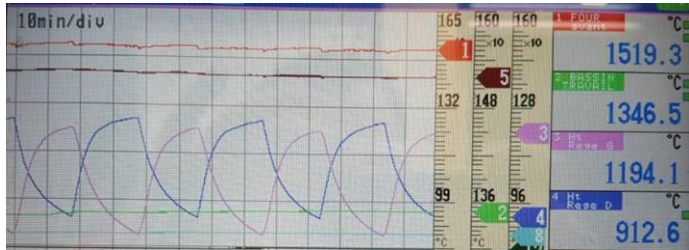
- Both regenerator chambers where clogged, therefore capacity decreased
- Furnace pressure was to high
- Production decreased to 73 t/day

Result

- Production could be restored to the original level
- Due to lower Offgas volume the furnace pressure was decreased
- Assymetric operation of the regenerator chambers was reduced
- Electric boost has been reduced by 80 kW

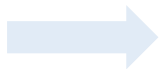
Oxyboosting

Glass Tank



Glass Tank

<u>Basic data:</u>		
Glass Type:	C-Glass	
Furnace area:	91 m ²	
Production:	270 t/d	
Specific pull:	3,0 t/m ² /d	
Fuel:	LHV NG	
Melting temperature:	1450 °C	
Total burner capacity:	15100 kW	



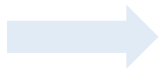
Problems

- Recuperator was damaged during the loss of electric power supply
- Not enough air to combust the required amount of fuel.
- Preheat temperature decreased
- Further degradation of the Recuperator performance is expected



Solution

- Preparation of all the needed equipment to change to full Oxy-fuel (Regulations, Burners and Bricks)
- As a first step installing 2 pieces of Oxy-fuel burners (substituting 4 Air-fuel burners)



Result

- Production was kept at the original level
- Combustion air volume was reduced to a value which was possible to get through the damaged recuperator

Oxyboosting

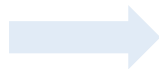
Glass Tank



Oxy-fuel vs. Oxy-fuel

Glass Tank

<u>Basic data:</u>		
Glass Type:	Solar Glass	
Furnace area:	178m ²	
Production:	270t/d	
Specific pull:	1,52t/m ² /d	
Fuel:	NG	
Melting temperature:	1500°C	
Total burner capacity:	15500kW	
Electric boosting:	1690kW	

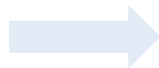


Problems

- Short life time of the existing Burnerbricks (Flat flame burners)
- Reduction of NOX desirable

Solution

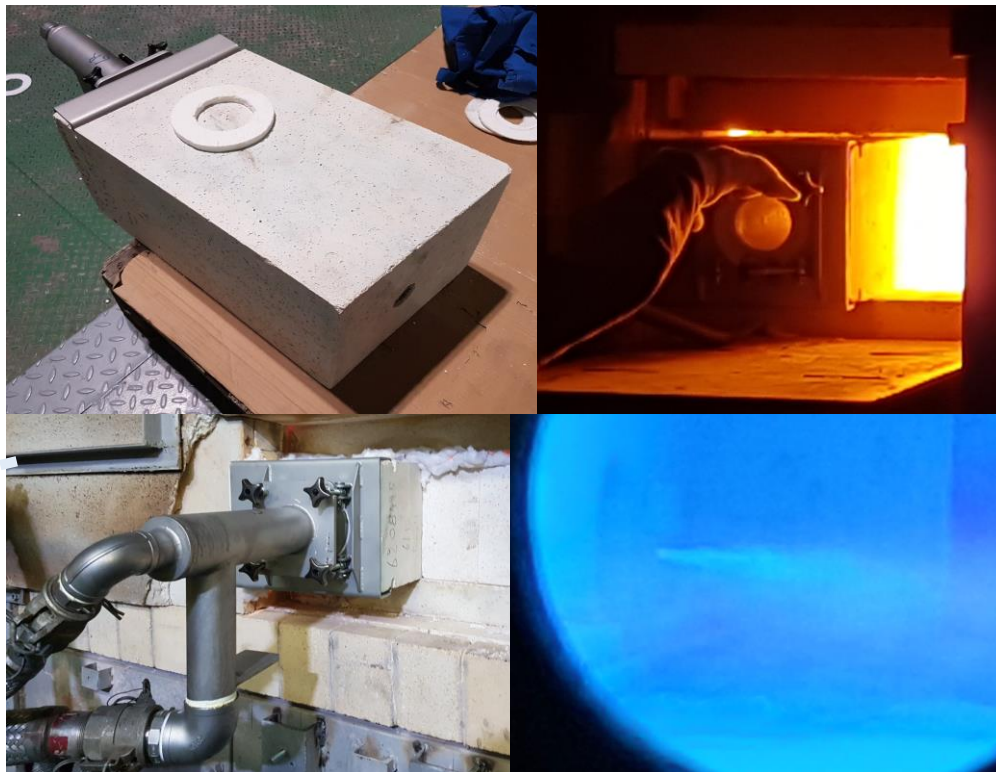
- Preparation of all the needed equipment to change Burners and Bricks
- Changing 10 pieces of flat flame burners to Oxipyr-F burners



Result

- Easy mounting of burnerbricks and burners during continuous full production because of tailormade solution
- Reduction of NOX by 30%
- Reduction of Oxygen consumption by 2 %

Oxy-fuel vs. Oxy-fuel



Technical solutions offered by Messer for the Glass Industry

Thank You for Your attention!

