

# Soluzioni tecnologiche per bruciatori di idrogeno



# SIAD Group in Brief

Since its incorporation (1977), ESA has been a company of the **SIAD Group**, Italian leader in technical gases founded in 1927 from **Sestini Family**, now at 4<sup>th</sup> generation. ESA was a spin off of the pre-existent combustion dep. Into SIAD Macchine and Impianti, the engineering company of the Group.



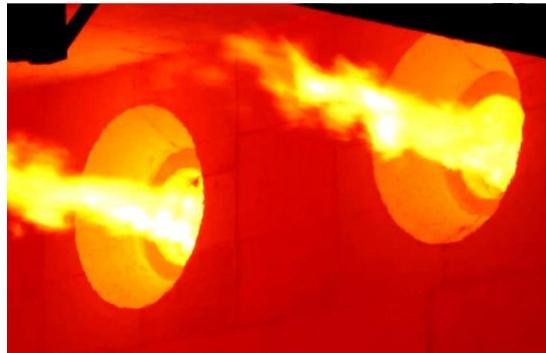
<p><b>Industrial Gases</b></p> <p><b>SIAD</b> SIAD Italia S.p.A. SIAD Czech SIAD Russia SIAD Slovacchia SIAD Austria SIAD Romania SIAD Polonia SIAD Bulgaria SIAD Ungheria</p> <p><b>ISTRABENZ PLINI</b> ISTRABENZ PLINI Slovenia PLINARNA MARIBOR Slovenia ISTRABENZ PLINI Croazia ISTRABENZ PLINI Serbia ISTRABENZ PLINI Bosnia- Erzegovina</p> <p><b>PT "PEMTEXGA3"</b> Remtechgas Ucraina</p> <p><b>IGAT</b> IGAT Italy</p> <p><b>2LNG</b> 2LNG, Italia</p>	<p><b>Engineering</b></p> <p><b>SIAD MACCHINE IMPIANTI</b> SIAD Macchine Impianti, S.p.A Italy SIAD Macchine Impianti Middle East, UAE SIAD Macchine Impianti Sucursal de España Russian Branch of SIAD Macchine Impianti SIAD Engineering Trading (Shanghai), Cina SIAD Engineering (Hangzhou), Cina</p> <p><b>ESA PYRONICS INTERNATIONAL</b> SIAD Group ESA Spa italia ESA Manufacturing India Pyronics International Belgio</p> <p><b>TPI</b> TECNO PROJECT INDUSTRIALE Tecno Project Industriale, S.p.A. Italy Tecno Project Industrial, Brazil</p>
<p><b>Healthcare</b></p> <p><b>Magaldi Life</b> Magaldi Life Italia S.p.A</p> <p><b>Medigas</b> Medigas Italia S.p.A</p> <p><b>SIAD</b> SIAD Healthcare Italia S.p.A</p>	<p><b>Industrial Goods</b></p> <p><b>ARROWWELD</b> Arrowweld Italia</p> <p><b>TECNOSERVIZI AMBIENTALI</b> Tecnoservizi Ambientali Italia</p> <p><b>Pentatec</b>, Italy</p>



# A Complete Combustion Offering

## EQUIPMENTS

### Industrial Burners



40 burner families for any application up to 20MW, featured by low emissions and intense energy saving.

### Instruments



A complete range of high precision devices for low pressure (<150 mbar): pneumatic regulators, valves, solenoid, actuators, mixers, measure and control instruments

### Electronic Devices



- Burners Ignition & Control systems
- Communication and network devices
- Sensors & Actuators
- Proportional regulators

## ENGINEERING

### Fuel Feeding lines



- Compliant to PED, EN746, ASME, ATEX or any applicable regulations
- Fully customized

### Automation



- Hardware & Software up to SIL3
- Control Panels; SCADA systems
- Selection of market components

### Technical Services



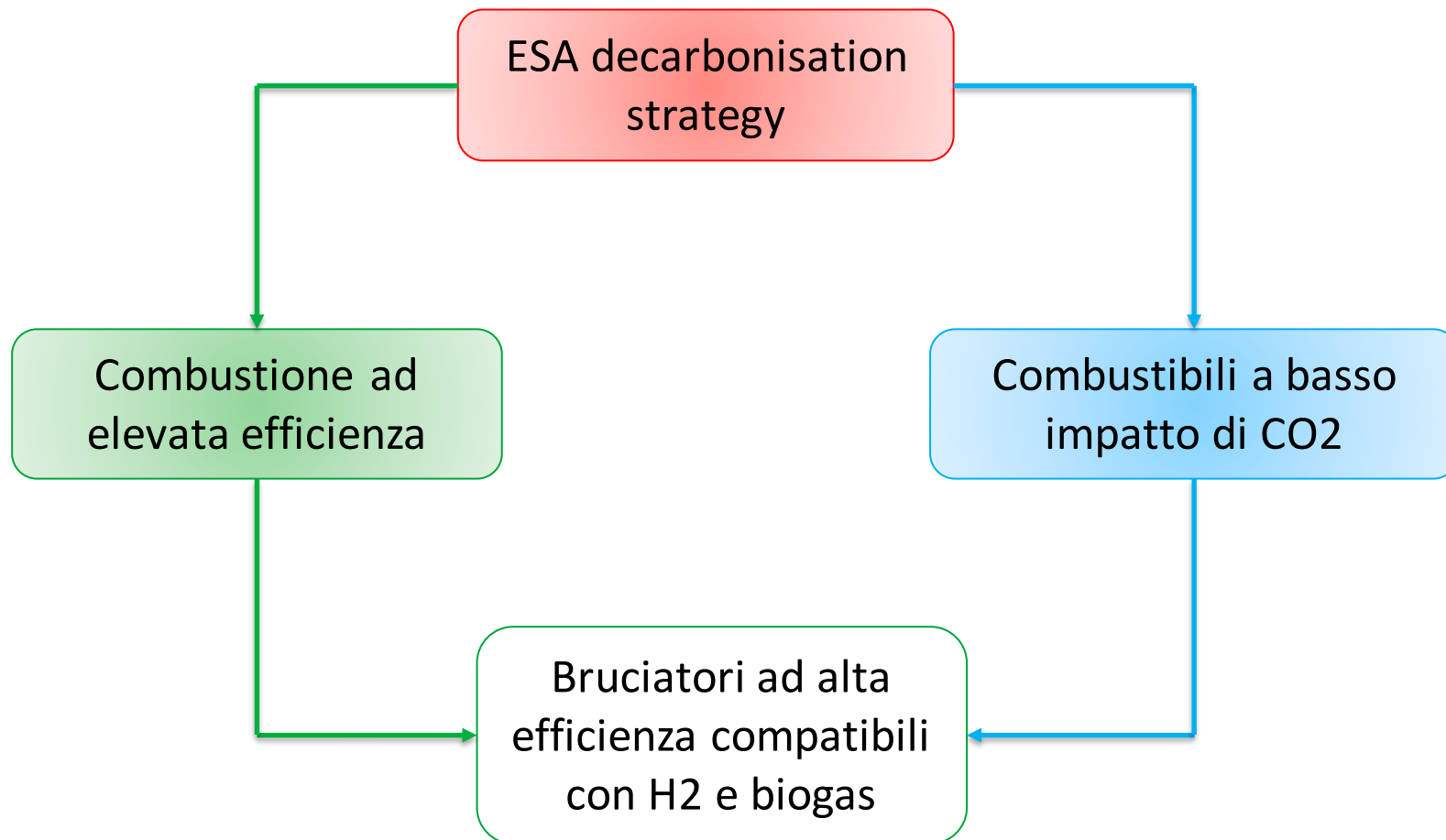
- Technical Assistance & training
- 8 test furnaces up to 4MW on hire
- Repair and replacement services.

## Hydrogen test equipment

- Dedicated pipe line for H<sub>2</sub> supply to burners.
- Explosion-proof room for H<sub>2</sub> cylinders storage.
- Reduction, feeding and mixing line in compliant with PED and ATEX.
- Hydrogen supplied by the parent company SIAD S.p.A.



# ESA decarbonisation strategy

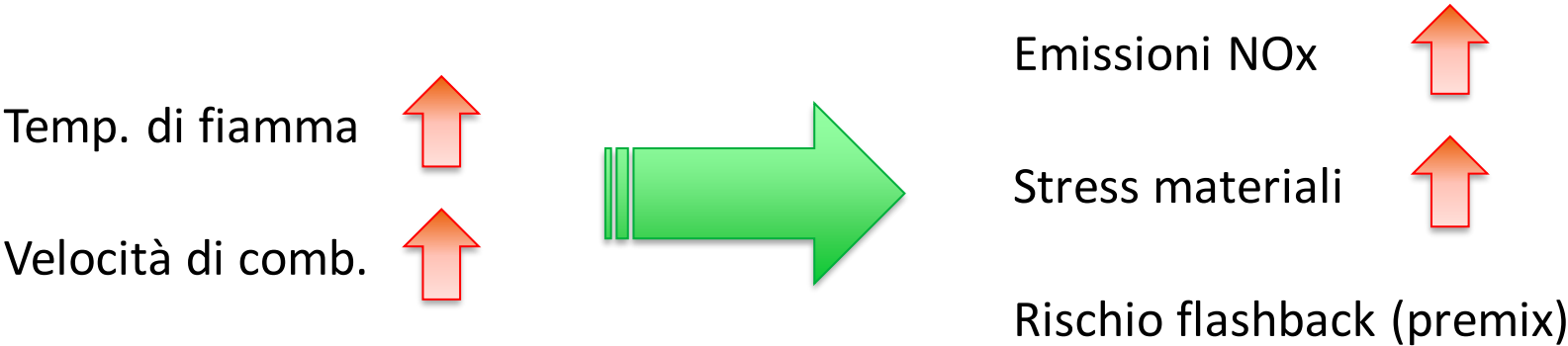


# Natural gas VS Hydrogen

## METANO

## IDROGENO

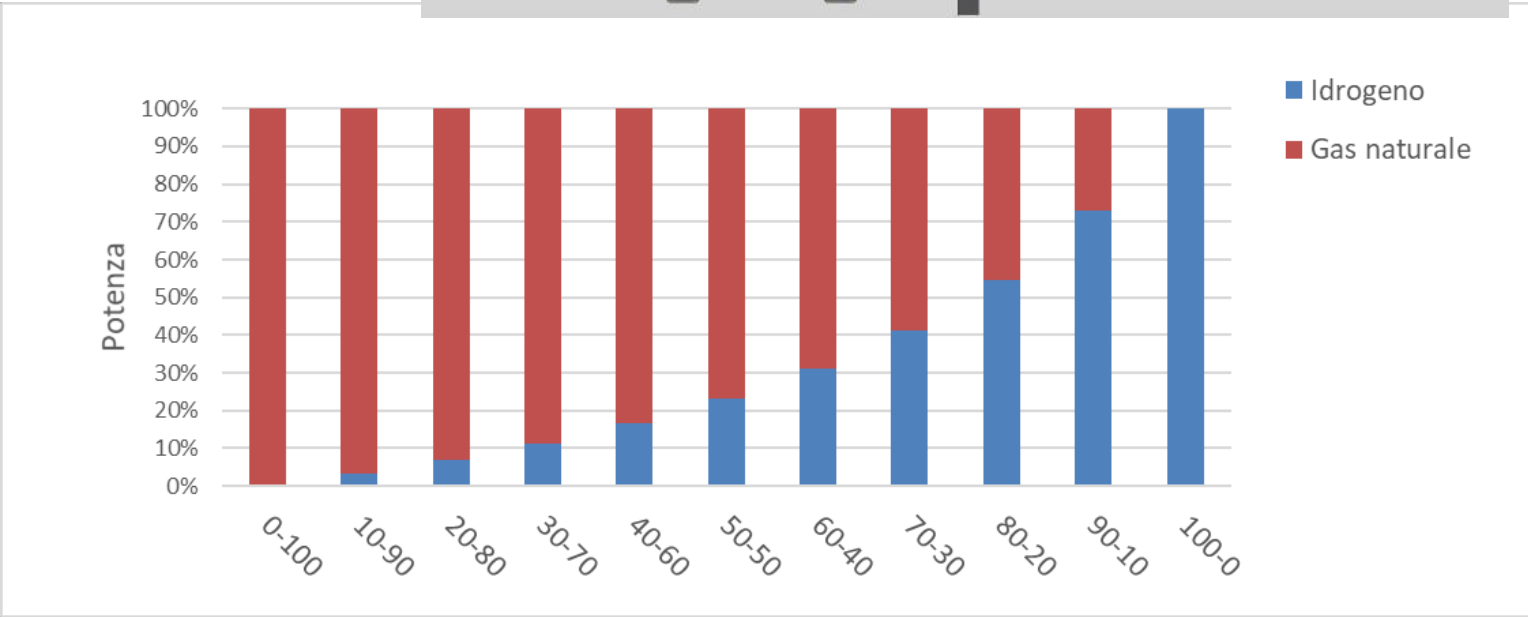
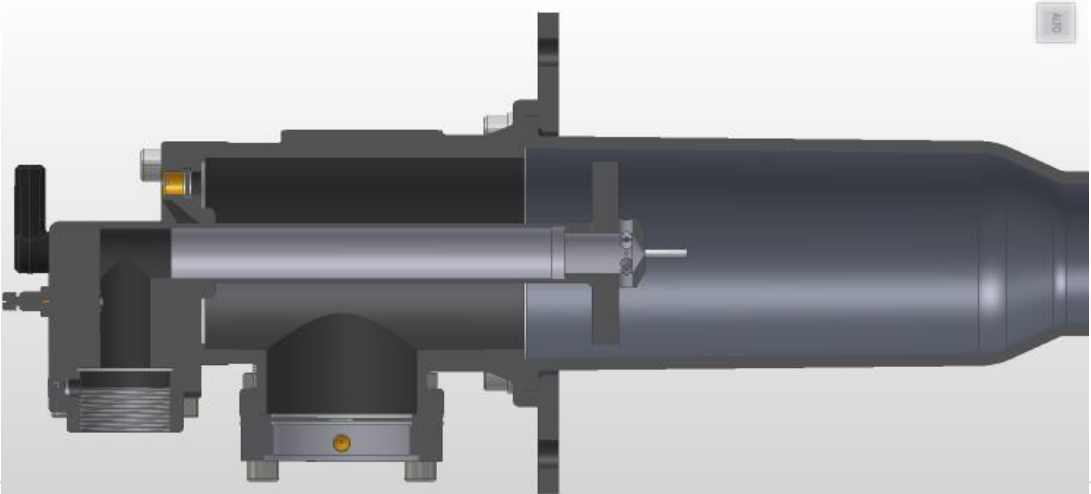
Vel. di combustione [m/s]	0,37	+730%	2,7
T di fiamma [°C]	2040	+8%	2200
Campo infiammabilità (in aria)	5-15%		4-75%





# CASE STUDY 1 - High speed burner

- Potenza 80 kW
- Nozzle mix
- Progettato per NG
- Da 100% NG a 100% H2
- T forno 600°C



# CASE STUDY 1 - High speed burner

IDROGENO

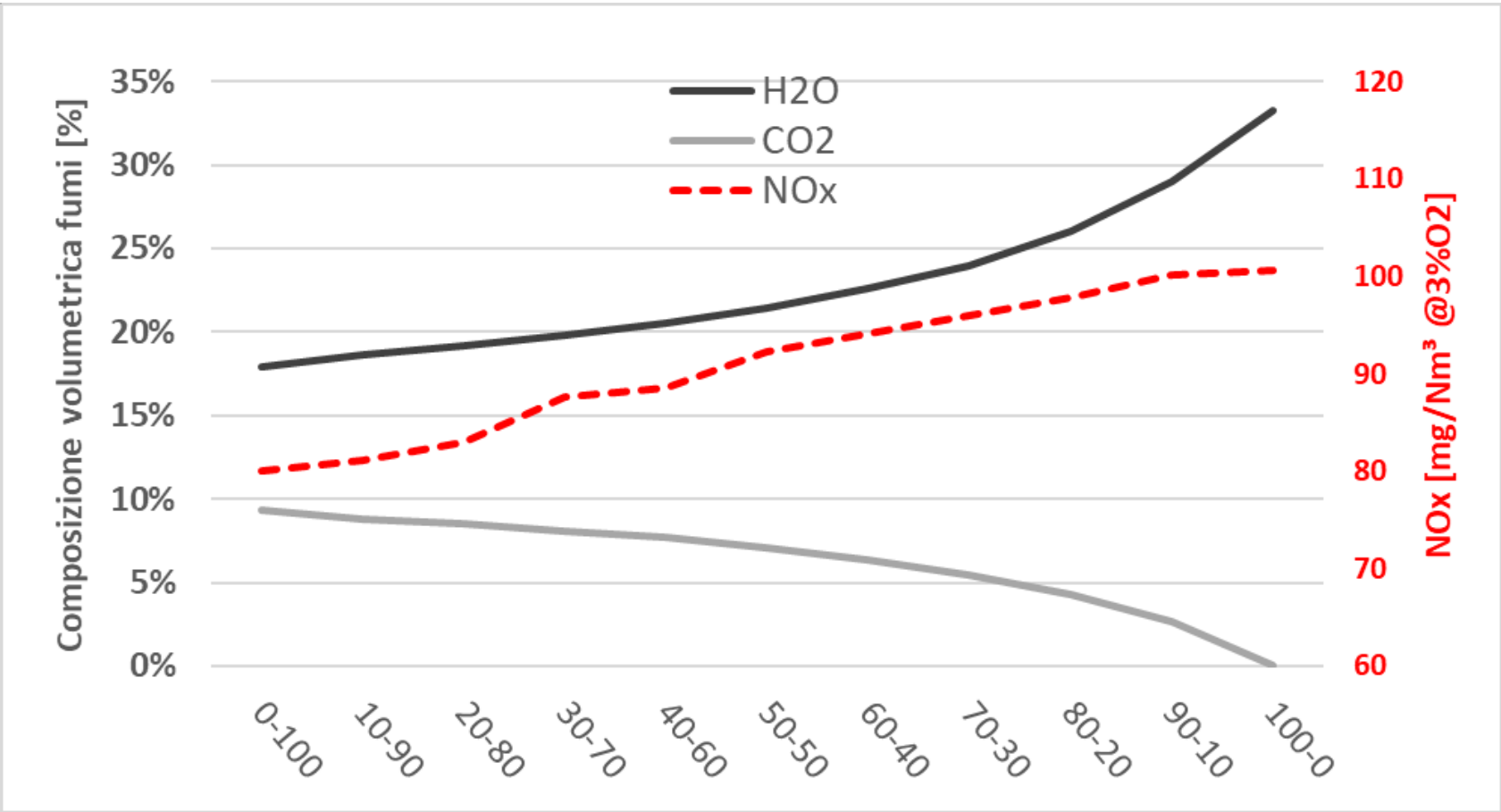


METANO





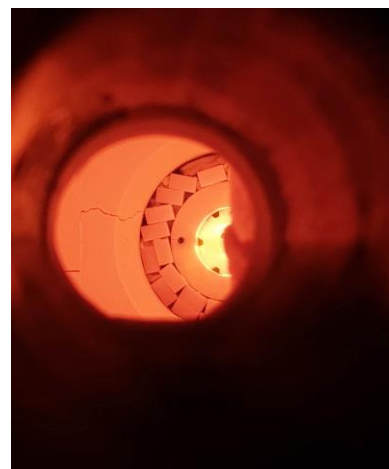
# CASE STUDY 1 - High speed burner



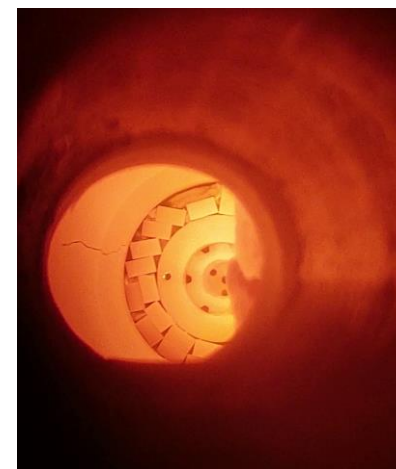
# CASE STUDY 2 – Regenerative flameless

## Test details:

- Burner model ESA REGE-6-NxT H2
- Fuel composition: from 100% NG to 100% H2
- Combustion power: 600kW (constant)
- Furnace temperature: 1100°C
- Regenerator air temperature: 850-950°C
- Flame mode + flameless mode



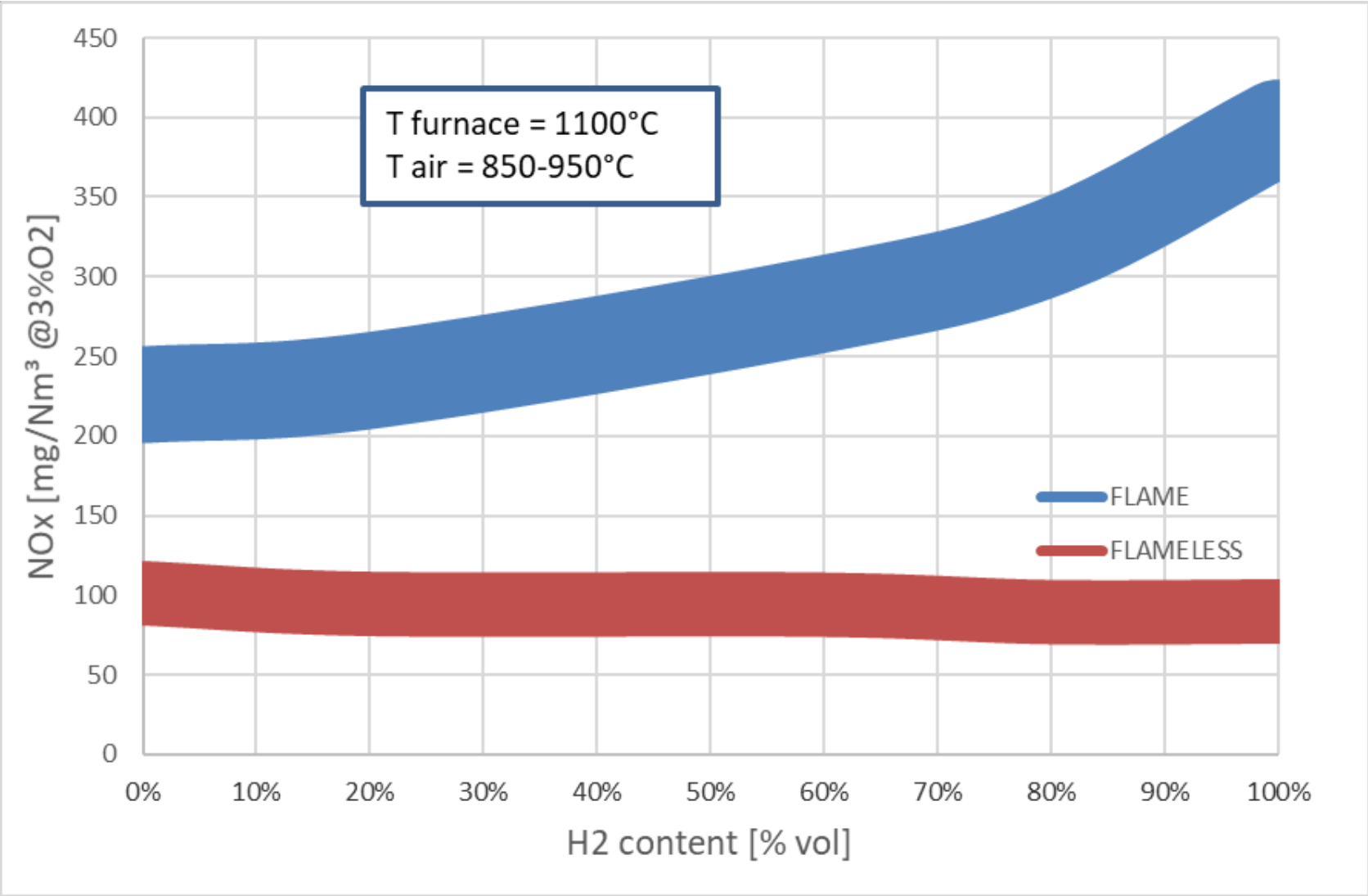
Flame H2 100%



Flameless H2 100%

TECHNICAL DATA ANALYSIS											
DESCRIPTION	UNIT	VALUE									
Instantaneous power	[kW]	589	576	560	583	568	589	576	560	583	568
Instant. PW/Nomin. PW ratio	[%]	98	96	93	97	95	98	96	93	97	95
Air flow	[Nm <sup>3</sup> /h]	630	610	580	560	530	630	610	580	560	530
NG flow	[Nm <sup>3</sup> /h]	57	52	38	26	0	57	52	38	26	0
Hydrogen flow	[Nm <sup>3</sup> /h]	0	13	56	105	190	0	13	56	105	190
Lambda	[mm]	1,16	1,16	1,17	1,13	1,17	1,16	1,16	1,17	1,13	1,17
Fuel volumetric composition	NG	100%	80%	40%	20%	0%	100%	80%	40%	20%	0%
	H2	0%	20%	60%	80%	100%	0%	20%	60%	80%	100%
Fuel Calorific power	[Kcal/Nm <sup>3</sup> ]	8900	7635	5132	3830	2575	8900	7635	5132	3830	2575
		FLAME					FLAMELESS				

# CASE STUDY 2 – Regenerative flameless



Thanks

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[www.esapyronics.com](http://www.esapyronics.com)

Ing. Michele Brena  
brenam@esacombustion.it