

# CALDEIRAS INDUSTRIAIS

*„H2 READY“*

João Ribeiro

28/02/2023

# Bosch pioneers to become truly CO<sub>2</sub> neutral

## Our path to climate neutrality



“When it comes to the climate, words are not enough. Companies need to aim for carbon neutrality, here and now.”

DR. VOLKMAR DENNER,  
CHAIRMAN OF THE BOARD OF MANAGEMENT

**From 2020 on Bosch is carbon neutral at its 400 locations worldwide.**



**Hydrogen boilers**



**Biogas boilers**



**Boilers for bio-oil and other liquid fuels**



**Waste heat recovery boilers**



**Hybrid boilers**



**Electric steam boilers**

# Decarbonisation of heating and process heat

## Specifics of using hydrogen



- ▶ Smallest atom in the world → diffuses through metal and impacts piping
- ▶ Flame temperature roughly 2000 °C → flame is not visible
- ▶ Heating value comparison with natural gas 1:3 → At 100 % hydrogen combustion three times the amount of gas volume is needed
- ▶ Several ways of hydrogen generation for power generation (examples)
  - ▶ „Blue“: Waste product of gas extraction
  - ▶ „Green“: Generated with green power

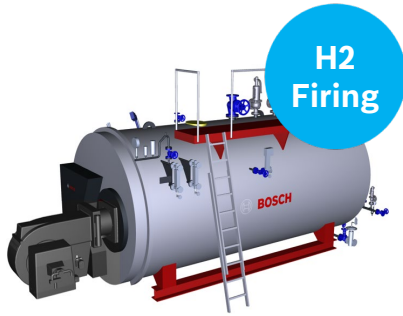
# Decarbonisation of heating and process heat

## Hydrogen firing

### Bosch Industrial can offer two solutions

#### Hydrogen Firing

Boiler and Burner fully equipped to burn H<sub>2</sub>. The main criteria to have 100% hydrogen firing in a project, is the availability of H<sub>2</sub>.



- Oversize boiler body +10%
- Special gas supply components
- External recirculation installed
- Fully equipped H<sub>2</sub> burner (+100%)

#### Hydrogen Ready

Boiler ready to burn 100% hydrogen. Burner, gas supply, controls, etc. has to be modified/replaced in the future to burn hydrogen.



- Oversize boiler body +10%

Advantages:

- Boiler has not to be replaced when using H<sub>2</sub>
- Bosch supports a CO<sub>2</sub> free future

If hydrogen becomes the “fuel of the future”, e.g. within the next 20 years, a burner replacement is pending anyway.

Main criteria for boiler selection and emissions is the current and future available fuel on site

# Decarbonisation of heating and process heat

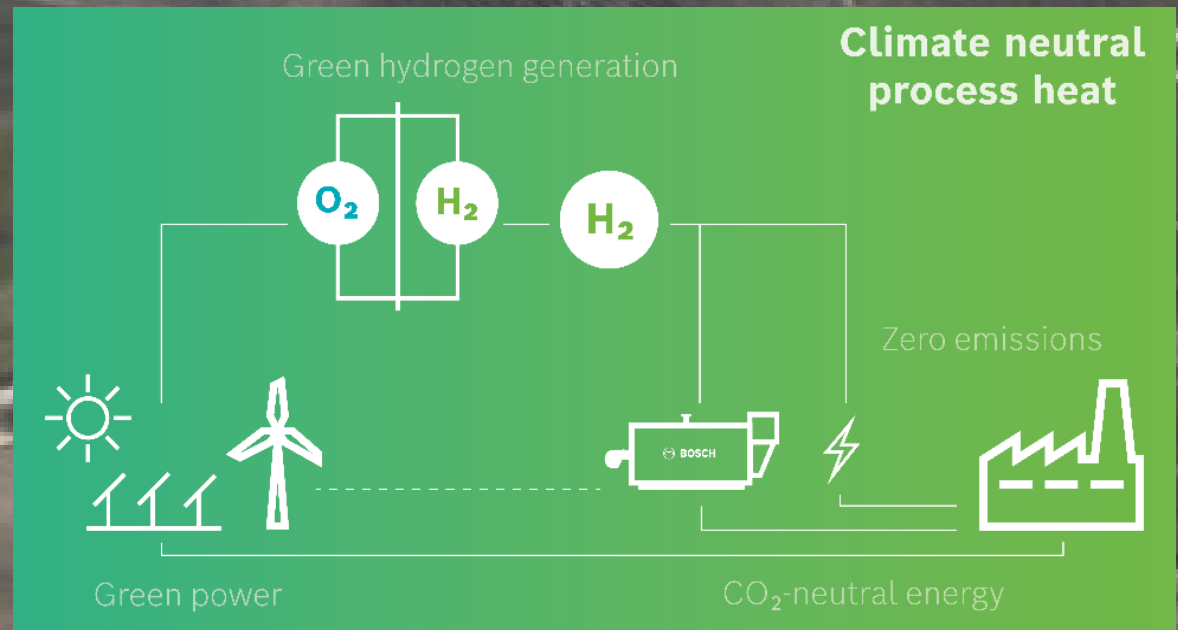
## Pharma-company Switzerland 20 t/h steam 13 bar



### Summary:

- ▶ Triple fuel for maximum reliability
- ▶ Priority 100 % H<sub>2</sub> when available
- ▶ Natural gas as secondary fuel
- ▶ Light oil as worst case backup on site
- ▶ Mini exhaust gas recirculation from reversal chamber for NO<sub>x</sub> optimization
- ▶ Soft ignition measure blending in H<sub>2</sub>

**Triple-fuel burner ideal solution for full flexibility and maximum availability.**



# Decarbonisation of heating and process heat

## 30 MW district heat with 100% biofuel



- ▶ Boiler and burner technology interact effectively
- ▶ Flue gas recirculation for low NOx levels
- ▶ An innovative cleaning system with compressed air avoids manual cleaning effort and optimises efficiency
- ▶ Clean, flexible and efficient combustion of biofuel
- ▶ Used biofuel from combustible residue of sunflower, rapeseed and other plant oils

**Constant efficiency up to 92% for bio oil –  
without condensing technology**



# Ready for the future with Bosch: Use alternative fuels in your project now or be prepared for its future use



## CO<sub>2</sub> neutral boilers

- Up to 100% CO<sub>2</sub> neutral
- Up to 100% hydrogen (H<sub>2</sub>)
- Up to 100% biogas
- Up to 100% biofuel/ethanol



## Hybrid boilers

CO<sub>2</sub> neutral electrical steam generation with regenerative power supply.

### Hybrid boilers

- Up to 5 MW heating coil combined with burner
- Hybrid-capable option for partial electric supply in the future



## Electrical boiler

- Pilot project since beginning of 2021
- Green steam generation with green electricity
- Available steam outputs from 350 to 7,500 kg/h

# Decarbonisation of heating and process heat

## Waste heat utilisation for cost-efficient process heat generation



**Waste heat boiler HRSB**

up to 4 t/h



**4-pass-boiler** up to 25 % of total capacity can be used as waste heat boiler



**Customised waste heat boiler**  
from 4 t/h

**Our innovative heat recovery systems**  
use existing waste heat sources for efficient heat or process heat generation.

# MODERNISATION OF STEAM BOILER SYSTEMS

REDUCING OPERATING COSTS – PRESERVING THE ENVIRONMENT



# OBRIGADO

[www.bosch-industrial.com](http://www.bosch-industrial.com)