

BDR THERMEA GROUP

THyGA WP4 workshop

BDR Thermea experience

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BDR Thermea experience: Test facilities

Since 2015 BDR Thermea Group and BAXI SpA have started activities to develop residential gas appliances operating with H₂.

During 2016 the BAXI Lab has been provided of all the test facilities to operate with both pure hydrogen and NG+H₂ blends.



Electrolysers for Green Hydrogen (25 m³/h)

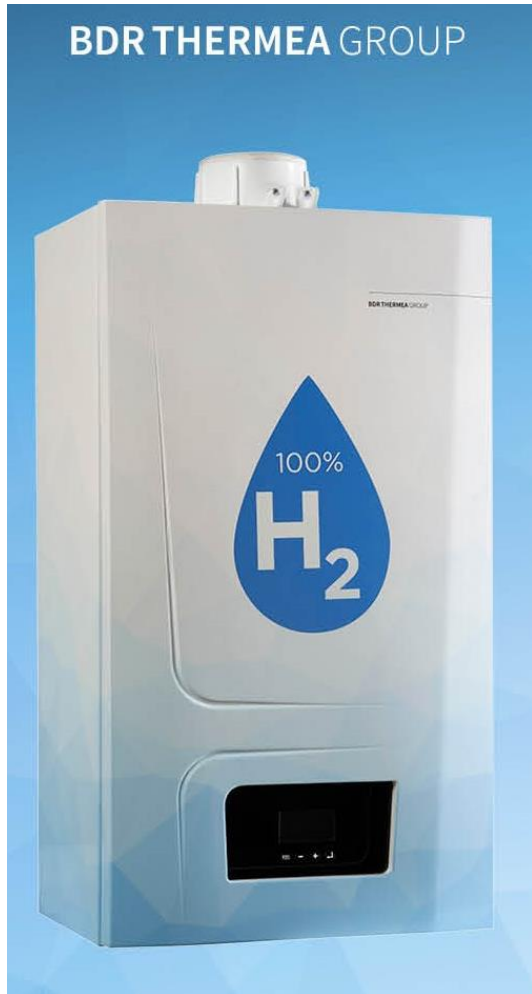


H₂ bottles Storage and mixing station



Mixing station

BDR Thermea experience: Pure H2 application



Hydrogen gas opens to opportunities, but risks must be considered:

H2 has different characteristics / features from NG (flammability range, ignition energy, density, laminar burning velocity, heat of combustion, detonation sensitivity/pressure rise, ...)

An H2 boiler should prevent itself:

- any explosion outside the combustion chamber because of gas leakage;
- any ignition of the gas/air mixture before the burner;
- any flashback also in case of wrong lambda used.

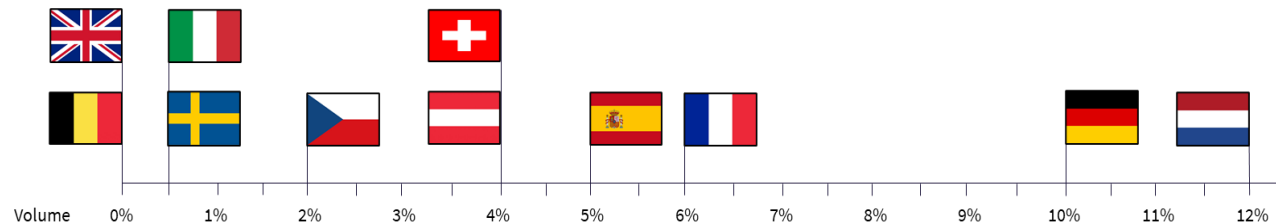
New European Standard, as well as the PAS 4444 UK standard, should consider all these risks related to H2 gas. **In this preliminary phase any incident in field will not be accepted and the available technology should be used to prevent any safety issue.**

BDR Thermea experience: NG+H2 blend

NG+H2 in blend is not new in our business!

Gas boilers operated with town gas for many years in the past in several Countries (e.g., EU, China, ...)

Most of the gas fittings are already suitable to operate with a NG+H2 blend and most of this components are approved for the 1st gas family (G110 with 50% H2) .



Because of the H2 volume in the distributed blend could be variable, a limit of H2 to a maximum of 20% is recommended.

From our point of view, it is important to consider:

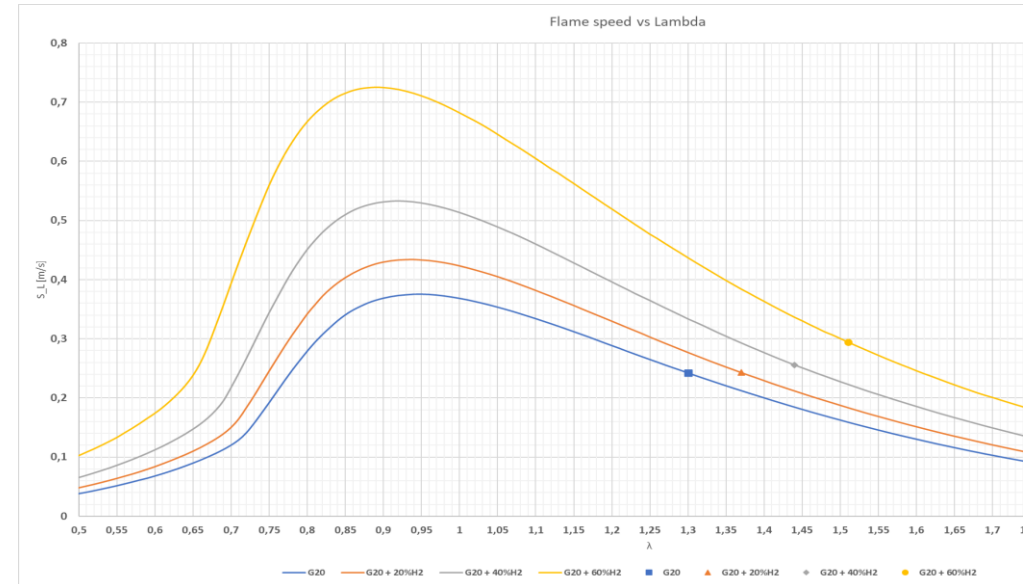
- **risks of wrong setting in the field by service people (in a fully premix boiler);**
(setting the gas valve for a low Ws blend (H2% max) and operating with a high Ws (NG) → the boiler works in overload, the CO and the burner temperature increase)
- **risks of the delayed ignition;** especially when the H2% is max and the setting is done with NG value (nominal lambda).
- **heat output & comfort reduction** for the end user (circa **5%**);

BDR Thermea experience: NG+H2 blend

- **Lambda is the most important parameter to consider for the evaluation of the operating margin**

Flashback is never an issue when the boiler is set to operate with NG. Also at 60%H2 the flame speed remains low because of the reduction of the W_s and the increase of the lambda.

Flashback could be an issue, increasing the %H2, only if it associated to a reduction of lambda.



- **Some Electronic Combustion controls based on ionisation current don't seem to react to the W_s change in case of presence of H2 in the blend.** This behaviour could be positive because it avoids any risk of adjustment in the field by service people and the boiler operates always in safe conditions.
- **Boilers with very high modulation ratio operating at min power could meet problems:** high burner temperature and flashback could happen more likely.

BDR Thermea experience: NG+H2 blend

Some considerations:

- BDRT/BAXI SpA is directly participating on several Working Groups connected with H2: THYGA, Hy4heat, TC109 ad hoc WG for H2, Assotermica Green Gas Group, UNI mirror Group, Notified Body.
- The risks associated to the use of the NG+H2 blends, as described in the previous slides, are not in our opinion an obstacle for the introduction of H2 in the NG grid.
- Use of a limit gas, to verify the operating margin for the flashback (e.g. G22 used for max 20%H2 blend), is consistent with the approach used today on EN15502 standards.
- Ecodesign / Energy labelling should not be impacted by the NG+H2 blend adoption for limited H2 content (up to 20%). Same approach should be used also for other applicable legislations.

BDR Thermea experience: NG+H2 blend

Some considerations:

- While the new boilers will be properly certified for NG+H2 blend (CE), approval for boilers already on the market remains an open point; field responsibility should be defined.
The CE approval of all the installed appliances seems unrealistic.
A manufacturer's declaration, together with safety instructions, should be in our opinion the minimum requirement in case H2 (10 ÷ 20 %) is added in the gas grid.
Old running products not GAR/GAD certified should not be considered for H2 blend and replaced.
- The possible use of a retrofit kit, should not be a problem for new CE approved appliances when the kit is part of the certification.
For BDRT boilers, according to the tests, the retrofit kit for NG+H2 blend up to 20% H2 is not necessary.
If it is not mandatory to certify already installed products in the field, in our opinion also the use of a retrofit kit should not be certified but just authorized by the boiler manufacturer.