Hydrogen at BDR Thermea Group

Manufacturer experience

Ir. Paul J. Gelderloos
BDR Thermea Group is a world leading manufacturer and distributor of smart climate and sanitary hot water solutions
Our brands

BDR Thermea Group is owner of the brands **Baxi, De Dietrich, Remeha, Brötje, Chappée** and **Baymak**. All of these trade brands have a long heritage and a unique position in the countries in which they operate.

A scroll through these market-leading names reveals decades and, in some cases, centuries of manufacturing experience and expertise.
BDR Thermea H₂ History

• 1950's: Town gas: >50% H₂; 25% CH₄; 8% CO; 2% CO₂; N₂

• 2008 – 2012: Ameland 15 boilers from 3 manufacturers
  field test up to 20% H₂
  first lab tests at 30% H₂

• 2019: CE approval for 20% H₂ admixture domestic NL

• 2019: Rozenburg
  First field test 100% H₂ boiler prototype

Proactive: Do not wait for the chain, but act and cooperate with chain partners
Hydrogen-ready boiler – what’s new?

**Technical:**
No details, but think of:
- burner (flame speed $\text{H}_2$: 7 x flame speed $\text{CH}_4$)
- flame detection
- controls
- sensors
- some other parts
- redundancy for ultimate safety at this stage
- even redundancy in the boiler room in first tests

**Cost:** competition rules
- hydrogen is rocket fuel, not rocket science
- additional cost not prohibitive
Status

- First prototypes: they are there ... but still prototype concept models
- First demonstrations just starting, often 1 year behind schedule due to delay in safety permit
- All manufacturers in phase of IP development
- Field test approved in line with GAD standards and additional risk analysis; limited number, supervision
- ★ 100% Hydrogen-ready boiler is not yet public available technology
- Real standards tailored for 100% Hydrogen-ready not yet available:
  - definitely needed
  - need for experience and open technology
  - after thorough field test and demonstration phase
  - review of Gas Appliances Regulation and its Essential Requirements?
- Too much eagerness can damage the whole hydrogen opportunity
Hy4Heat Timeline

- **2018**
  - WP1&9 PMC Managing WPs in preparation for a Community Trial
- **2019**
  - WP2 Quality and standards
  - WP7 Safety and risk assessment
  - WP3 Development of appliance certification
  - WP4 Development of certified domestic appliances and WP10 Metering development
- **2020**
  - WP5 Commercial appliances Understanding the market
  - Potential commercial appliance development
  - WP6 Industrial appliances Understanding the market
  - Potential industrial appliance development
- **2021**
  - WP8 Demonstration trials
  - Possible Community Trial
  - Hy4Heat ends
Leeds Citygate h21 Timeline

Source: Leeds Citygate h21 Report, July 2016
Timeline to mass production

Yes, manufacturers are very proactive and active and have reached a lot

But...
- Not open available technology yet
- Real large scale development will start first after proof of whole chain in larger scale demonstration projects, taking into account lessons learned
- Complete portfolio needed for conversion: all boilers + other gas appliances
- Standardisation, national roadmaps with gas sector needed
- Hydrogen production chain to be built up → start with admixture

So: yes, it will come, but
- → not yet ready for regulation now → next review
- → market can do its work: cf HD-ready
- → not everything needs to be done by energy label
- → do not contaminate energy label with all kinds of bonuses: incredible.
Cogeneration correction for electricity
Connected issues and finding the correct method
Ir. Paul J. Gelderloos
Cogeneration correction for electricity

• Connected issues:

  • Physically correct **weighted average** method:

    average \( \eta \) → average Specific Energy Consumption

  • Real world representative **CC-factor**:

    average PEF on Net Calorific Value → marginal PEF on Gross Cal. Value

  • Correct **Calculation method** for comparability and level playing field

## Calculation methods in Task 1 report

### Table 43. Overview of calculated CHP and package heating efficiencies according several methods

<table>
<thead>
<tr>
<th>CHP type</th>
<th>$\eta_{el}$</th>
<th>$\eta_{th}$</th>
<th>$\eta_{tot}$</th>
<th>$P_{th}$</th>
<th>$P_{th}/(P_{th}+P_{sup})$</th>
<th>$F_{pref}$</th>
<th>TM2014sh</th>
<th>EN 50465 / efficiency</th>
<th>PES</th>
<th>Carnot 45</th>
<th>EN 50465 / SEC</th>
<th>Carnot allocation (heat)</th>
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<td></td>
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<td>chp + sup</td>
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<td>chp + sup</td>
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</table>

In graphical form:

![Graph showing calculation methods](image)

### Date
Cogeneration correction for electricity
Packaged efficiencies from Task 1 – table 43

Date Cogeneration correction for electricity 14
Several methods kick out most efficient mCHP’s

Minimum Ecodesign requirement
Energy labelling Regulation 2017-1369:
(10) The provision of accurate, relevant and comparable information on the specific energy consumption of energy-related products facilitates the customer’s choice in favour of products which consume less energy and other essential resources during use.
Energy Consumption easily calculated from Table 43

Which efficiency method curve:
- complies with the shape and values of the energy consumption curve and
- leads the customer to the products that consume less energy?

Only the EN 50465 SEC method gives the perfect match and the leads to the lowest energy consumption.

This is technical, physical and LCA reality and cannot be subject to political manipulation. Leave it to the technical experts who have written the standard!

*: for the same amounts of heat and electricity
Back up slide: same with CC = 2.65