

Workshop “Standards for Ecodesign lot 1 and lot 2- where are we?”

Part 2 Overview of the mandated work to be done. Are standard ready?

Point 6 : **GAS HEAT PUMPS**

- 1 - What are the parameters to be measured (Marcello Aprile)
- 2 – Are the standards already updated? For GAHP (Marcello Aprile)
- 3 – Are the standards already updated? For engine based GHP (Jonas Wintermayr)
- 4 – Testing reproducibility expected (based on existing experience) GdFSuez – presented by Marcello Aprile
- 5 - Action on going or planned for the validation of the standard (HEAT4U) presented by Marcello Aprile

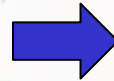
1 - What are the parameters to be measured

- Energy Seasonal Primary Energy Ratio
(including gas and electricity consumption)
- Noise Sound power level
- Emissions NO_x (CO, hydrocarbons, particulate matter)

2 - Are the standards already updated? GAHP (prEN 12309:2012)

Tasks of TC299/WG2:

- Revise EN12309-1:1999 (Safety) and EN12309-2:2000 (Rational use of energy) for GAHP with net heat input < 70 kW
- Address ErP and GAD
- Provide test and calculation methods for the determination of the seasonal primary energy ratio (SPER)



Present status:

- **prEN 12309:2012 ready (under approval)**
 1. Terms and definitions
 2. **Safety (under drafting)**
 3. Test conditions
 4. Test methods
 5. Requirements
 6. Seasonal performance
 7. Hybrid appliances

2 - Are the standards already updated? GAHP (prEN 12309:2012)

- $SPER = f(SGUE, SAEF)$ for space heating

$$SPERh = \frac{1}{\frac{prim_{gas}}{SGUEh} + \frac{prim_{elec}}{SAEFh}}$$

“prim” for gas = 1
“prim” for electricity (CC) = 2.5

$$SGUEh = \frac{\sum_{j=1}^n h_j \cdot Ph(T_j)}{\sum_{j=1}^n h_j \cdot \left(\frac{Ph(T_j)}{GUEh_{pl}(T_j)} \right)}$$

$$SAEFh = \frac{Q_{refh}}{\frac{Q_{refh}}{SAEFh_{on}} + H_{TO} \times P_{TO} + H_{SB} \times P_{SB} + H_{OFF} \times P_{OFF}}$$

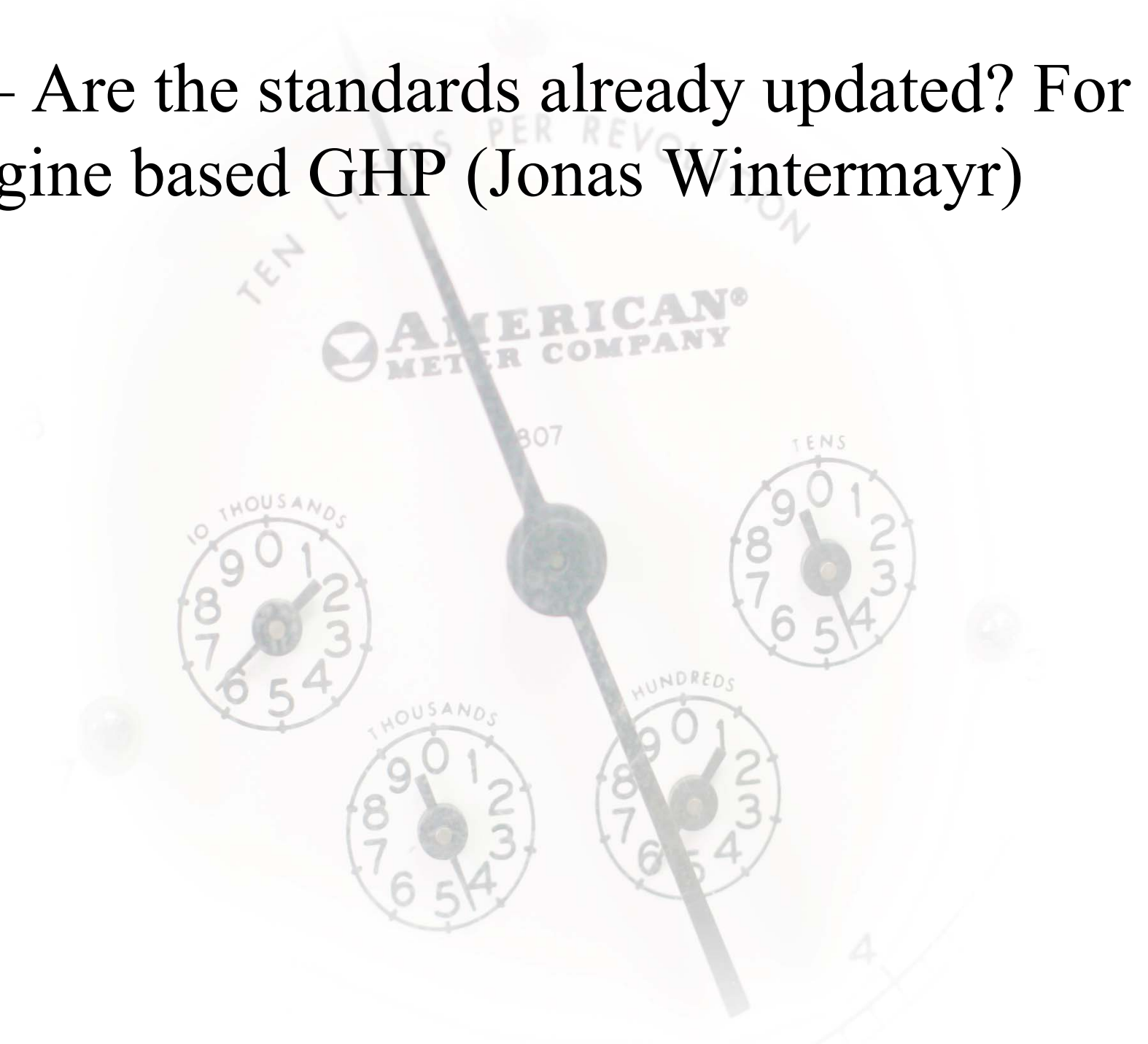
$$SAEFh_{on} = \frac{\sum_{j=1}^n h_j \cdot Ph(T_j)}{\sum_{j=1}^n h_j \cdot \left(\frac{Ph(T_j)}{AEFh_{pl}(T_j)} \right)}$$

2 - Are the standards already updated? GAHP (prEN 12309:2012)

- Test methods (Part 4)
 - Steady state
 - Transient (defrosting)
 - Cyclical (on/off)

Permissible deviations on individual measured quantities (temperature, flow rate, gas input, power input,...) and much more ...
- Part load conditions (Part 6)
 - depending on climate (Average / Colder / Warmer)
 - Part load ratio | Outdoor HX | Indoor HX

3 – Are the standards already updated? For engine based GHP (Jonas Wintermayr)



4 – Testing reproducibility expected (based on existing experience)

Part 4 of the PrEN 12309 has been written based on :

- Previous tests performed with the current standard EN 12309-2:2000 by at least 3 laboratories (GDF SUEZ, CETIAT and CEMAFROID)
- Full and part load efficiency measurements for boilers (– contract N° MAT 1-CT92-009 funded by the European Union under MEASUREMENTS & TESTING programme – Directorate General XII – final report – June 1996)
- Pr EN 14825 (June 2010), Air conditioners, liquid chilling packages and heat pumps with electrically driven compressors for space heating and cooling – Testing and rating at part load conditions

4 – Testing reproducibility expected (based on existing experience)

According to this knowledge and with the aim to obtain reproducible tests, the following have been included in the prEN 12309-4 :

- Uncertainties criteria for individual values measured (temperature, flow rate, calorific value....)
- Permissible deviations (in steady, transient and cyclical operations) for individual values but also for GUE in steady and cyclical operations)
- For brine/water or water/water version, an energy balance is suggested

A similar approach can easily be adapted for the standard that will be written for engine driven heat pumps (WG3)

5 - Action on going or planned for the validation of the standard

HEAT4U project : **monovalent / heating mode only, air-to-water GAHP**

Test plan:

- 1) Testing of the 1st prototype (joint activity involving 4 labs, this year) → objective : follow the Pr EN 12 309 and implement the draft during the consultation period
- 2) Testing of similar prototypes in different labs (next year) → improve the laboratory skills in term of test reproducibility

Test of a **hybrid (or bivalent unit)** by GDF SUEZ → objective : follow the Pr EN 12309 and implement the draft during the consultation period

Critical aspects: combustion air, flue gases, part load compensation system, defrosting