

# ENGINE BASED GHP

In LOT 1 & LOT 2 of Ecodesign Directive

Actual situation regarding criteria and testing

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## Engine based GHP in Ecodesign LOT1 & LOT2

### **LOT 1 Space heaters & Combination heaters**

- GEHP were firstly developed for cooling operation (fin spacing, control pattern etc.) and optimized for VRF systems. Now they are utilized in Air/Water applications too.
- The usage of GEHP for water based space heating systems in the sense of Ecodesign is optimized if the “waste engine heat“ is used as a by-product while the main application is another one.

Comment: Regarding above statements it should be considered if GEHP should be only included in the scope of LOT 1, as the product due to its flexible usage is already touched also by LOT 2, 10, 21, ENTR LOT 6. At least there should be included some additional explanation or article treating a multi usage product such as GEHP.

\*GEHP = engine based (abbreviation in order to distinguish from absorption or adsorption technology)

## Engine based GHP in Ecodesign LOT1 & LOT2

### **LOT 2 Water heaters & hot water storage tanks**

- Same remarks like in LOT 1 are also valid for LOT 2
- in addition to the summary given under LOT 1 it must be understood that the usage of GEHP for a single water heater purpose only under economic point of view is not debatable at all

Comment: Regarding above statements it should be considered if GEHP should be included in the scope of LOT 2, at least there should be included some additional explanation or article treating a multi usage product such as GEHP.

\*GEHP = engine based (abbreviation in order to distinguish from absorption or adsorption technology)

## Engine Based GHP test standards

Main values to be covered by testing standards:

- Rated COP/EER(PER) at nominal conditions including primary energy and electric energy to be comparable with electric heat pumps or air conditioners. However due to the modulating operation in average European climate with > 95% in partial load condition those data has limited usage by considering lifetime costs. Therefore seasonal based test points are essential.
- Production of cooling energy + heating energy (air and/or water at the same time) + generating electricity at the same time
- Methodology of waste heat recovered as contribution to the global efficiency.
- Exhaust emissions (Nox, CO, HC) as yearly average values and not single peak values in nominal condition.
- Maximum noise levels
- Include both air/air and air/water systems

## Engine Based GHP test standards

There exist several test standards for testing heat pumps in Europe like:

**EN 14511** for standard COP, EER in general test (electrical heat pump)

**EN 14825** for SEER, SCOP (electrical heat pump)

**EN 16147** for COP of DHW

**EN 15502** test and classification of gas boilers

**EN 12309-1, -2** for safety and test of gas driven adsorption and absorption heat pumps

Following standard for the sound test: EN 12102:2008

Following standard for the NOx test: EN 15502-1:2010

None of those existing standards is suited for GEHP

## GEHP in CEN-TC299 new test standards to be developed

<b>Proposals :</b> Gas-fired endothermic engine heat pumps air-conditioning and/or heat pump appliances with a net heat input not exceeding 70 kW”	<b>Comments</b>	<b>Mirror norms</b>
<b>EN XXXXX-1 : Part 1 : Terms and definitions.</b>	Chapter “terms and definitions” may be based on European standards EN14511-1 (EHP) and also on Pr EN 12309-1 (GAHP).	EN 14511-1 Pr EN 12309-1
<b>EN XXXXX-2 : Part 2 : Safety.</b>	This part Safety part may be based Pr EN 12309-2	Pr EN 12309-2
<b>EN XXXXX-3 : Part 3 : Test conditions.</b>	Different tests conditions could be introduced according to the technologies and to the applications. It lists the test points necessary for the seasonal performances calculation defined in part 6.	EN14511-2 EN 16147 Pr EN 12309-3
<b>EN XXXXX-4 : Part 4 : Test methods and results in heating and Cooling mode.</b>	<ul style="list-style-type: none"> <li>- Description of test protocols for permanent running, with and without defrosting when relevant at different loads,</li> <li>- Description of test protocols for on/off running, with or without defrosting when relevant at different loads,</li> <li>- Electricity consumptions included,</li> </ul>	EN14511-3 Pr EN 12309-4
<b>EN XXXXX-5 : Part 5 : Requirements.</b>	This part Requirements may be based on EN 14511-4 and Pr EN12309-4,	EN14511-4 Pr EN 12309-4
<b>EN XXXXX-6 : Part 6 : Calculation of seasonal performances in heating and Cooling mode.</b>	The redaction of this part may be based on those standards : EN 14825, 16147 and Pr EN12309-6,	EN14825 En 16147 Pr EN 12309-6

## Required New Standards for engine based GHP Proposal

### Other complementary sources to be considered

- Include parts of JIS B 8627-1:2006 (international reference ICS 97.100.20) GEHP General requirements in the new standards, especially the average concentration method of NO<sub>x</sub>
- Consider also JIS B 8627-2:2000 and JIS B 8627-3:2000 GEHP testing and rating for performance by specifying the test methods
- Consider all the experience of the Asian market, manufacturers and bodies

## Limits for GEHP in working documents

2009/125/EC (Lot1 & Lot2)

Sound power level with rated heat output:

$12\text{kW} < Q_h \leq 30\text{kW}$ : 70dB indoor / 75dB outdoor

$30\text{kW} < Q_h \leq 70\text{kW}$ : 80dB indoor / 85dB outdoor

Tolerance +1,5dB

For GEHP those limits are within a realistic range

NOx emissions:

240mg/kWh fuel input

Tolerance +20%

For GEHP this limit should be considered in accordance with the technology and its evolution. It should be applied to yearly average operation and not to nominal conditions at 100% load.