

GASQUAL project: a step closer to gas quality harmonization in Europe

Jean Schweitzer

Danish Gas Technology Center Denmark
Coordinator GASQUAL

Francois Cagnon

GDF SUEZ – DRI-CRIGEN France
Convenor CEN BT WG 197

GASQUAL project

- The scene: Gas quality & internal gas market
- GASQUAL project description
- Results
- Conclusions



Gas quality & internal gas market



Gas Quality and the internal market

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- ★ Liberalisation
 - ★ National markets with national specifications
 - ★ Market integration means diversification of gas sources
 - ★ Increase of import-dependency
 - ★ Growing importance of LNG
 - ★ Different gas sources = different gas qualities
- → Need for an harmonized gas quality standard



Harmonized gas quality standard

For Gas Quality (Natural Gas H)

Phase 1 : Study GASQUAL: Impact of gas
quality variations on appliances (safety,
operational, emissions, efficiency)

Phase 2 : Standardisation



GASQUAL Project

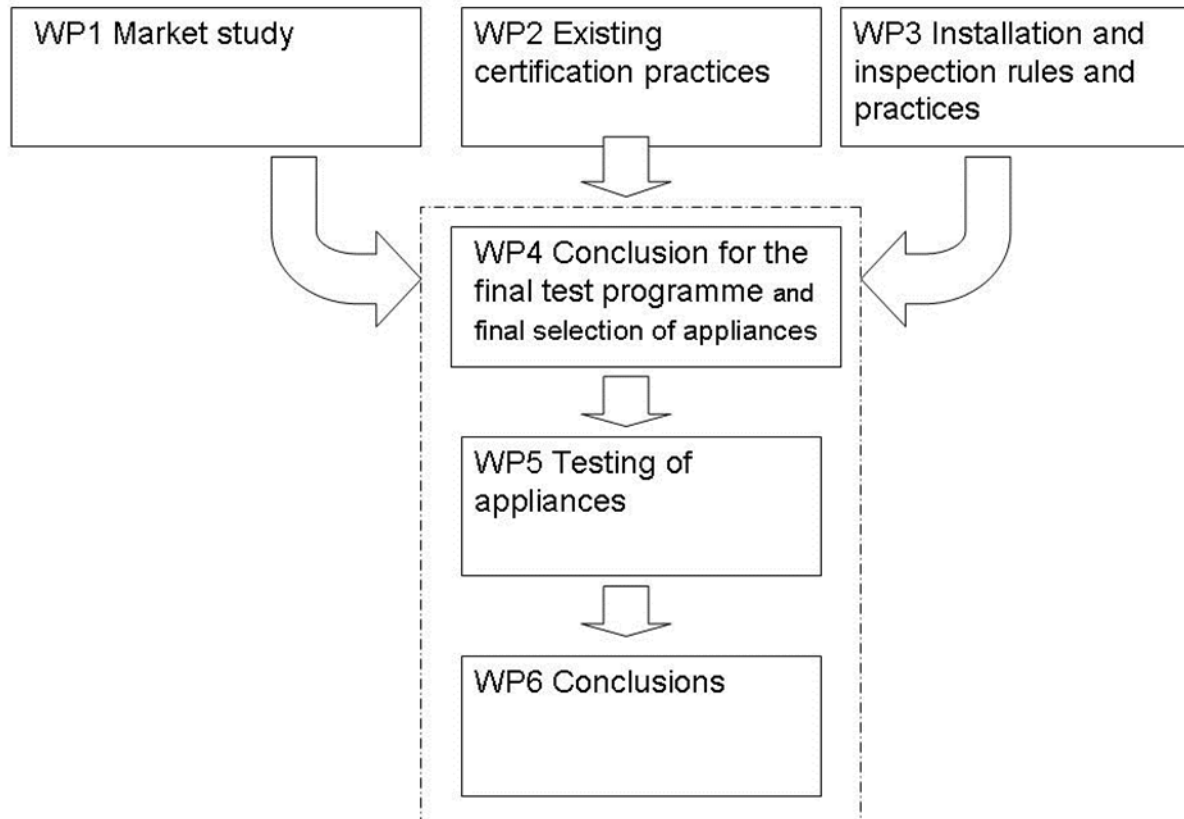
GASQUAL works under the supervision of
CEN BT WG 197

GASQUAL Consortium

- Coordination DGC – Denmark
- 16 EU partners (from 9 Countries)
- 5 laboratories involved

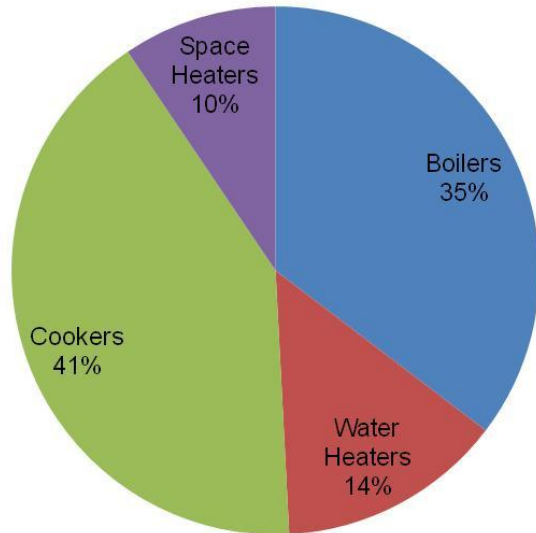


GASQUAL work

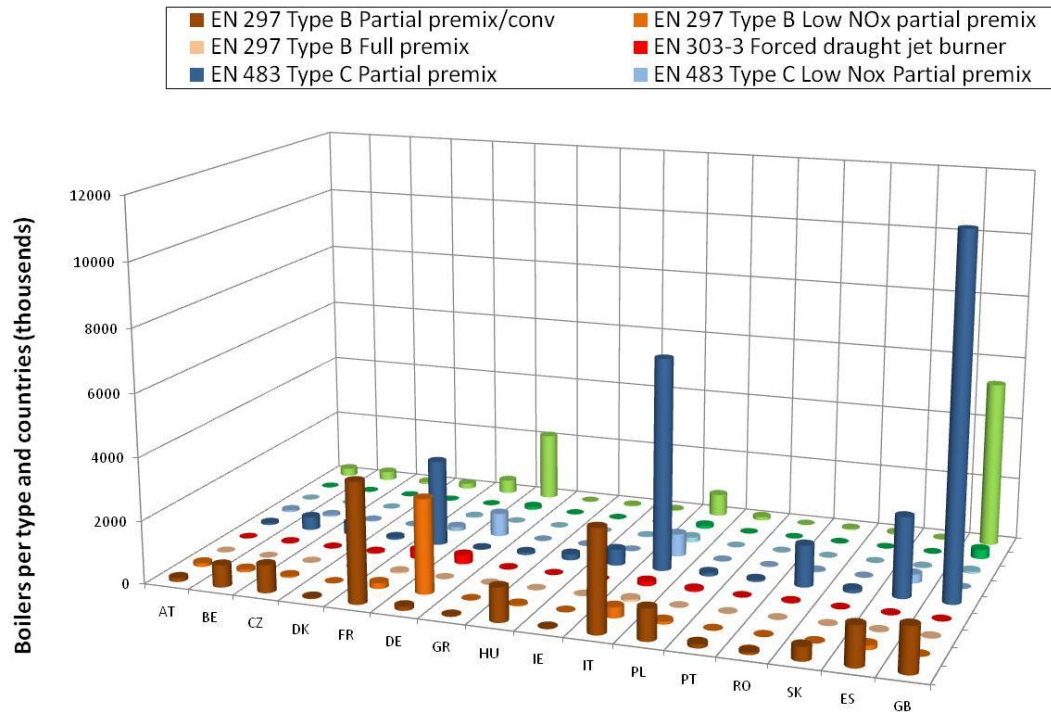


Gas appliances in EU

Domestic appliances in EU: 167 millions



- Non domestic appliances ± 20 millions
- Focus on boilers (59 millions)

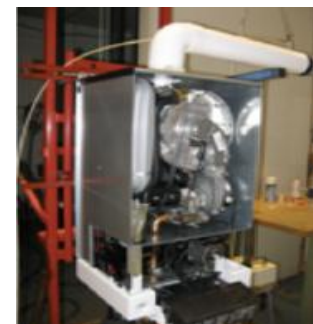


Choice of sample

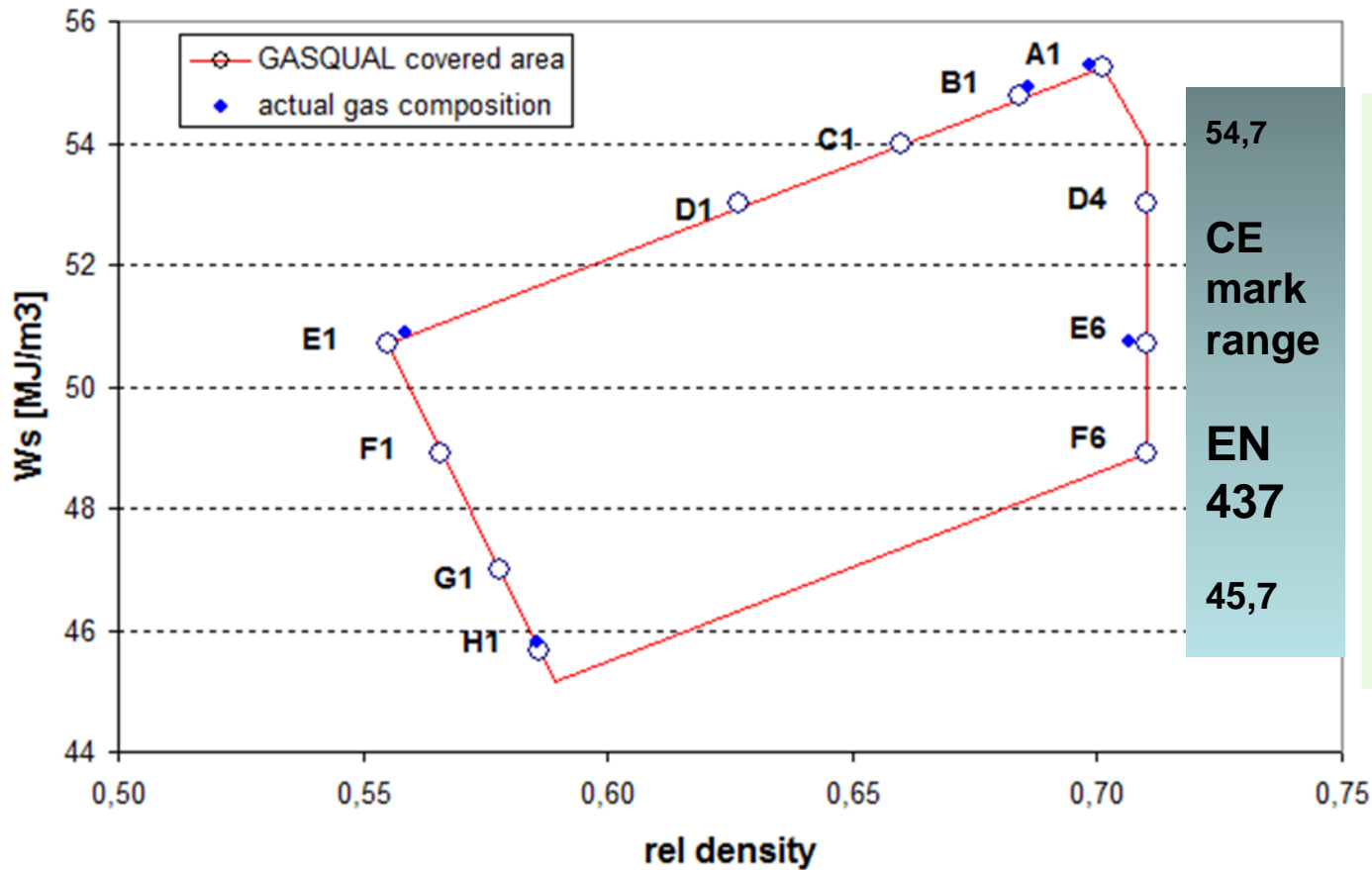
- About 100 appliances tested
- Segmentation based on:
 - Product standard (EN)
 - Burner types
 - ...
- Number of appliances per segment
 - Risk assessment taking into account:
 - Theoretical sensitivity to gas quality variations
 - Number of appliances in segment
 - Air gas ratio adjustment increased sensitivity

APPLIANCE SEGMENTATION

- SEGMENT 01 EN 677 Room Sealed Condensing Boiler
- SEGMENT 02 EN 30. Atmospheric Partially Aerated – Single Ring Built-in Hob
- SEGMENT 03 EN 303-3 Forced Draught Burner
- SEGMENT 04 EN 297 Open Flued. Low NOx PreMix - Atmos.with and without cooling rods & water cooling Boiler
- SEGMENT 05 EN 483 Room Sealed. Low NOx Partial PreMix Boiler
- SEGMENT 06 EN 30 Partially Aerated Surface Combustion Grill Burner Grill on a Free-Standing Cooker
- SEGMENT 07 EN 483 Room Sealed. Partial PreMix/Conv (Atmos. & fanned) Boiler
- SEGMENT 08 EN 483 Room Sealed. Full premix - fanned Boiler
- SEGMENT 09 EN 26 Instantaneous Water Heater Open Flued. Partial PreMix/Conv
- SEGMENT 10 EN 30. Partially Aerated Oven Burner Oven on a Free-Standing Cooker
- SEGMENT 11 EN 297 Open Flued. Partial PreMix/Conv (Atmos. & fanned) Boiler
- SEGMENT 12 EN 297 Open Flued Full premix - fanned With a fanned fully pre-mixed burner. Boiler
- SEGMENT 13 EN 613 Open Flued Live Fuel Effect Gas Fires
- SEGMENT 14 EN 30 -Partially Aerated Ribbon Type Grill Burner. Grill on a Free-Standing Cooker
- SEGMENT 15 EN 613 Open Flued Radiant Gas Fires - Partial PreMix/Conv
- SEGMENT 16 EN30-Partially Aerated Oven Burner Built-in Oven
- SEGMENT 17 EN 509 Open Flued Decorative Gas Fires- Partial PreMix/Conv
- SEGMENT 18 EN 30-Atmospheric Partially Aerated – Multi-Ring Built-in Hob
- SEGMENT 19 EN89 Storage Water Heater Open Flued Partial PreMix/Conv
- SEGMENT 20 EN26 Instantaneous Water Heater Room Sealed Partial PreMix/Conv (Atmos. & fanned)
- SEGMENT 21 EN 613 Room Sealed Wall Heaters-Partial PreMix/Conv
- SEGMENT 22 EN 613 Room sealed Live Fuel Effect Gas Fires Partial PreMix/Conv
- SEGMENT 23 EN 14829 Flueless Gas Fires- Partial PreMix/Conv
- SEGMENT 24 EN 613 Open Flued Room Heaters Floorstanding Partial PreMix/Conv
- SEGMENT 25 EN 677 Room Sealed Condensing. Partial PreMix Fanned Boiler
- SEGMENT 26 EN 13278 Open Flued Fanned Live Fuel Effect Gas Fire-Partial PreMix/Conv
- SEGMENT 27 EN 778 Open Flued & Room Sealed Ducted Air Heaters- Partial PreMix/Conv (Atmos. & fanned)
- SEGMENT 28 EN89 Storage Water Heater Room Sealed Partial PreMix/Conv (Atmos. & fanned)
- SEGMENT 29 EN 1458 Tumble Dryer



Testing points



For each gas
Tests at different
• Pressure
• Span

Test at Min and
Max load (mod)

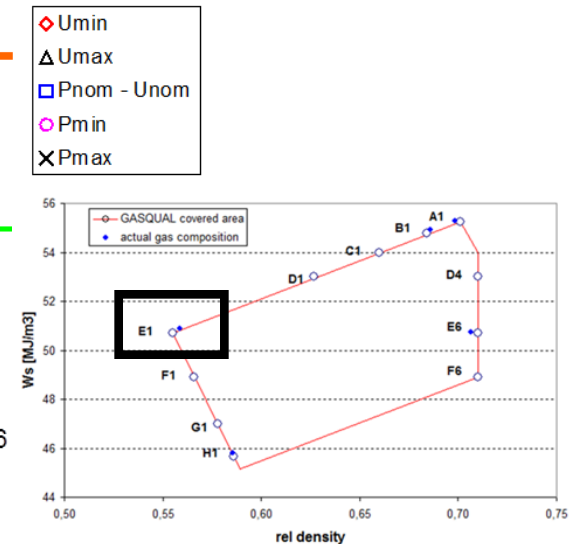
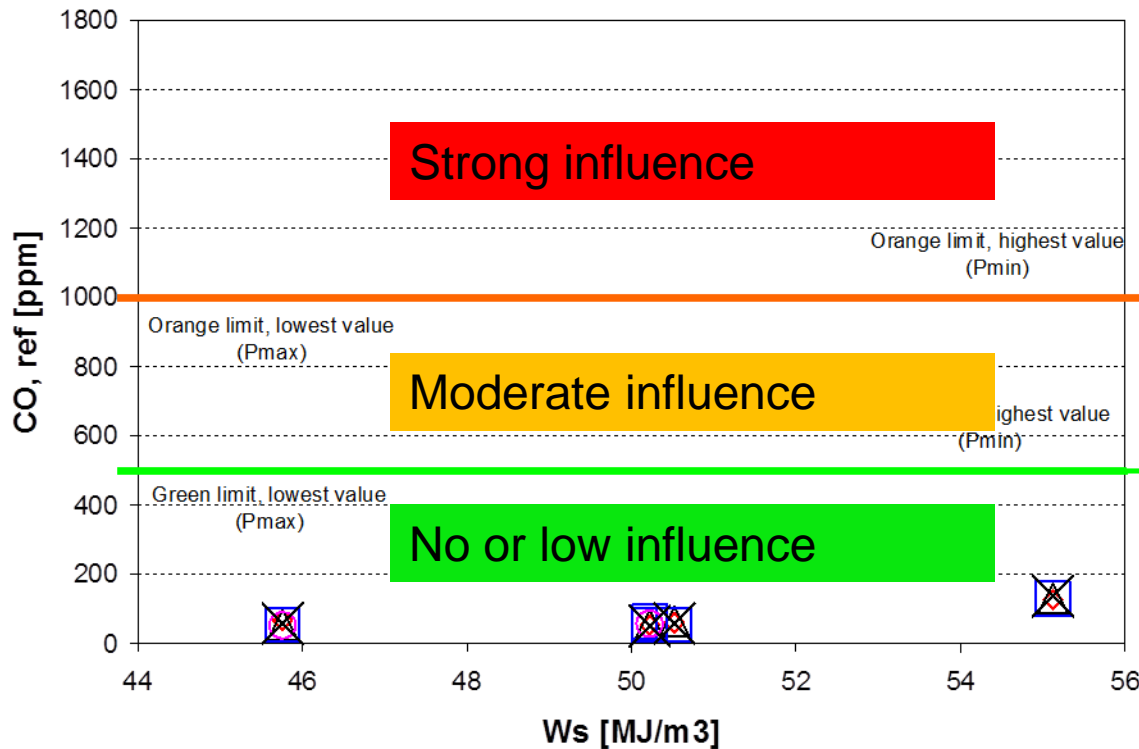
Test at G1 & B1
Setting (adjustable)

For GASQUAL Wobbe index is always expressed in MJ/m³ 15 °C, 15 °C 1013.25 hPa

Exemple segment 1: E1set

Adjustable Condensing boiler
Modulating burner
En 677

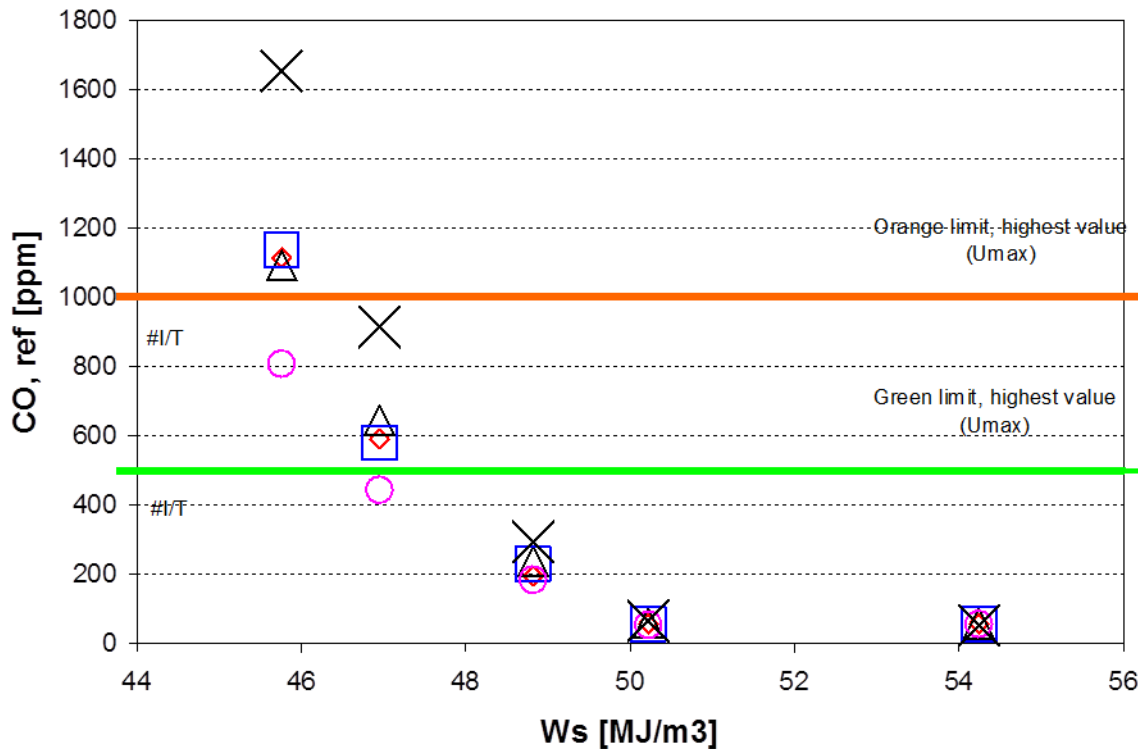
Maximum load, E1 adjustment



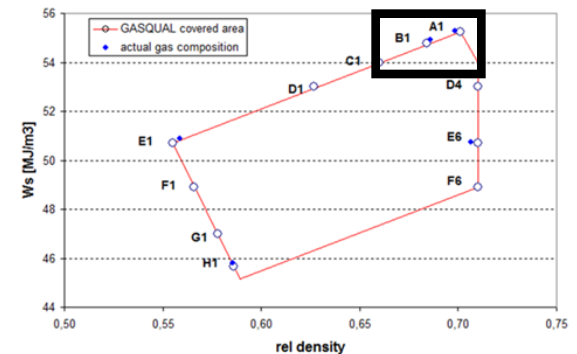
Exemple segment 1: B1set

Adjustable Condensing boiler
Modulating burner
En 677

Maximum load, B1 adjustment



About 10 Million of Boilers out of 167 Million of EU appliances can be adjusted



Overview of results by product type (safety & operation)

- **No or low impact of Wobbe variations** on adjustable boilers if no field adjustment in the range 45.7-54.7 MJ/m³. When adjusted, very sensitive to gas quality variation particularly if adjusted on rich gas and fed lean gas.
- **Low impact of Wobbe variations** on other boilers in the range 46-54. **Moderate impact** for 27 million (segment 7) and some uncertainty on real effect for 14 million (segment 11) **on the upper part (53-54)**
- **Moderate impact of Wobbe variations** for forced air burners (segment 3, 0.9 million) starting at different Wobbe depending on the country. The same applies for full premixed boilers sealed and open flue (segments 8 & 12, 0.47 million)
- **For cooking appliances** there is no strong impact in the range 46-54.7, but :
 - Segment 6 is sensitive to Wobbe over Wobbe 53 (moderate influence)
 - Segment 10 results are very inaccurate (because of the very high air excess).
- **Fires** are not impacted in the range 46-54.7 except from segment 15 (CO issues above 53)
- **Water heaters** present a **moderate (>52) to strong (>53) impact** with rising CO emissions. The effect is mainly due to the combined influence of high Wobbe and high pressures (those appliances are not equipped with pressure regulators).

Scenarios and impact

- Total number of domestic appliances installed in the EU is about 167 Millions
- The percentage of those presenting no or low impact on safety and operation with Wobbe variations within the following ranges are:
 - 46 - 50.8 → 75 %
 - 46 - 52.2 → 60 %
 - 46 - 53.5 → 45 %
 - 46 - 54.7 → 35 %
- Condensing boilers with fully premix burner (5 % of EU population) may present problems in case they have been adjusted very quickly with gas quality variations
- Those ranges could be expanded if moderate impact can be accepted.

Remedies?

- In most of the cases with high or moderate impact of the Wobbe it is due to the combination of Wobbe variation AND variation of another parameter such as gas pressure or voltage and not Wobbe variation alone. As a result there are for some appliances also ways to reduce the impact with adequate technical solutions (e.g. Pressure regulators).
- When readjusting appliances to G20 set, the appliance can perform well again over the range investigated
- Use of combustion control will also be a possible solution (as Scott system)

Efficiency & NO_x emissions

- An increase of the Wobbe distributed will result in a general increase of NO_x emissions and a slight increase of efficiency.
- A decrease of the Wobbe will bring opposite results.
- Appliance performances are measured on reference gas G 20 (methane) at the middle of the range.
- If the average of gas distributed remains unchanged, there is no impact on Eff. & NO_x.

Non domestic appliances

- No test done for non-domestic
- Extrapolation of results obtained on similar tested domestic appliances
- Size effects?
- There are some specific issues for some products

Limitations & uncertainties

- Aging effect on appliances with or without maintenance (mostly new appliances tested)
- Appliances non compliant to the GAD (gas appliance directive)
- Other

What now?

- CEN BT WG 197 to put these results in perspective with the national situations and formulate recommendations for standard
- Current study highlight different approaches
 - Appliance manufacturer may consider H range as virtual i.e. in a given location gas quality is stable
 - Network operators and suppliers want to use widest range for safety of supply and economic reason inducing variations
 - Authorities want efficient and low environmental impact use of gas
- Good balance to be found, thus the need for discussion based on facts and data as brought by this study.

Thank you for your attention

Jean Schweitzer

Danish Gas Technology Center Denmark
Coordinator GASQUAL

jsc@dgc.dk

Francois Cagnon

GDF SUEZ – DRI-CRIGEN France
Convenor CEN BT WG 197

francois.cagnon@gdfsuez.com

