“Third Workshop” on Potential Standards and Labelling for Water Heaters in Pakistan

WELCOME

HIMA^Verte

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Efficient Appliances for People & the Planet

Programme

11.00-11.10	**Welcome and Introductions**	**Salman Zaffar** HIMA^Verte
11.10-11.20	**Overall Goal, Current Progress and Short Term Objectives**	**Salman Zaffar** HIMA^Verte
11.20-12.10	Summary options to improve product performance and realistic goals in Pakistan **– with group input**	**Winton Smith** **Stuart Jeffcott** CLASP Consultants
12.10-12.20	**Agreement on target performance parameters and MEPS**	**Salman Zaffar** HIMA^Verte
12.20-12.40	Identification of any issues with current test method(s) and potential solutions **– with group input**	**Winton Smith** **Stuart Jeffcott** CLASP Consultants
12.40-12.50	**Agreement on proposed revisions to the test methodology**	**Salman Zaffar** HIMA^Verte
12.50-13.00	**Final inputs and close**	

Participant Introductions

Present at the meeting physically

- Hammad sb – Super Asia
- Tajammul sb – Canon
- Engr. Waseem – PSQCA
- M. Ismaiel Khan – PSQCA
- Salman Zaffar – CLASP/HIMA^Verte
- Stuart Jeffcott – CLASP
- Ali Hassan Habib – CLASP/HIMA^Verte
- Abdul Rehman – CLASP/HIMA^Verte

Joining Online

- Abdul Qayyum – NasGas
- Khuram Shahzad – Waves & Singer
- Dr Ainy Zehra – PSQCA
- Ashraf Palari sb – PSQCA
- Kaleem Ahmed – PSQCA
- Asad Mahood – NEECA
- Muhammad Umer – NEECA
- Meekal Jamil – CLASP / HIMA^Verte

Overall Goal, Progress and Short Term Objectives

Salman Zaffar

Overall Objective

To reduce the growth in gas consumption associated with Gas Water Heating appliances through the introduction of Minimum Energy Performance Standards, Labelling and relevant revisions to the testing methodologies.

Progress to date

NEECA/CLASP Workshops

First Workshop: 23 September – Lahore

- Background and need for revised regulation
- Introduction to concept of MEPS/Labelling of water heaters and international actions to date
- Establish if any key barriers to such regulation in Pakistan

Second Workshop: 13 October – Islamabad

- Estimate of current Pakistan water heater unit and household energy consumption
- Comparison of Pakistan Water Heater Performance to international benchmarks
- Initial estimates of *potential gas* savings from introduction of standards and labelling

Ministerial Meetings on Gas Conservation

- Three meetings took place in the month of October.
- PSQCA, PCSIR and NEECA were invited along with several other government entities like Gas Companies.
- Energy experts from various organisations also attended these meetings.
- Focus remained on gas conservation including gas appliances.
- Gave PSQCA the task to develop MEPS within 10 days of third meeting.
- NEECA to develop labels within 6 weeks of MEPS development.

Short Term Objectives

By Friday 12th November:

Complete draft proposals for MEPS and required test methodology revisions for Gas Storage and Instantaneous Water Heaters

- **5th November (today): Present outline proposals for water heater regulation and test methods**
  - Present options for water heater improvements and estimate potential savings/benefits
  - Agree performance parameters and associated MEPS for "typical products"
  - Agree required revisions of water heater test method

- **10th November: Delivery draft proposal to PSQCA for Circulation to Working Group/Stakeholder:**
  - Proposed MEPS for Water Heaters by major "capacity buckets"
  - Proposed revised testing methodology for gas water heaters

- **12th November: Proposals on Gas Water Heater MEPS available for minister *(working group lead)***

- ***8th December: Draft proposal for Gas Water Heater Labelling thresholds and MEPS/Labels/Test for electric storage water heaters***

Meeting Etiquette

- Input/comment discussion encouraged, but time very tight to meet ministerial deadline
  - Today's meeting has to reach conclusions
  - Hard 1pm meeting finish time

- "Proposals" presentations structured in small sections. Each section contains
  - Current situation
  - Summary potential improvements
  - Discussion/questions/suggestions
  - Proposals for adoption

- Please "raise your hand" to speak – we will call on you – press your space bar to unmute and speak

Summary of realistic options to improve product performance in Pakistan

Winton Smith/Stuart Jeffcott

Approach

- Current gas water heater "efficiency" regulation based around two key parameters:
  - Thermal efficiency (how efficiently the water is heated) - PS 4858-2017
  - Heat loss (how much heat is lost when the water is stored) - PS 4858-2017
  - *Pilot light - PS 4860 2017*

- Development timeframe requires retention of thermal efficiency, heat loss parameters and pilot light parameters, but separate storage and instantaneous thermal efficiency requirements

- Proposals today based on "typical" units
  - Gas Storage 35 Gallons
  - Gas Instants 8 litres/minute

  Attempt to covert to equivalent values for other "capacity buckets" by Wednesday. 10th

- Values given:
  - Business as Usual (BAU) – estimate of *typical* current levels in Pakistan
  - Best available technology (BAT) – estimate of current best international units ***(excluding condensing products)***
  - Proposed MEPS – value proposed as new minimum performance requirements based on realistic[10] Pakistan production capability (labels allow for, and promotes, premium units)

Gas Storage: Heat Loss

Current MEPS	BAT	BAU
10%/hour *4.4%/hour*	0.5%/hour *~0.3%*	7-10%/hour *3.5-4.4%/hour*

Tank Insulation:

- Tank envelope is characterised by 25-50mm (1-2in) of glass wool insulation wrapped around the walls of the cylinder, encased in sheet metal.
- Little or no insulation on the top of the cylinder and around penetrations include the flue and the water inlet and outlet pipes

Gas Storage: Potential Reductions to Heat Loss

Summary actions	Benefit
Increased Insulation	
• Insulate tank top	???
• General insulation improvement	

Insulation type	thickness	R-Value ($K.M^2/W$)
Glass wool	25mm (1 in)	1.0
Glass wool	50mm	2.0
Glass wool	75mm	3.0
Extruded polystyrene	25mm	4.5-5

Gas Storage: Reduction in Heat Loss Proposals

Improvement options:

- Insulate tank top
- Thicker insulation
- “Foam/Polystyrene”

Current MEPS	BAT	BAU	Proposed MEPS
10%/hour *4.4%/hour*	0.5%/hour *~0.3%*	7-10%/hour *3.5-4.4%/hour*	**2%/hour** **~0.8%/hour**

VIEWS and COMMENTS?

Gas Storage: Pilot Light

Current MEPS	BAT	BAU
0.59kW/h	0 or 0.07kW/h	0.1-0.4kWh

Pilot characteristics:

- Single (user adjusted) flame pilot maintaining thermocouple temperature (and main gas value open)
- Spark or manual ignition following depression of a main gas valve override
- Typically running 24hr day

Gas Storage: Potential Reductions to Pilot Light Losses

Summary actions	Benefit
Increased Insulation	
• Electric (auto) ignition	100%
• Installation of max flow pressure valve	0-90%

Gas Storage: Pilot

Improvement options:

- Electric ignition
- Introduction of a maximum flow value of gas by using a pressure control valve

Current MEPS	BAT	BAU	Proposed MEPS
0.59kW/h	0 or 0.07kW/h	0.1-0.4kWh	**0.1kWh**

VIEWS and COMMENTS?

Gas Storage: Thermal Efficiency

Current MEPS	BAT	BAU
65%	74%	50-65%

Combustion:

- Typically a circular, dome-shaped solid steel burner plate sitting over am open gas port/single interchangeable atmospheric burner
- No pre-mixed air, producing a low temperature blue/yellow flame and high excess air factor, therefore high exhaust gas losses
- Large, open combustion chamber

“Flue”:

- Typical 2-3.5” in diameter steel pipe integral to the cylinder running from the centre of its base and protruding some 3-4” from the top
- Some models have airflow reduced (and resultant increase in heat exchange) by original/retrofit insertion of “zig-zag”/conical baffles

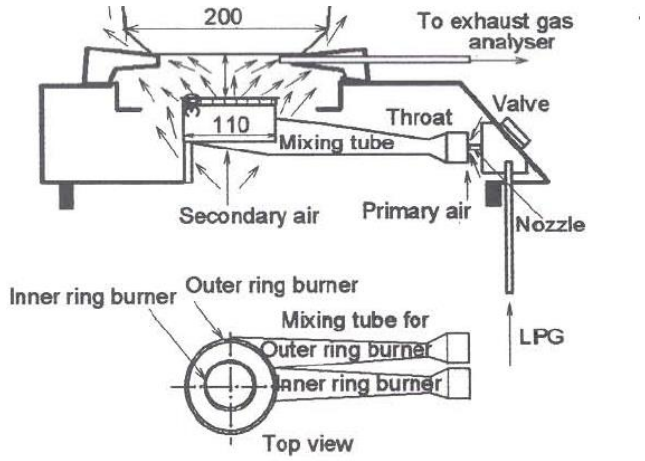
Gas Storage: Potential Thermal Efficiency Improvements

Combustion:

Summary actions	Benefit
"Burner" design	
• Optimisation of burner plate radius relative to tank diameter and spacing between two	???

• Introduction of refined burner approaches:
  • Partial Pre-Mix Burner (image)
  • Porous Radiant Burner
  • Porous Radiant Recirculated Burner
	
	10-15%
	10-15%
	25%

Combustion Chamber	
• Compact size	}
• Controlled airflow	} 12%
• *Insulated walls*	}



Gas Storage: Potential Thermal Efficiency Improvements

Flue:

Summary actions	Benefit
Reduced airflow	

• Baffle
  • Basic (zig-zag)/conical baffle
  • Helix
	0-15%

Flue Design (increased surface area)	
• Multiple small diameter tubes	???
• Coil tube	???

Gas Storage: Thermal Efficiency Proposals

Improvement options:

- Burner design
  - Optimisation of burner plate/tank base size/spacing
  - “Refined” burners
- Combustion chamber
  - Compact size
  - Airflow management
  - *Insulated walls*
- Flue
  - Baffles
  - Alternative flue options

Current MEPS	BAT	BAU	Proposed MEPS
65%	74%	50-65%	**70%**

VIEWS and COMMENTS?

Gas Instantaneous: Thermal Efficiency

Current uncertainty about details and research ongoing. But reasonably confident something close to the following:

Current MEPS	BAT	BAU	Proposed MEPS
65%	87.5%	65-72%	**78%**

Identification of any issues with current test method(s) and potential solutions

Winton Smith/Stuart Jeffcott

Test Methodology PS 4858-2017: Observations

- Somewhat challenging to understand. Main body mixes:
  - Testing methodologies
  - Performance requirements (efficiency and others)
  - Construction requirements (e.g. metal thickness, pipe diameters)
  - Safety requirements (e.g. adjacent wall temperatures)

- Methodologies for heat loss and thermal efficiency testing reasonably sound and *relatively* low cost/sophistication to undertake

- Operating conditions appear not to align with actual usage

Test Methodology PS 4858-2017: Suggestions

- Restructuring of main body to improve understanding by separating:
  - Testing methodologies
  - Performance requirements (efficiency and others)
  - Safety requirements (e.g. adjacent wall temperatures)
- Review testing methodologies for heat loss and thermal efficiency to identify any possible simplifications (unlikely)
- Remove construction requirements (e.g. metal thickness, pipe diameters)
- Revise operating conditions to specify cold water input 21C, hot water output 45C
- *Review PS 4860 2017 to ensure test method appropriate to establish pilot light consumption*

VIEWS and COMMENTS?

Next Steps

Salman Zaffar