



Testing **H**ydrogen admixture for **G**as **A**pplications

Minutes of the 1st Workshop of the THyGA project

1st THyGA Workshop

6th of May, 2020

10-12 am and 1-3 pm Central European Time (CET)

Web-Meeting

Organisation	Gas- und Wärme-Institut Essen e.V. (GWI), ENGIE
Coordinator of the THyGA Project	Patrick Milin, ENGIE
Host of the day and moderation	Johannes Schaffert, GWI
Speakers	Alberto Garcias Hombrados, Project Officer, FCH 2 JU
	Patrick Milin, ENGIE
	Mustafa Flayyih, GWI
	Jean Schweitzer, DGC
	Kris de Wit, gas.be

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1. Patrick Milin (coordinator), ENGIE on the overall project

Jairo Soto Rey (Marcogaz): Why not to study 100% hydrogen injection impact if we have, apparently, a decarbonized future in 2050? (Answered): Call and contract were designed by FCH 2 JU to answer the research questions for hydrogen / natural gas blends.

Massimo Prencipe (Riello): Timing for each WP (answered through the conclusion presentation with the planning of the project)

Mindert van Rij (Kiwa): Is the scope limited to appliances covered by the GAR or does it cover also appliances not covered by EU legislation? (Answered): Mainly GAR. No large-scale equipment (industry, power generation)-

Robert Bloom (DeltaEE): How will this work differ from a project like HyDeploy in the UK? (apart from testing higher H₂ admixtures). (Answered): THyGA aims at higher H₂ admixture levels. It is an EU project and results will be public for everyone. The goal is to make sure that everyone is aware of the extent to which appliances tolerate hydrogen. Most of the UK results are not public. THyGA does not aim to double results, exchange with the UK expertise and experience would be highly appreciated.

Julius von der Ohe (NOW): Will the recommendations also include (regulatory) aspects such as the differentiation of the role of DSO vs TSO? (Answered): Yes, WP4 deals with this. THyGA focusses on small scale appliances, thus sees itself to be situated within the DSO ecosystem.

Kevin Sleuyter (Fluvius): Will the project do research on fluctuations in hydrogen content? (Answered): Yes, THyGA's strategy on that topic is included in the WP3 presentation.

Anamaria Zianveni (Encevo): How are we going to cope with different admissibility of different admixture levels of H₂ in different countries? (Answered): THyGA uses representative gas mixtures which we refer to as "EU high" and "EU low", representing the upper and lower regimes of H-Gas (in terms of Wobbe Index). L-Gas however, is out of scope of the project, as clearly pre-defined by the original call.

2. Presentations by Mustafa Flayyih, GWI on work package 2 – literature, market segmentation and selection of appliances for testing

Luis Carlos De Sousa (IET): Is the relatively small number of papers dealing with industrial applications a result of your search strategy or are there no more out there? (Answered): The search criteria are linked to the focus of the THyGA project on small appliances from household and commercial sector (mainly heating and cooking) and could explain the relatively low number of results for industry, indeed.

Mindert van Rij (Kiwa):

cross lighting, flame stability and the other essential requirements of the GAR.

Slide 8, the technology should be more general: combustion for example and after that non premixed, partially premixed, fully premixed. (Answered): Yes, will be refined in the next step of this task.

How much safety margin is included in conclusion 2? (Answered): A lot, this is just a preliminary overview.

Petra Nitschke-Kowsky (E.ON): CO is a safety and emission question. CO₂ is not a question of safety. (Answered): More sub-segments will be included in the study and topics such as CO will indeed be included in several chapters / diagrams.

Julius von der Ohe (NOW): Did you look into literature addressing the impact of fluctuating admixtures as additional (sub-)category? (Answered): Not yet. This research question on literature knowledge is a candidate for more detailed research and will be discussed and included, if time allows.

Maurizio Beghi (Electrolux): Were already in literature studies suggestions or proposals about how to adapt/modify current products and technologies towards use H₂NG mixtures? (Answered): We will look at these aspects during a detailed analysis of respective documents.

Thomas Muller (GRDF): I am surprised that knocking for NG engines is not a problem... Are the results obtained with dedicated optimised NG engines? The methane number of admixture is of course changing fast when the % of H₂ increases so it should have an impact... (Answered): for most appliances in the scope of the results, the knocking is not a problem. Indeed, this phenomenon will appear for engines and we will underline it in the final report.

Jan-Willem Tolkamp (SolidPower): In general, in KIWA CE testing, hydrogen admixing up to 20% is standard. Did you check with KIWA what their level of knowledge is about the topics just presented by Mustafa? (Answered): Yes, Kiwa reports are included in the literature review

Paul Glanville (GTI): Will there be a separate discussion in this lit review of flame detection/supervision and ignition control across equipment categories? Flashback is noted, but other matters are of interest as well (e.g. ignition delay, reliability of flame sense) (Answered): Yes, more aspects will be included, if possible, to give a more complete overview.

Richard Goff (HSE): Will the literature review cover oxygen depletion sensors? This is something that is being considered as part of HyDeploy (Answered) The impact on safety devices used in gas appliances needs to be considered, so yes. It will also be looked into detailed later in WP5 (mitigation)

Petra Nitschke-Kowsky (E.ON) : Why don't you take the same numbers like GasQual to avoid confusion? (Answered) number of segments is not definitive, we can indeed make the link with Gasqual clearer/simpler by using GASQUAL segment numbers and adding additional segments

Mindert van Rij (Kiwa): in the segmentation I miss the I2H, I2E and I2E+ appliances, these are tested using other test gases so they will react differently. (Answered): More sub categorisation will be done soon

Petra Nitschke-Kowsky (E.ON): I think this may even be the same appliances, but only adjusted in a different way. (Answered): The issue of adjustment gases and their impact will be addressed as part of the testing protocols.

Harald Petermann (Figawa): Please note the products covered by CEN/TC180: EN 416, EN 419, EN 17175, EN 17082, are all reworked and published in the past weeks. (Answered) Thank you for your comments, noted.

Thomas Muller (GRDF): Why do you consider Hybrid HP different than a gas condensing boiler with respect to the compatibility with H₂NG mix? (Answered): Specific test on hybrid appliances would only make sense in case those have a different design compared to the gas boiler....

Jean-Michel MESLEM (BNG): poor information available about air heaters? (Answered): Yes, this is a point of progress for WP2

- - - Afternoon Session - - -

3. Jean Schweitzer, DGC on work package 3 – Laboratory Tests

Update from the lab: Pre-tests have begun using an experimental protocol. Video Clip from the day before shows a flame burning a H₂/NG blend up to 70% H₂.

Petra Nitschke-Kowsky (E.ON): There is a theoretical relation between leakage rates for different gases. Will you check that? (Answered): Will be dealt with in tasks focused on leakage and material science (not the topic of today)

Jorge Modrego Neila (Enagas): In the tests, are you considering to use the same volume flow or energy flow regarding natural gas supply? (Answered): In the households there will be no compensation of the loss of the calorific value. The philosophy of WP3 is to check the impact of H₂ injection without touching/adapting the appliance, so we don't try to compensate any effect due to H₂ injection.

Petra Nitschke-Kowsky: We know already that it is difficult to have appliances adjusted to the local gas. Wouldn't it be better to develop and implement a method to adjust the appliances on G20 while using the local gas? (Answered): this method is not the scope of the project, we aim at being as close as the

situation on the field as possible. Studies show that on-site adjustment is common practice for residential appliances in many major EU countries.

Wilfried Linke (BDH): Does the efficiency drop down? (Answered): It depends on the appliances. NATURALHY says that the efficiency is constant. There might be some consequences on efficiency but we are not sure of it beforehand.

Mindert van Rij (Kiwa): If only 20% of hydrogen is considered for setting the appliance you only test for 20% of hydrogen. (Answered): There will be adjustments with NG/H₂ blend but we proposed to limit such exercise at 20% H₂ for the reason that 20% will probably be a value we will see in the next 10/15 years. Maybe some place will see 30%, but TSO/DSO agree to say today that the next step above the 20/30% H₂ injection will be 100% dedicated grids. So injection with e.g. 50% of H₂ are unlikely and therefore making a lot of testing for such scenario has only little added value.

Petra Nitschke-Kowsky (E.ON): I didn't want to propose that readjustment should be a part of the project, but not to put too much effort on differently adjusted appliances as in any case the market should develop to good adjusted appliances (to G20)

John Bruijnen: Is hydrogen embrittlement being assessed as part of the testing criteria? (Answered): Embrittlement is relevant for H₂ in NG at high pressure, so this is considered out of scope for domestic and commercial appliances

Mindert van Rij (Kiwa): If adjusting the appliance is part of the installation instructions, the related safety risk cannot be ignored due to cost reasons. (Answered): THYGA team confirmed that adjustment will definitely be an important part of testing programme.

Jacques Dubost (ENGIE): EN 437 also defines gas families and groups; we should also consider whether additional ones are needed. (Answered): Indeed, in the scope of WP4 (Liaison with TC238 in charge of EN437)

4. Kris de Wit, Gas.be on work package 4 - Standardization and Certification

Harald Petermann (Figawa): TC 58: combustion controls is the better wording (Answered): Noted

DUBOST Jacques (ENGIE SA): In the additional technical committees, CEN/TC 234/WG1 on gas installations for buildings. (Answered): Noted

Harald Petermann (Figawa): Please regard also TC 180. (Answered): TC180 has been contacted but is missing on the slide, it will be corrected on the final version

Wilfried Linke (BDH): Will there be also tests investigating the effect of fluctuating amount of H₂?

(Answered) Yes, some tests will also look into fluctuations and RoC (rate of change).

Mindert van Rij (Kiwa): Why spending money for testing of 60% if that is impossible? (Answered): We will make a test and then conclude what additional blends make sense or are not feasible.

Jacques Dubost (ENGIE): THyGA is sponsored by fuel cell hydrogen 2 joint undertaking, the high % of H₂ was asked from the EU, an answer should be given for higher H₂ %. (Answered): We will test only few appliances on 60% if they can cope with this high percentage.

Petra Nitschke-Kowsky (E.ON) would be interested in more tests with 20% and not up to 30%. (Answered): we need to be conclusive and therefore we need to know what happens in the future. 20% will be possible for appliances that are installed now, but not 30%. Research focus as defined by FCH 2 JU admixture levels, from 10 to 60%. The range 10-30 % is being expected to be realistic for the next 2 decades and will be the focus of the tests. The range above 30% will be less examined, naturally because many appliances won't cope with such high percentage of hydrogen (but it will be assessed with the tests). The population of appliances will not be the same in the days when that high hydrogen admixture levels might be reached in the grids.

Question: How are the appliances going to be selected and from which manufacturers? (Answered) Selection of appliances is based on the market segmentation, first insights presented this morning by Mustafa Flayyih. THyGA will try to represent the market. We will choose by segments to make sure that we have the relevant ones included.

Mindert van Rij (Kiwa): How are we going to find an appliance that is not being produced for 10 years now? (Answered): Maybe we will take a system from the market from some user and offer to exchange theirs with the new ones. GWI has a collected stock of different used systems. If the systems are not being produced any more already today that means that their relevance will reduce in the future.

Wilfried Linke (BDH): BDH can provide help selecting representative appliances. Comment: Also very old appliances can be found in the field (40 years).

Steve Sutton (HHIC): I think this depends on the results of the tests. A risk assessment would be required - all products will exhibit limited knowledge on testing with specific gas blends.

Wilfried Linke (BDH): Jet burners should be tested. (Answered): THyGA consortium has included jet burners in the market segmentation. So yes, it is planned to test those, not as a priority, but on the list.