# Minutes of Air Filtration Meeting

27 October 2015, ETN office, Brussels, BE

**Attendees:**

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| **Luke Thompson** | AAF |
| **Marco Tappani** | Ansaldo Energia |
| **Richard Ringström** | Camfil |
| **Daniel Newton** | Cullum Detuners |
| **Mike Ebo** | Cullum Detuners |
| **Maarten Schepens** | Donaldson |
| **Wim Van Gelder** | Donaldson |
| **Peter Hall** | E.ON |
| **Christer Björkqvist** | ETN |
| **Ugo Simeoni** | ETN |
| **Ignacio Lescano** | ETN |
| **Mike Garnett** | Freudenberg |
| **Giorgio Marchetti** | GE Oil & Gas |
| **Carlo Coltri** | Mann Hummel Vokes Air |
| **Jesús Monforte** | Mann Hummel Vokes Air |
| **Diego Montaña** | MTU |
| **Martin Oestemar** | Siemens |
| **Christian Borguet** | Solar Turbines |
| **Olaf Brekke** | Statoil |
| **Dominique Orhon** | Total |
| **Wilson Poon** | W.L. Gore & Associates |

## 1. Introduction by ETN Officer

C. Björkqvist opened the meeting and welcomed the participants. He relayed the apologies of Shell, Enel, Iberdrola and Dresser-Rand representatives, who unfortunately could not attend due to business reasons.

C. Björkqvist presented the agenda and proposed a roundtable to introduce the new members of Working Group.

U. Simeoni reviewed the minutes of the previous meeting. He also presented the objectives of the current meeting which were to discuss the part 2, 5 and 6 of the ISO-29461 standard and the comments submitted by the WG's members.

## 2. Short Report from ISO/TC 142 Amsterdam's meeting

P. Hall reported the main concerns that were raised at the Amsterdam meeting (MoM available on the website). Specifically, what constitutes a marine environment and if there would be any patent issue regarding the test methods. He also stated that the comments revised by the WG have been submitted to the ISO/TC142.

## 3. Discussion ISO-29461 standard: Part 2, 5 and 6

M. Garnett presented the reports on the Kanazawa meeting (MoM available on the website). He also introduced the 6 parts that constitutes the ISO-29461 standard and asked for comments on the system element tests and general ideas.

W. Poon asked why only cylindrical filters are considered and no other geometries such as conical filters. M. Garnett replied that targeting a single geometry would make the testing simpler and cheaper and would allow obtaining the basic parameters. W. Van Gelder added that we should first focus on developing a procedure that works. The procedure could be extended to other geometries further down the road.

M. Garnett stated that during the last meeting, given the comments from the ETN Working Group, the ISO/TC142 agreed to increase the relative humidity (RH) in the tests for Part 5 to 80%. W. Poon suggested that a RH lower than 90% would give stability problems due to droplet evaporation that will jeopardize the repeatability of the test. O. Brekke stated that the RH measured in marine environments is on average 88%. D. Orhon added that 100% RH and fog is sometimes observed. He pointed out that it would be important to know the behaviour of the filters in these circumstances. It was agreed to report again these comments regarding the RH to the ISO committee and to ask them to considering a higher RH than 80%.

M. Garnett presented a patent of BHA Altair regarding a filter test procedure. GE was originally involved in the patent; however, the intellectual property is now part of BHA Altair. W. Poon pointed out that the patent is currently just an application and it hasn't been granted yet. M. Garnett mentioned that there would be many cases of prior art, as the methods described were already used by several members of the working group before 2015. He also suggested that in the best case scenario, getting in contact with the patent holder and discussing the claims could avoid a legal dispute. M. Garnett agreed to share the patent references with the ETN office in order to make them available on the website. M. Garnett would also provide the latest draft of part 5.

W. Van Gelder reported on the fog test that was presented in the Kanazawa meeting. The results suggest that more complex tests would generally be more costly and difficult for repeatability. He also pointed out that the dust choice would be a relevant contributor to the overall test cost.

O. Brekke asked about the timeline for Part 5. M. Garnett expects to complete a preliminary working item (PWI) in 2 years' time. Once the PWI is submitted, ISO grants three years maximum to complete the proposal.

O. Brekke asked why Part 2 has a higher RH than Part 5. P. Hall answered that Part 5 is a longer test and should be performed in close loop. In those circumstances, it is unclear how the environment could be controlled to ensure repeatability. R. Ringström agreed with P. Hall. He added that the biggest challenge for Part 5 is to define and create the marine environment.

U. Simeoni proposed to discuss the "*Marine, offshore and costal harsh environments*" document. D. Orhon proposed a qualitative description but commented that it is challenging to define the environment quantitatively.

D. Orhon described the three main issues from a user perspective:

- Humidity
- Salinity
- Ageing

Regarding ageing, P. Hall mentioned that different fatigue methods would affect different type of filters (membrane vs fibre glass filters). It would be necessary to understand the failure mechanisms to define how to perform the ageing tests. W. Van Gelder suggested that it would be difficult to recreate the conditions that lead to failure.

O. Brekke added that a main challenge for ageing testing is to select a realistic testing time length. R. Ringström mentioned that accelerating the ageing tests would make the comparison task between test results and real performance difficult.

R. Ringström proposed to do three separate tests for each of the main issues (humidity, salinity and ageing). This would allow a clearer and simpler focus on each issue to find the most suitable tests. W. Poon agreed with R. Ringström as he pointed out that there are interactions that would be unknown. L. Thompson manifested that separate tests could result in filters that individually pass each test but fail under the combined effect. R. Ringström replied that separate testing would be a good first step to obtain interesting insights. It was agreed that separate testing should be the way forward in early stages.

G. Marchetti stated that we need to define the pressure drop, the salinity, the dust and the RH. O. Brekke proposed to use a standard ocean salinity of 3.5 ppm with Sodium Chloride. W. Poon agreed with O. Brekke. L. Thompson suggested increasing the concentration to accelerate the test. M. Garett advised not to do so as that could increase the issue of repeatability of the test. L. Thompson agreed to this and to the use of the standard ocean salinity of 3.5 ppm.

**4. Discussion on air filtration tests on a model scale test rig**

U. Simeoni presented the capabilities of two research institutes (SP and LMS) and one university (Politecnico di Torino) that could perform the tests with minor or major modifications. U. Simeoni highlighted that research institutes have better testing capabilities and normally they perform tests for third parties. Therefore it would be of their interest to develop new testing methods and they could share the risks and the costs with our WG. On the other hand, the involvement of Politecnico di Torino would require a higher initial cost, due to their limited capabilities, but it would be less expensive in the long run to perform tests.

It was proposed to start working on the test method and to verify the possibility to perform testing activities. U. Simeoni stated that it would be beneficial to plan these two activities together, since the testing methods would depend on the feasibility to perform the new test and verify their accuracy. D. Orhon replied that it should be a two-step process, and we should first define the testing method. W. Poon supported D. Orhon comment. M. Schepens stated that the research institutes could have better knowledge or new ideas that could benefit the discussion. It was agreed to have more than one research institute involved in order to have an open discussion on which one would be the most effective way to proceed forward and to seek a long term agreement. It was suggested to contact also VTT, Fiatec and Blue Heaven in addition SP, LMS and Politecnico di Torino.

M. Garnett suggested selecting a standard filter off the shelf and testing it for a short and a long period. He roughly estimated the cost to be around 10 k€. D. Orhon agreed to the proposal and added that the cost could be shared among all the participants, which would significantly reduce the individual cost.

In order to allow the OEMs and End Users to compare the results of test with their worldwide based plants, M. Tapani suggested to use in the test rig a standard environment condition and then to vary the air composition (HR, dust, sticky particles, NaCl). This will allow obtaining a simple performance curve related to environment features (two or three points). This was considered too complex in order to have a clear comparison between filters, and too long/expensive at this stage of the project.

M. Garnett stated that Part 5 ISO procedure has been revised and he agreed to share it with the members. D. Orhon proposed to discuss the pros and cons of different testing procedures. M. Schepens stated that a decision should be made based on a checklist where each participant would indicate their best procedure, dust type, RH, etc. With regards to the comments already submitted by the partners and not revised yet, it was agreed to make the excel sheet, previously shared by email, available online for the members so that each participant would be able to add new comments and/or agree with the old ones.

M. Garnett agreed to discuss within the ISO/TC 142 the comments received in Part 5 by the end of February. The draft document should be sent to the research institutes and in order for them to be prepared for the meeting.

## 5. Next meetings

U. Simeoni would send a doodle in order to agree on the date for the next meeting with the research institutes which should take place not later than the end of March 2016.
Afterwards, a meeting in May would be organised to discuss the research institutes proposals.

## Annex I: Action list

| Action Owner | Description | Deadline date |
|---|---|---|
| M. Garnett | To share the latest ISO 29461 – Part 5 procedure draft | 10 November 2015 |
| All | To review and/or add comments on ISO29461 procedure. | 18 December 2015 |
| U. Simeoni | To send a doodle to the participants for the next meeting. | 15 January 2015 |
| ETN | To follow up with the research institutes to attend the next meeting. | 1 February 2016 |
| M. Garnett | To review the ISO29461 Part 5 based on members' comments and send an updated version to be shared with the research institutes. | 26 February 2016 |