Minutes of Air Filtration Meeting

16-17 November 2016, ETN Office, Brussels, BE

ETN Attendees:

Scott Taylor	AAF
Marco Tappani	Ansaldo Energia
Giovanni Barbieri	Boldrocchi Group
Richard Ringström	Camfil
Mike Ebo	Cullum Detuners
Wim Van Gelder	Donaldson
Peter Hall	E.ON
Andrew Thomson	EMW
Ugo Simeoni	ETN
Frank Spehl	Mann Hummel Vokes Air
Martin Oestemar	Siemens
Christian Borguet	Solar Turbines
Olaf Brekke	Statoil
Dominique Orhon	Total
Wilson Poon	W.L. Gore & Associates

1. Introduction by ETN Officer

U. Simeoni opened the meeting and welcomed the participants. He presented the agenda and the objectives of the current meeting, which were to discuss the status of the draft of the "Water/Salt test procedure" included in the part 5 of the ISO29461 standard and the comments to be submitted to the ISO/TC 142 about ISO29461- Part 6 and ISO29461-Part 2.

2. Presentation research done on the ISO 29461 - Part 5: Marine and Offshore environment filter systems

As agreed during the ETN Air Filtration meeting that took place in Florence on 11-12 April 2016, the first step for the draft of the Water/Salt test procedure is the definition of the aerosol, the qualification for the aerosol and the definition of the technical equipment.

S. Taylor presented the research done on the definition of the aerosol. The presentation "ISO TC 142 – WG9 – Part 5 - Atlanta" will be uploaded on the ETN website. An extensive report of the research has been sent to all the ETN members and uploaded online ("Research – ISO29461 Part 5"). The conclusion of the research is that the liquid water content is in the range of 0.02 - 5 g (water) m^{-3} and the droplet size in the 0.5 to 50 µm range.

It was asked to S. Taylor to provide the data on the minimum, maximum and mean droplet size. Also, it was noted that GE procedure currently considers 1.5g as reference in their wet test. It was agreed to ask GE to provide further information about the water challenge in their test.

S. Taylor presented the type of equipment taken into consideration in the research to replicate the saline aerosol challenge. He stated that the internal mix atomiser at 3400m^3/hr would be able to replicate the saline aerosol without any concern in being blocked. However S. Taylor will investigate the most suitable nozzle solution at higher volume flows (3400m^3/h to 10000m^3/h). It was clarified that according to ISO rules, it is not possible to list in the procedure a specific manufacturer.

M. Oestemar underlined that if it is not possible to specify the manufacturer, the geometry and the technical requirements of the nozzles should be specified. S. Taylor replied that the standard normally specifies only the droplet size.

In the research it was reported the dispersion pattern of the internal mix atomiser. It was asked if the pattern is with or without air flow. S. Taylor will investigate it with the manufacturer. He also specified that the nozzle identified as solution would have a cost of 350 euro.

3. Discussion on the draft ISO 29461 - Part 5: Marine and Offshore environment filter systems

U. Simeoni reported that in order to complete a first draft of the standard, the following tasks should still be completed:

- Identify what equipment is available to produce the water challenge at the higher volumetric flow and its dispersion pattern in a test duct.
- How to measure upstream/downstream and leakage.
- Define dust loading procedure.
- Define equipment.

It was therefore agreed to go through the draft standard and discuss the comments submitted by the ETN members in the previous meetings.
The attendees agreed that the air should be recirculated and that the RH shouldn't be less than 90%. Furthermore the test shall be at rated air flow and if the products are used at various air flows, multiple tests may be required to satisfy OEM/aftermarket end users.
It was agreed that the test should have a long duration, up to 72 hours, alternating dry and wet periods with intermittent loading of dust in order to replicate offshore conditions. The procedure should therefore be modified accordingly.
It was agreed that the volume of the water to be sprayed has to be determined based on the formula in the paragraph 6.3.
R. Ringström proposed to carry out some tests with different duration simulating dry and wet cycles. The tests should be carried out for different types of dust in order to evaluate their effect on the wet and dry cycles. The dust loading could be either up to a Dp or with incremental mass. In addition, a wet burst test should be done but only applicable to panel filters (i.e. not high velocity bags).
R. Ringström should verify the feasibility of the tests at Camfil's labs.
It was suggested that the measurements to be taken could be Dp, upstream droplet size and concentration, downstream DEHS for efficiency and water leakage.

In order to progress with the drafting of the procedure it was suggested to create a sub-group that would identify the best technology for measurements during the tests. The members of the group would also update the chapters 6 and 7 of the draft including the Users' comments. A monthly teleconference will be scheduled with the members of the group in order to discuss the progresses of the work. W. Poon, W. Van Gelder, A. Thomson and O. Brekke expressed their interest in being part of the sub-group.
S. Taylor agreed to complete the research done, adding the information about the nozzles.
D. Orhon proposed to draft a short document clarifying the users' vision. P. Hall and O. Brekke will contribute to draft the document.
It was agreed that the Users should send inputs for the ISO29461-Part5 Foreword.

4. Review of ETN members comments on the ISO 29461 - Part 6: Cartridge testing method

During the meeting, the members reviewed the comments submitted to ETN on the ISO29461-Part6.
M. Tappani stated that the flow rate at which the test procedure is carried on doesn't reflect the real conditions. M. Oestemar stressed that neither the geometry nor the flow are the ones that GT OEMs use in their systems. It was suggested to ask to the ISO/TC 142 committee to adjust the flow rate to 3000 m^3/h in order to better fit with oil and gas operations where smaller filters require higher velocity.

M. Oestemar recommended to include in the standard also other geometries, such as conical elements, and whether this wouldn't fit in the scope of the procedure, the ISO/TC 142 committee should better define the range of the dimensions since 600 to 1000mm is too big.
It was agreed to submit the following comments to the ISO/TC142:

Paragraph	ISO29461 - Part 6
6.5	As final filter stage or backup filter a pocket or rigid filter with an PM1-efficiency to ISO 16890-1 of at least 80% shall be used. By weighing the final filter, the mass of dust which penetrated through the test filter cartridge can be determined. Why a so low efficiency filter element is considered as backup filter. The back-up filter should be a HEPA filter
7.2	As loading dust a white pigment Kronos Ti2160 shall be used, which is an ultra-fine dust with a rather narrow particle size distribution below 1 µm. A fixed dust concentration of 0.5 g/m³ shall be supplied by the dust feeder. What's the rationale for having selected this test dust? Part 2 and Part 6 of ISO29461 should use the same test dust.
8	…..the test procedure starts, which consists of 10 cycles, wherein each cycle consists of 1) 500x online cleaning pulses in interval of 5s 2) Pressure differential measurement 3) 10x offline cleaning pulses 4) Pressure differential measurement 5) 100x offline cleaning pulses 6) Pressure differential measurement What's the rationale for having selected these test parameters? In the large majority of GT installations, offline cleaning pulses are not possible, so what useful informations can be obtained by this test procedure? What's the rationale for 5 s interval? It should be more in line with Part 2
9	three trend lines shall be fitted to the data points generated from the test procedure, which give information on the long term operation behavior and the cleanability of the surface loading filter element: How this can be stated?
9	Besides the full ageing curve, there are four pressure drop values that are used in this standard for evaluation of the filter element: (1) the initial pressure drop Δpi, (2) Δpon as the final value of the upper trend line for the long term operation behavior, (3) Δpoff, 10 as the final value of the trend line for the values after 10 offline cleaning pulses, and (4) Δpoff, 100 as the final value of the trend line for the values after 100 offline cleaning pulses. How the Δpon Δpoff,10 and Δpoff, 100 curves help the End User to evaluate the filter element?

5. Review of ETN members comments on the ISO 29461 - Part 6: Cartridge testing method Part 2

W. Van Gelder presented the latest updates on the ISO29461-Part 2. The presentation "ISO-TC142-WG9_N0170_ISO_TC142_-_WG9_-_N170_-_20461-2_Update_" will be uploaded on the ETN website.

It was agreed to ask to the ISO/TC142 Committee to draft the procedure taking into consideration the aging effect and the effect of humidity. It was also suggested to use the same water spray nozzles as now defined ISO29461-Part 5.

It was suggested that pulse jet systems should be defined according to the dimensions.
It was suggested to update the draft including comments from the ETN members.

6. Next meeting

It was proposed and agreed to schedule the next meeting the day before the ETN Annual General Meeting 2017, which is set to take place in May 2017. As soon as the date will be defined, U. Simeoni would set up the ETN Air Filtration meeting.

Annex I: Action list

Action Owner	Description	Deadline date
U. Simeoni	To upload the ppt "ISO TC 142 – WG9 – Part 5 – Atlanta" on the ETN website.	30 November 2017
S. Taylor	To identify nozzle geometry for high volume flow (ISO29461-Part5)	30 January 2017
S. Taylor	To identify min, max, average droplet size for the aerosol (ISO29461-Part5).	30 January 2017
S. Taylor	To find out if nozzle dispersion patters are with or without airflow (ISO29461-Part5).	30 January 2017
R. Ringström	To verify the feasibility to carry out tests at Camfil's labs.	15 December 2016
sub-WG members	To identify the best technology for measurements for the ISO29461-Part5.	1 April 2017
sub-WG members	To update chapter 6 and 7 of the ISO29461-Part5 including Users' comments.	1 April 2017
U. Simeoni	To schedule a monthly teleconference with the sub-WG members.	Monthly
D. Orhon	To draft a short document to clarify Users' vision	30 January 2017
D. Orhon, P. Hall, O. Brekke	To send inputs to the ISO29461-Part5 Foreword.	30 January 2017
ETN members	To review and send comments to the updated draft of the "Water/Salt test procedure".	1 May 2017
U. Simeoni	To submit the comments on the ISO29561-Part6 to the ISO/TC 142 Committee	15 December 2016
U. Simeoni	To submit the comments on the ISO29461-Part 2 to the ISO/TC 142	15 December 2016