Minutes of Air Filtration Meeting

06 May 2015, ETN office, Brussels, BE

Attendees:

Luke Thompson	AAF
Mark Stephenson	AAF
Marco Tappani	Ansaldo Energia
Richard Ringström	Camfil
Maarten Schepens	Donaldson
Wim Van Gelder	Donaldson
Peter Hall	E.ON
Carlo Coltri	Mann Hummel Vokes Air
Johnny Hauballe	Mann Hummel Vokes Air
Alex Straver	Shell
Olaf Brekke	Statoil
Dominique Orhon	Total
Christer Björkqvist	ETN
Ugo Simeoni	ETN

1. Introduction by ETN Officer

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

C. Björkqvist presented the agenda and reported on the Annual General Meeting which took place on 21-22 of March in Dublin.

U. Simeoni presented the objectives of the 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. Election Chairperson and co-Chairperson of the Air Filtration WG

U. Simeoni announced the election of P. Hall (E.ON) as chair of the Air Filtration WG. For the co-chair position it was proposed to share this position between Alex Straver, Shell and Olaf Brekke, Statoil.

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

U. Simeoni stated that the next ISO/TC 142 meeting would take place in Amsterdam on 8th of June 2015. As liaison member ETN can send one representative of the Air Filtration WG in order to discuss cooperation opportunities and to report on ISO-29461 Part 1, 2, 5 and 6. It was proposed that P. Hall as chairperson could attend to the ISO meeting.

ISO-29641 Part 5

U. Simeoni reported that most of the comments submitted by the WG partners on the ISO-29461 were related to the Part 5.

O. Brekke stated that one of the main concerns in the requisition of an air filtration system is to evaluate the performance of a filter element in a multi-stages filtration system. From a user's perspective, for new installations, it would be more interesting to perform testing activities on how a single filter element is performing in the complete

air filtration system, rather than to know the performance of a single filter element, which on the other hand is also an important parameter to be evaluated for maintenance activities.
M. Tappani highlighted that the lifetime of the filters should also be evaluated in the testing activities.
A. Straver underlined the importance to specify the testing methodology and to define test methods for the complete air filtration system, which would take into consideration multiple filter stages as well as single filter elements. The goal for a user should be to get 3 years of gas turbine operation without any air filtration issue, which at the moment is already achieved on single occasions. Endurance tests of the filters would help in understanding the failure mechanisms.

Currently the ISO-29461 Part 5 is misleading and not clearly structured, as the test methods described seem to refer generally either to single filter elements or to the complete system.
The WG agreed that in the ISO-29461 Part 5 the test of the complete system should come after the test of single filter elements and it would be better to create two different sections (namely part A and part B):

A. Test methods for single filter element

B. Test methods for complete filtration system

Furthermore, it is vital to specify the steps of how the test should be performed and the environmental conditions, in order for the users to be able to reproduce these tests in an accurate way.
Since the ISO-29461 Part 5 is still in a draft the WG agreed that it would be advantageous to share internal testing procedure (e.g. Salt Separation Efficiency Test) in order for them to be included in the standard after the approval of the ISO/TC 142. ETN will follow up with the partners not present at the meeting in order to retrieve internal testing procedures.
With regards to the scope of the standard it was discussed and agreed that the upper limit for the flow rate is not justified since the flow rate is not a parameter set by the user during the operation, but it rather comes with the design of the Filter house. Therefore it was proposed not to put an upper limit as this should be determined from the design criteria of the filter element manufacturers.
A general comment was reported to the limits of Relative Humidity (RH) within the standard. According to the users for offshore applications it is reasonable to consider a level of RH up to 90% or higher. Therefore in the standard the range of RH should be 30%÷90% for the element test for the entire duration of the test (included when the solution is sprayed). Moreover in the tests should be always specified the level of RH. To this regard in the paragraph 6.3.1 with a flow rate equal to 14.1 ml/m^3 it should be specified also the RH, considering that a low level (e.g. 30%) wouldn't represent correctly the environmental conditions.
With regards to the particle size spectrum Fig. 2 paragraph 6.3.1, the WG agreed that it should be specified how the particle distribution is checked. Moreover it would be beneficial to add a case study as a reference to understand if performing a particle distribution test would be justified in terms of cost vs benefit.

Paragraph 6.2
It is needed to specify the characteristics of the test rig assembly, e.g. the distance between the filter elements for a model scale test rig should be reduced rather than increased. In this last example it would be relevant to indicate the maximum distance.
It was proposed that the WG could cooperate in carrying out the test rig activities. In order to do so a model scale test rig should be identified among the ones owned by ISO and by filters manufacturers. It was agreed that the filters manufacturer should write a one pager with the description of the test rig and specify what would be the costs to modify it.

With regard to the definition of a harsh offshore environment it was agreed that the WG should define both the upstream and downstream conditions for a harsh offshore environment (to be reproduced in the test rig) based also

on the document that the ISO/TC142 WG9 would reference in the standard. D. Orhon proposed to circulate a document where the harsh offshore environment characteristics would be described and where all the partners should contribute to the definition of this environment.
The additional comments related to part 5 were left open since it was agreed, in order not to create confusion, to first clearly divide the standard in two parts.

ISO-29641 Part 1

It was underlined that Part 1 of the standard covers performance with very low RH and therefore it is not representative for most of the offshore environments. The WG agreed that an Annex should be added in part 1 for marine environment.

ISO-29641 Part 2

The WG went through the comments of Part 2. A general comment, related as well to part 6, is that the Aramco test used as a reference is not reliable enough and, though it may be a good test for Middle East environment, it doesn't represent all the different conditions. The WG agreed that a more global test should be made and at least 3 different environments should be defined by the ISO WG9. The ETN WG could help in the specification identification of the different environments.

The partners agreed to report the following GE Oil & Gas comments to the ISO/TC 142:

Ref.	ISO/WD 29461-2 wording	GE Comment
Page ii	Therefore the results of this test method only apply to systems using the same pulse mechanism, pulse duration, and pulse timing as used in the device tested.	We would suggest to modify the wording as: Therefore the results of this test method only apply to systems operated ***at the same (or lower) airflow per cartridge***, using the same pulse mechanism, pulse duration, and pulse timing as used in the device tested.
5.3.1	If the system to be sold pulse cleans more than one element per pulse, the test system pulsing equipment must be scaled to provide that same pulse to a single element. [Bruce: foregoing assumes one element per pulse in the system to be tested. Suggest changing it to the more general: If the system to be tested pulses a different number of elements per pulse than the system to be sold, then the pulse hardware in the test device must be scaled to provide the cleaning pulse per element as the system to be sold.] The system must include the capability to disable pulsing and do continuous pulsing.	The system shall use the same diaphragm valves and the same blow pipes of the system to be sold. To allow using the same diaphragm valves and the same blow pipes even pulsing just one element (instead of two or more as in the system to be sold) the blow pipes ejecting holes, not used to clean elements, shall be rearranged (i.e.: rotated 180° to eject air downstream instead of upstream). Details of the geometry of the blow pipes shall be added to the test report. The compressed air header, where the diaphragm valves are installed on, shall have the same section used in the system to be sold. GE recognizes the impact of the location of the diaphragm valves close to the compressed air header ends. It is therefore allowed to install the diaphragm valves on a compressed air header longer than that strictly needed to lodge the required valves. Details of the geometry of the compressed air header shall be added to the test report.
5.3.1	The system to be tested shall not include any filtration downstream of the pulse cleaned filters. [? Should two stage systems be included?]	GE would appreciate if the standard would establish a test procedure for "combined" air filtration systems, too.
7.1	The loading test dust is to be determined.	What are the currently proposed alternative test dusts? (Finer type of dust which should be more challengeable

		than in the Aramco's test)
Table at 8.1	Stage 1	What's the purpose of Stage 1?
Table at 8.1	Continuous pulsing	GE understanding is that, during a continuous pulsing phase, the cleaning system will operate not driven by DP start/stop set points and there is no need to control the duration of the Complete Pulse Cleaning Cycle (e.g.: diaphragm valves may be operated every 20 seconds one after the other).
Table at 8.1	Stage 1	If our understanding of continuous pulsing definition is correct (refer to previous point) we would expect a limited rise in DP during Stage 1. What are the ending criteria for Stage 1?
Table at 8.1	Automatic (High/Low dP set points)	GE understanding is that, during the automatic pulsing phase, the cleaning system will operate driven by DP start/stop set points and the duration of the Complete Pulse Cleaning Cycle is set to be not shorter than the Complete Pulse Cleaning Cycle of the system to be sold (e.g.: each of four diaphragm valves may be operated every 5 minutes one after the other to have a Complete Pulse Cleaning Cycle 20 minutes long validated).
Table at 8.1 (last row)	[Removing element after test is very dirty operation. May not be suitable for measuring efficiency after test.]	We would suggest having a continuous pulsing phase, having an appropriate duration, before moving the element to the efficiency test.
8.2		Extend the pulsing phase.

4. Next meetings

It was agreed that the date of the next meeting of ETN's project group should be based on the outcome of the ISO/TC 142 June's meeting.

Annex I: Action list

Action Owner	Description	Deadline date
P. Hall	Check his participation to the ISO/TC 142 Meeting	20 May 2015
ETN	Follow up with the missing partners for internal testing procedures.	15 June 2015
AAF, Camfil, Donaldson, Mann Hummel Vokes Air	Write one pager with description of testing rigs.	30 June 2015
D. Orhon	Send a document with the description of harsh offshore environment.	15 May 2015
All	Provide inputs for the definition of harsh offshore environment.	29 May 2015
U. Simeoni	Propose the date of the next meeting.	30 July 2015