

**Contribute your data to the experience base
of the new TGD on corrosion product
sampling and analysis**



The task group preparing the new TGD (Technical Guidance Document, ~IAPWS standard) on how to sample, analyse and interpret corrosion products for plant under flexible operation is working to have a white paper, a preliminary version of the TGD, ready for the meeting in Banff later this month. The idea is to present the white paper for the PCC (Power Cycle Chemistry) group and to ask the members to coordinate field test to collect a firm base of experience for the guidance that will become an essential part of the TGD. However, since many Nordic CHPs start up in September after the summer period, sending this request out after the Banff meeting in Mid-October will be too late. Thus, this newsletter explains the background for the field trials to come and invites you to take part by running a campaign during start-up of your plant(s).

The new TGD will extend the existing one for application under transient conditions such as start-up and load variation when large amounts of iron or copper oxides are transported in the condensate and feedwater trains eventually ending in the evaporator. Tracking of corrosion products under such conditions may be done by proxy-methods, such as turbidity, particle monitors, particle counters, or by means of the well-known membrane filtration method. The last one has been extended to give better sensitivity and precision by analysis of the particulate matter on the filter after the initial visual estimation. The filter is digested with acid and the solution analysed by either a spectrophotometric method or ICP-OES. The results is termed "filtered iron", and experience shows that it tracks total iron quite well, typically giving 80-90 % of the reference method with AVT(O) or OT conditioning of feedwater. Furthermore, experience gained recently shows that filtered iron correlates better with the particle-based proxy-methods than grab samples for total iron determination. In lack of a proxy method, filtered iron may even be used as a "poor man's proxy method" because the sampling and first evaluation are fast and uncomplicated. The more tedious work with the chemical analysis needs only to be done, if the preliminary results look promising.

The most important guidance of the new TGD will be on monitoring the effect of preservation during lay-up. The amount of iron oxides transported to the boiler/evaporator may be monitored by means of the proxy-methods (filtered iron inclusive) at the feedwater sample point. The TGD describes a standard procedure for this, and once it is established, the use of it to measure the effect of improved preservation is straightforward:

- Measure the transported amount during start-up with the usual preservation
- Try to improve preservation at next standstill
- Look if transport of iron oxides decrease at the following start-up.

In this way, you may document the effect of preservation and optimize it to significantly lower standstill corrosion. This in term saves lifetime of the component and makes it easier and faster to obtain acceptable water quality dur-

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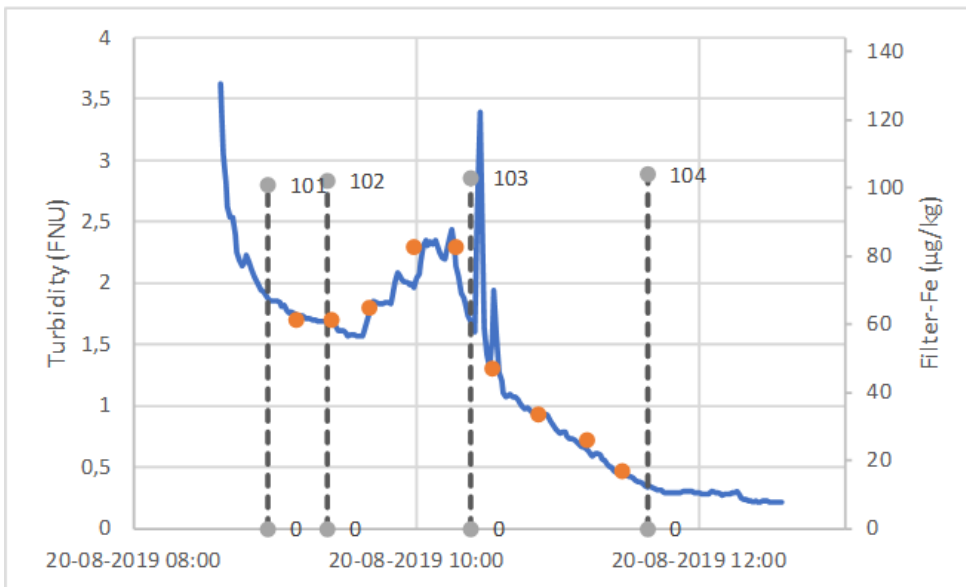
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See the first TGD on corrosion product sampling and analysis—and all the other TGDs—here:
<http://iapws.org/techguide.html>

Note, Matarvattenkonferensen in Stockholm, 12-13 November. See the program and register at this website: <https://matarvattensektionen.se/>



101	GT fire
102	FWT heating
103	Make-up
104	ST. sync

Turbidity and filtered iron in feedwater during start-up of CCGT in Jutland recently. The correlation between filtered iron was: $\text{Filter-Fe} = 36 (\mu\text{g}/\text{kg})/\text{FNU} * \text{Turbidity}$

ing start-up.

The figure above illustrates the basic procedure:

- Turbidity and filtered iron are measured during start-up at the feedwater sample point
- The conversion of turbidity to iron oxides is established by means of a calibration curve (Filtered iron versus turbidity)
- Milestones (first fire, start of heating, by-pass operation, turbine run-up, synchronization etc.) are noted
- The amount of iron transported is calculated from first fire to steady iron levels in feedwater integrating the product of iron concentration and feedwater flow.

The example illustrates the start-up after the summer stop of 2019 of a CCGT (Combined Cycle Gas Turbine) in Jutland. The heat-recovery steam generator was preserved by dry air, but there was doubt if it has been effective. The condensate and feedwater systems were flushed with conditioned make-up water on the foregoing day, but rather high contents of iron remained. The turbidity was recorded during the start-up, and the iron scale on the right axis was established from the samples for filtered iron taken regularly during the process. The calibration worked out nicely as demonstrated by the proximity of measured values and the turbidity curve giving a calibration constant of 36 ($\mu\text{g}/\text{kg Fe}$)/FNU. The evaluation of the start-up supported the assumption that preservation was as good as previously; however, there is potential for improvement.

The TGD will have a base of plant experience covering different types, chemistries, and preservation applied. The idea is that each plant should be able to find a matching group and learn what is achievable, if you do

the preservation properly. Once they have put themselves on the scale from appropriate preservation to almost no preservation, the incentive to improve the local preservation practice will be evident. To establish that base of experience, we need your help - please, consider to take part and submit your data for the common goods. It doesn't matter, if you are not satisfied with preservation conditions as is. By taking part you may learn something about your plant and get ideas how to improve conditions during the next summer stop. The white paper will give you advice on this part when it will be available after the Banff meeting.

If you consider taking part, please contact Karsten (knth@cowi.dk or +45 2787 5744). You will then receive detailed instructions and a short questionnaire on your plant and preservation measures. The figure above also illustrates that using the filter method only, you would not see some details, but essentially get the right amount of transported iron.

The task group preparing the new TGD hopes on your cooperation.

Kind regards
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