Determination of acid conductivity with WATCON sample ion exchanger

Conductivity determination is a standard method to test for impurities in steam, condensate and feedwater. In many modern installations volatile alkalizers are used such as ammonia and morfoline as complement to trisodiumphosphate and caustic.

The volatile alkalizers evaporate together with steam and when condensing they cause the condensate to become slightly alkaline. Sodium-based alkalizers on the contrary remain in the boiler water, they do not evaporate and the steam is free from any alkalizer.

The condensate from such a steam will tend to become acid due to the presence of carbon dioxide and volatile organic acids. The acidic condensate will cause corrosion in heat exchangers and condensate pipes.

The volatile alkalizers however will increase the conductivity but this is of course not to be considered as a contamination of the steam or the condensate , but makes it more difficult to recognize impurities such as carry over from the steam drum or leaking raw water into the condensate.

If one adds 0,5 mg ammonia per litre water it gives a pH of 9.2 corresponding to a conductivity of 3 µS/cm. If the conductivity increases to 5 µS/cm it may depend on an increased charge of ammonia which gives a pH of 9.4 but could aswell be the presence of 1mg NaCl per litre which might create a problem in both the boiler and the turbine.

To overcome the problem with volatile alkalizers in the control of the boiler steam system the sample is passed through a cation exchanger in hydrogen form before testing the conductivity.

The conductivity thus obtained is called “acid conductivity”. The conductivity contribution from ammonia is thus reduced to zero and possible impurities are easily recognized.

Neutral salts carried over from the steam drum are transferred to mineral acids and 1 mg NaCl per litre condensate gives an increase of about 2 µS/cm while the equivalent HCl will increase the conductivity contribution almost 3 times to about 5.5 µS/cm. As pure steam condensate has a conductivity of about 0,1 µS/cm very small amounts of impurities are easily recognized.

The Watcon sample ion exchanger is placed between the sample cooler and the conductivity meter.

The Watcon sample ion exchanger is made of stainless steel and borosilicate glass of high quality and loaded with a special grade cation exchanger with built in color indication. In the hydrogen form the resin is green and turns to deep purple when exhausted. At continuous sampling the resin (2 litre) will last about 3 months. When almost the whole resin column has turned purple the resin has to be replaced.

The several types of sample ion exchangers are shown on the drawings C00151-1A/B.

Watcon B.V. Industrial Sampling & Water Systems,
Winthontlaan 200, 3526KV Utrecht, The Netherlands Tel. 030-6912235 , E-mail info@Watcon.nl,