



HYDROGEN LEAK DETECTION FOR HEAT EXCHANGERS

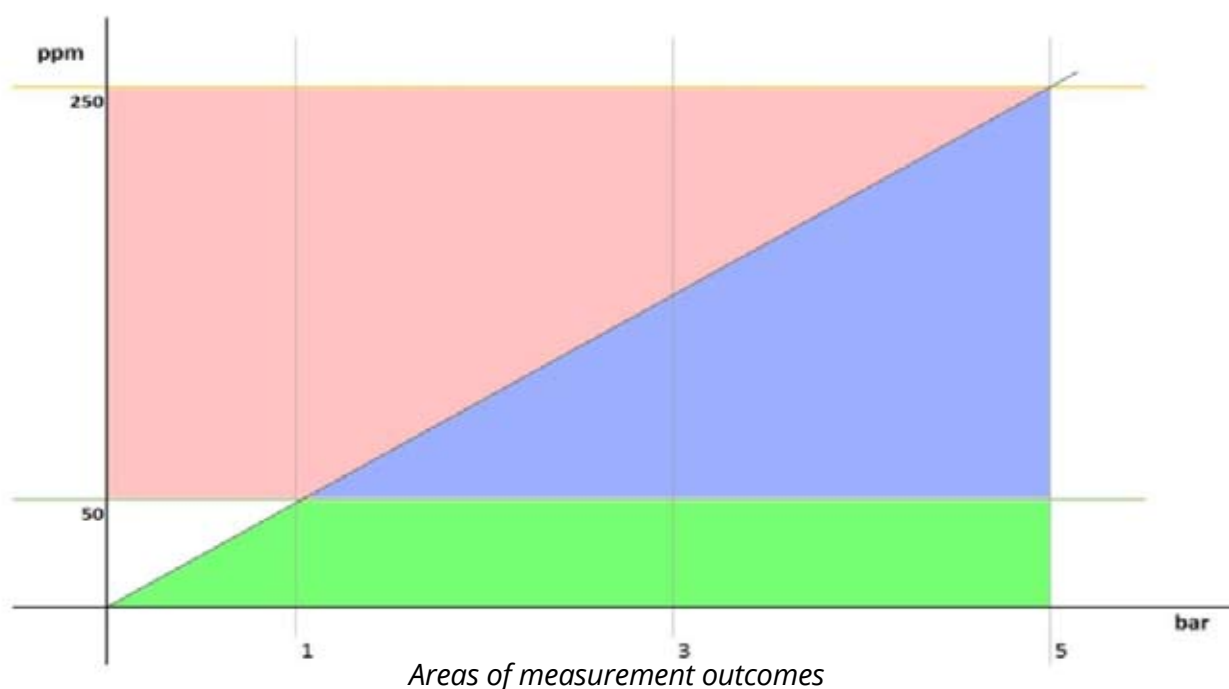


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Interpretation of the measurement outcomes

Regarding the requirements asked by "Lactalis" the interpretation of the so called "grey area" can be specified with the following explanations:

Previous trials and the experience of previous measurements have shown, that the measurement result can be divided in three areas. The areas are colorized in red (NOK), green (OK) and blue.



The green area includes every measurement result where the highest amount of tracer gas detected is not more than 50ppm at 5bar. If the inspection shows an outcome like this, the heat exchanger is in a good condition and there is no further investigation at the moment necessary.

The area colorized in red has the boundary at 250ppm at 5bar. If the inspection shows a fast increasing value of hydrogen, the reason for that would be a defect in the heat exchanger. The value measured will increase very fast in case of a critical crack so that there will be an amount of tracer gas measured which will go over the 50ppm boundary even at 1bar at the first measurement.



The blue area has a range of the measurement results between 50ppm and a maximum level of 250ppm. If the results show a maximum amount at 5bar in between these two measurements, the HE must not be opened immediately. But for safety reasons it is recommended to observe this section of the HE regarding the biology or to inspect the HE again in e.g. 2 month depending on the amount of usage or the security level of the product.

The interpretation of the measurement outcomes based on a standard plate heat exchanger with a single sectioned volume of 120 liters. The leakage was a defined groomed hole with a single $\sim 20\mu\text{m}$ hole.

Furthermore, these interpretation diagram is regarded to the standard measurement method with the HLD600automatic. To secure a safety area the level of a necessary change of plates was slightly lowered.

The current procedures for measurement outcomes in that blue area in dairies and beverage:

- Investigation of the micro biology
- Recurrent inspection of the affected section after 2-6 month

Depending on the sensitivity of the product which is running through the HE the duration between the first and following inspection can be expand or narrowed. Due to the sensitivity of this kind of measurement method the focus is always on the preventive inspection. The limitation of the range of the "blue area" was also affected by the experience and outcomes of former inspection reports and single plate checks.

At the present moment, these results are the nearest interpretation explanations that can be given from our side.

This part of the report was created on request by Lactalis represented by Mrs. Maude Goisset after the meeting with Mr. Atanasov on 24th of February.



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