

H₂ Will your pressure sensor fail after a while when exposed to hydrogen?

We used a scientific approach to find out – in detail

Most pressure sensors are built using martensitic stainless steel as its resilient properties make it a suitable option for many applications. When the same material is used in hydrogen however, it can become brittle – and hence fail after a short time. As an alternative, pressure sensors with diaphragm seals and austenitic stainless steel diaphragms can be used. Here another problem can arise: The small hydrogen molecules can penetrate through the stainless steel diaphragm and dissolve into the filling oil, causing an off-set in the sensors zero point.

At Labom, we decided to use a scientific approach, rather than trial and error, and developed a calculation method to predict service life; the time during which a transmitter would work within spec.

If a gold coating is needed, what thickness makes sense for this application? In the market, each manufacturer can have a different opinion about using gold coatings for hydrogen applications.

A study of interactions

Input for our calculations are the process conditions. Based on your input on the pressure, temperature and percentage of hydrogen in your process, we can calculate the service life for different sensor configurations.

Temperature is crucial, as most effects that play a role in the interactions that affect the sensor performance are strongly influenced by temperature. In our model, we use an Arrhenius approach to incorporate these effects in our calculations.

From all these calculation results the total service life of a specific configuration is calculated. By playing around with different parameters in the calculation we can find an optimised solution and answer questions like: can we get a service life of 10 years when using a stainless steel membrane or do we need a gold coating?

In order to provide a neutral, science based motivation for a decision in this matter, Dr. Schweder and Dr. Köster decided it was time for a scientific approach.

Using the calculation tool for hydrogen applications we can now compare performance for both gold plated and a stainless steel configurations.

Depending on the process conditions and requirements in your process, the best and most cost effective solution can be calculated.

Do you want advice for your application or do you have a question for us?

You can contact us via:

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