SENGENUITY
sensor engine technology
a division of Vectron International

Accelerated Lifecycle Testing of the Vectron ViSmart Viscosity Sensor

SenGenuity ViSmart™ solid state viscometer was subjected to an accelerated life cycle test for long term reliability in solvents to mimic exposure of the sensor to cleaning intervals. A 100+ hour compatibility test (see Figure 1 and 2) was performed using seven sensors in seven solvents.

Details of the solvents are as follows:

- Methylene Chloride
- Hexane
- S-2170-1, which contains xylene
- SP4H, which contains N-propyl bromide
- FA141, which contains heptane, hexane and toluene
- 2114, which contains water
- DT2701, which contains VM and naphta
- Toulene
- Acetone

All samples, with the exception of acetone and toluene were tested. Acetone and toluene were not tested because these are the solvents that are being currently used by Vectron's customer base at the current time for over the last year and there have been no reliability issues.

The readings from the SenGenuity ViSmart™ sensor are presented as acoustic viscosity, which is centipoises (cP) x density and are shown in the figures below.

Data points were taken continuously; the sensor was fully immersed into the sample fluid for the duration of the test. For all of the tests the temperature at which the data was taken was room temperature which fluctuated between 24° - 25°C.

The data for indicates an artifact of employing mineral oils as the calibration standard for a high shear rate (30,000 – 3,000,000 for the various liquids tested) viscometer such as the ViSmart™. Mineral oil begins to exhibit shear thinning at these shear rates and the degree of thinning that the standards exhibit is biased into the calibration functions. Materials that exhibit more shear thinning than the specific calibration oils read differently than their expected "low shear" viscosity, while materials like water, iso-propanol, and aromatics tend to exhibit less shear thinning than oils and read higher than expected. Mineral oil is employed as the standard due to the low reactivity, high stability and ability to measure from – 40°C to +140°C over the required viscosity range with a single family of chemicals.

It is for the above reason that the viscosity data for SP4H, S-2170-1, FA141 and hexane is approximately 0.14 – 0.18 AV.

None of the solvents had any impact on the reliability performance of the ViSmart™ sensor. As the data in Figure 1 and 2 shows, the viscosity readings remained constant and there was no viscosity signal degradation over the entire course of the test. DT 2701 and methylene chloride both are showing effects of the solvent evaporating out of the container that they were in.

It is clearly evident the SenGenuity ViSmart™ sensor is extremely resistant to the submitted solvents.

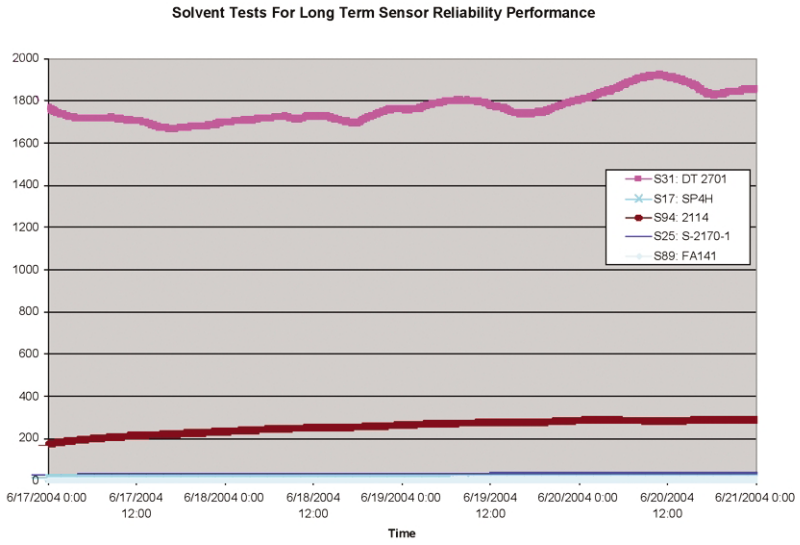

Figure 2: Solvent viscosity data for various solvents (S31 et. al denotes sensor serial number)

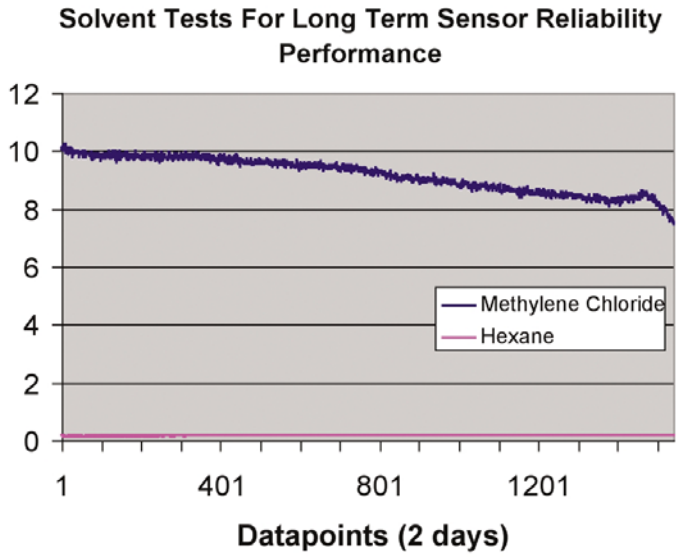

Figure 2: Solvent viscosity data for hexane and methylene chloride

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