Liquid & Chemical Compatibility

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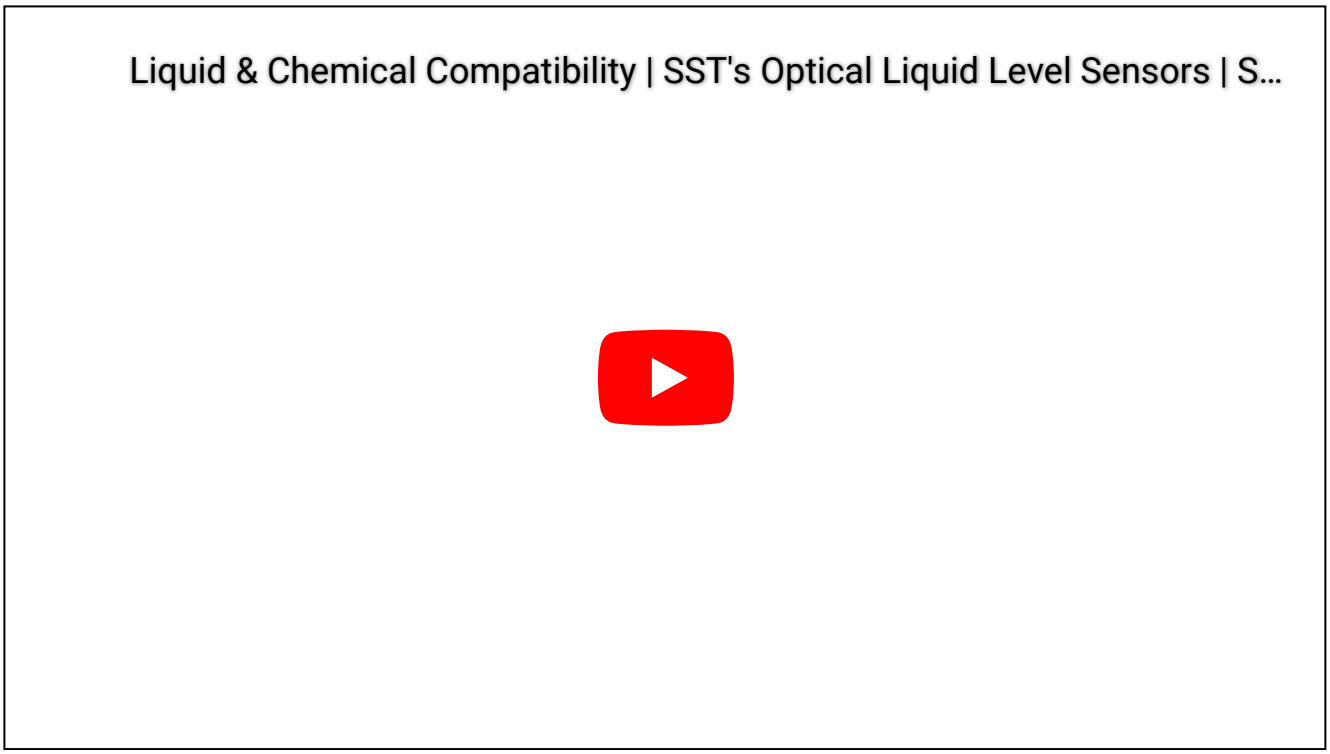

Liquid & Chemical Compatibility

Today I am going to speak to you about SST's range of optical liquid level sensors and specifically about Chemical Compatibility.

Our plastic sensors, we have 2 plastics, polysulfone and Trogamid and these are both high grade engineering plastics.

Typically, when 1 plastic is not suitable for a chemical, the other one will be. And if neither are suitable, then you can more to our higher specification glass tip sensors which are impervious to just about anything you can through at them.

We have done a bunch of testing in the last week just to give you an idea of the kind of things you are looking out for when you do a chemical compatibility test. It is something you really have to do, unless you are confident it's not going to be a problem.

For example, you are going to be using the sensor in water or in one of the chemicals we mention in our application note, which is available on our website.

If you have chosen a polysulfone sensor, the chemical you are going to use, the concentration you are going to use it in, is on the datasheet, then you can be pretty confident it is going to work.

That said, it is important to test the sensors thoroughly before you decide to use them in your application or in your product in at my significant volumes.

So for example you might find the chemical was okay at room temperature but if you maybe tested the sensor in that chemical at the top end of the temperature range, where everything becomes more aggressive, the chemical will more of an effect on the sensor, you might find there is a problem.

So it is really important to test your sensors thoroughly, it explains that in our application note,

It says you should test the sensors typically for about 3 weeks. You want to immerse the sensor in the liquid.

You want to immerse it in the liquid at and have the liquid at the typical maximum operating temperature that would be present in your product or in your application an that gives the chemical, or whatever it may be, the best chance at damaging the sensor housing, the plastic. If that's going to be the case.

If the sensor passes that test with no problems then great. You can go ahead and use the sensor.

Things to look out for would be: cracking, crumbling, crazing, melting, deformation and swelling.

And we have got some sensor we prepared earlier.

So one of our chemists has very kindly dropped a bunch of sensors into various chemicals.

I think I can pronounce most of them.

They have only been in there for 3 days actually, he has chosen some quite aggressive chemicals.

We really did that so we could produce some examples of what a failed sensor would look like so you would know what to look out for.

So over here I've got some sensors which have got a label on them saying 'Control', so they have not been subjected to anything.

A whole bunch of different ones. These are customer specials in fact, these particular ones, these are made of Trogamid, Trogamid is the 'yellowy' clear plastic.

Polysulfone, is the very dark, its actually a very dark purple although it looks black plastic.

These are the controls, you can see they are nice and shiny, the tips are smooth, the epoxy is nice and smooth at the back.

When you do a liquid compatibility test, you probably don't want to get the liquid on the back, because in the real world it's really only going to be the front of the sensor that's in the fluid of interest.

The back is usually just in fresh air. But if there is a concern about the chemical you are using getting to the back of the sensor, you should always test that.

But really the epoxy is designed to be impervious to chemicals, it's really just there to keep the electronics in place and to keep moisture out of the product and out of the housing.

Certainly, when a product starts life it should be nice and clean and smooth and not have any bulges or deformations.

So, lets look at the first test. The first test was in acetic acid, which is.. yep vinegar. Polysulfone housing you can see absolutely pristine, nice and shiny, just like the control one. At the front there is no marks, no softness, its not tacky. But, the epoxy at the back has been affected. Again, that's not something you necessarily need to worry about. But in our test, just to make things easier, we just dropped them into beakers full of the chemical so the chemical was able to attack the back of the sensor as well. So, depending on your application, I would still use that, the polysulfone in acetic acid. The Trogamid however has not fared so well, there is also , again that is not necessarily relevant. But if you look here you can see that the tip in no longer nice and shiny, it's kind of pitted, in fact.. it's actually soft, I can dig my nail into it. Threads are all just a bit rough looking. It has definitely been negatively affected by acetic acid.

So, if you are going to have a vinegar sensor, use polysulfone.

Acetone, we will start with the Trogamid, well acetone has done something very strange to the tip. It's left a white, milky coloured deposit on it. Reasonably smooth but it's definitely had some sort of effect. It has had a very strong effect on the polysulfone, you can see it's discoloured it, it's gone a milky colour as well and it's really made the polysulfone become rough. That's definitely been bad for the sensor.

Dichloromethane, wow. Okay so it's absolutely, destroyed both sensors. I think its fair to say you really shouldn't use our sensors in dichloromethane. You could probably use the glass ones, they would probably be fine I suspect.

Ethanol, which is just pure alcohol, that seems to have done no damage whatsoever to any part of this Trogamid sensor and the polysulfone also looks fine.

Ethyl acetate, again the tip of the Trogamid sensor looks nice and shiny, looks perfectly untouched, threads look okay, and looks like it's been absolutely fine. But the polysulfone has really started to melt. What used to be a nice, sharp, pointed cone, is a bulging, lumpy, deformed, rounded, it now has a rounded tip.

And the back of the sensor, the whole thing has just.. yeah it's not in very good shape. So, if you want to use Ethyl acetate, looks like Trogamid would be your one, although having said that we only tested them for a few days and we didn't test them at very high temperatures. So you would have to do a complete and thorough test.

Ethylene Glycol, so that is Anti-Freeze, that you use in your car. Our sensors are often used in the coolant level tanks in vehicles, so ethylene Glycol would be an example of the chemicals to which they were subjected to usually a 50/50 mix with water and both Trogamid and polysulfone look absolutely perfect, like the day they were made. No problems.

IPA (Isopropyl Alcohol), no effect on the polysulfone and no effect on the Trogamid either.

And finally, methanol, the other kind of alcohol but the one you really don't want to drink. Polysulfone looks absolutely fine, so does Trogamid.

So there's a range of sensors. I have also personally tested these sensors in Guinness, Whisky, milk and apple juice in the past. But, that wasn't the most scientific of tests.

That's what you need to do if you want to do a chemical compatibility test. 3 weeks, maximum operating temperature and you are taking the sensors out after that. You might know after a couple of hours that it's not going to work. Dichloromethane destroyed these in a few hours. But maximum 3 weeks and if the sensor comes out and it looks pretty much looks the way it went in, it's a good idea to keep a control back, to keep a reference sensor to compare it with, if everything looks okay and obviously the sensor still functions electronically. I'm sure it will if it looks okay then you are good to go and you should be able to use the sensors in that application.

So, thank you very much.

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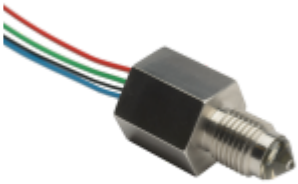

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