Re: Conductivity Sensor

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- *From*: John Popelish <jpopelish@xxxxxxxx>
- *Date*: Sun, 26 Jun 2005 22:01:25 −0400

Ted Edwards wrote:

> John Popelish wrote:
>
> > My favorite kind of sensor is a toroidal transformer type. It is completely enclosed in insulating material and is very resistant to fouling. Unfortunately, the electronics are fairly expensive. I think that Cole Parmer has some units for $360. But it might be fun to try to make one of these sensors from simple parts.
> >
> > The concept is that you excite a toroidal core (high permeability) with AC through a winding. Then you place a second toroid beside that one with another winding. The two cores are enclosed in insulation, with a hole passing through both cores. When submersed, the first core induces 1 turn's worth of voltage around the liquid loop that passes through the hole. The current that voltage moves through the liquid is sensed by the second core, acting as a current transformer. You amplify the AC current from the second core, rectify it, and the result represents the conductivity of the solution.
>
> Very interesting! What frequency do you use/recommend and why?

I haven't actually built one of these, yet, so I haven't thought too much about that. This is the way commercial toroidal conductivity probes work. I think I once measured a Yokagowa unit and it operated around 5 kHz. I would choose a frequency that allowed the two high permeability cores to operate with low losses. If the excitation core has high losses, they subtract a little of the voltage per turn the liquid receives. If the current transformer core has losses, it subtracts from the conductivity

signal. I think any frequency in the mid to upper audio range will work pretty well with a pair of 10,000 relative permeability ferrite cores. If you have a couple tape would permoly or hypermoly cores, the frequency could be lower.
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