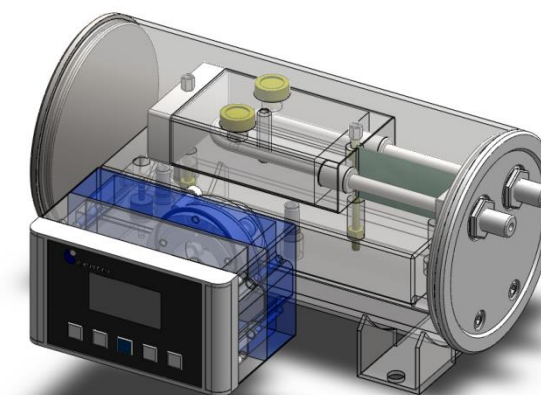


Concentration Measurement of H₃BO₃ in Nuclear Power Plants

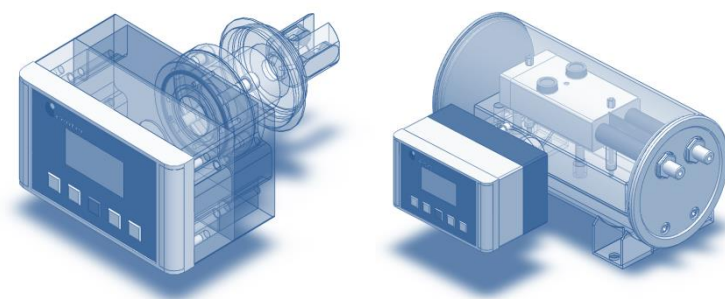
Application Report



Automated
process skids
and high precision
sensors from a
single source.
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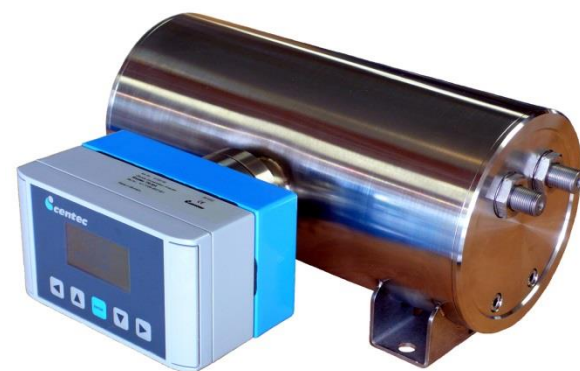
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RHOTEC

Description of the Application and Measurement Principle

In a nuclear power plant the heat generated by a nuclear fission process is used to drive a steam turbine which generates usable electricity. When an atom of nuclear fuel (uranium) absorbs a neutron the uranium will fission into two smaller atoms (waste) and release one to three neutrons. The kinetic energy of the waste is used to heat the water for the steam turbine. The neutrons are used to fission the next lot of uranium atoms and the process continues. Boric acid (H_3BO_3) is dissolved in the reactor coolant where it absorbs the neutrons and thus controls the speed of the nuclear fission process. The concentration of H_3BO_3 is determined with highest precision based on density measurement.

For density measurement, the liquid consisting of 2 components flows through a U-shaped tube. While the tube is electronically excited to oscillate at resonance, the oscillation frequency is observed. Any change in the fluid density has an impact on the detected signal and can thus be identified. Based on the correlation between concentration and density, the concentration is calculated and displayed.



RHOTEC
Transmitter Version

- Available as Transmitter Version with Local Display and as Sensor
- Highly Precise and Fast Determination of the Concentration
- Based on Density Measurement
- Applicable for a Huge Number of Liquids in Various Industries
- Short Response Time and Excellent Long-Term Stability
- Hygienic Execution, Full CIP Capability, Maintenance Free
- Outstanding Price-Performance-Ratio

Technical Data	RHOTEC
Measuring Range	0 - 3 g/cm ³
Accuracy	± 0,0001 g/cm ³
Repeatability	± 0,00001 g/cm ³
Response Time	≤ 1 s
Pressure of Operation	max. 50 bar
Temperature of Operation	- 25 - + 125 °C
Temperature Compensation	Pt1000
Material	1.4571/AISI 316Ti; Hastelloy C276; Monel 400; Incoloy 825; Tantalum; others on request
Connections	thread 3/8"; compatible to Varivent© Inline-Housings DN40 - DN150; others on request
Input Transmitter Version	6 x digital (24 VDC)
Output Transmitter Version	3 x digital (24 VDC) & 2 x analog (4 - 20 mA)
Profibus DP Transmitter Version	option
Sensor (w/o local display)	standard
Enclosure Rating	IP65
Explosion Protection Ex II 2G EEx d IIC T6	option
Power Supply	24 VDC