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FUNCTIONS AND SETTINGS

TSS90

Rainwater monitoring of large tank installations

TSS90 pipe probes

1 Point of departure

In large tank installations, rainwater is drained via the tank interior for tanks with floating roofs. If the rainwater drain line is not watertight, crude oil or other petroleum products can end up in the rainwater. However, uncontaminated rainwater should be cost-effectively redirected into public waters.

With a TSS90-type impedance pipe probe from Aquasant Messtechnik AG, minor leakages can be detected even in the case of small product amounts, from approx. 0.5%. Bar probes are not particularly suited to this application. Considering that rainwater can vary in terms of electrical conductibility, a dynamic evaluation procedure is beneficial.

2 Probe mounting

TSS90-type pipe probes have a very high resolution. The probe must always be filled 100%, i.e. incorporated into a ventilated siphon (culvert), ideally after a settling section.

An examination of roof rainwater with a TSS90 DN50 in Switzerland produced the following result:

The electrical conductibility of the rainwater decreases from approx. 50 µS when rainfall begins to approx. 5 to 10 µS during continuous rainfall. By the sea, this value can be significantly higher.

With a TSS90 DN50 MTI 50 F3 pipe probe, the following measured values are measured as a function of the electrical conductibility:

Water	>5000 µS/cm	around 3240 Imp (not to be expected with roof rainwater)
	250 µS/cm	2900 Imp
	100 µS/cm	2430 Imp (possible value for installations by the sea 100%)
	50 µS/cm	2330 Imp (when rainfall begins)
	5 µS/cm	2290 Imp (continuous rainfall 94.2%)

3 Static evaluation

This means that a fixed limit value < 2280 Imp = 93.8% equal to an oil alarm can be set for the floating roof rainwater monitoring.

(Note: the measured values (limit value) are dependent on the dimensions of the pipe probe.)

4 Dynamic evaluation

With a dynamic measured value evaluation of the analog signal in the process control system, responsiveness can be improved.

Signal spreading with the MAT 4190

4mA: 1944 Imp = 80%

20mA: 2430 Imp = 100% (MW at 100 µS/cm)

results in an optimal analog signal resolution.

Example for TSS90 DN50 MTI50 F3 probe:

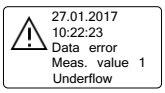
Spreading of 4 -20 mA signal: 1944 Imp = 4mA = 80% / 2430 Imp = 20 mA = 100%
Resolution 0.033 mA/Imp

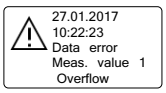
Display MAT %	Display mA	Display MAT Imp	MW Delta	Display PLS %	
100.0	20.00	2430		100.0	Water 100µS/cm
80.0	4.00	1944	Δ 486	0.0	Water/oil
95.9 When rainfall begins	16.7	2330	Δ 140	79.4	Water ~50 µS/cm
94.2 Continuous rainfall	15.4	2290	Δ 140	71.2	Water ~5 µS/cm
93.8	15.1	2280	Δ 150	69.1	Limit value oil detection

All increasing measured values: no oil alarm
Slowly decreasing values: no oil alarm, effect of slowly decreasing electrical conductibility

Mipromex® Display | Flow diagram

Fault messages





Dynamic evaluation in process control system

For dynamic evaluation, the differential *d* measured value is calculated according to *d t*. This allows even a small negative measured value change to be easily detected, independent of the electrical conductibility of the rainwater.

A simple option would be to also save the measured values with an interval between 0.5 and 10 seconds, and to calculate the measured value difference MWx – MWx-1 over the interval. The negative limit value for the measured value difference is determined as a function of the desired resolution (e.g. for Δt from 5s to -10 pulses).

I.e. if the impulse value decreases by more than 10 for each defined unit of time, oil is detected and the alarm is triggered. As an oil leak does not simply disappear upon draining the roof, an over haul of the drain line in the tank is unavoidable. As a safeguard, the rainwater is fed via the oil separator into the sewage processing plant or directly into open waters (second safeguard)

Depending on the local regulations, the rainwater can be directly conducted into open waters, or indirectly conducted via a sewage processing plant, with monitoring.

All measuring systems are pre-parametrized upon delivery for easy commissioning.

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