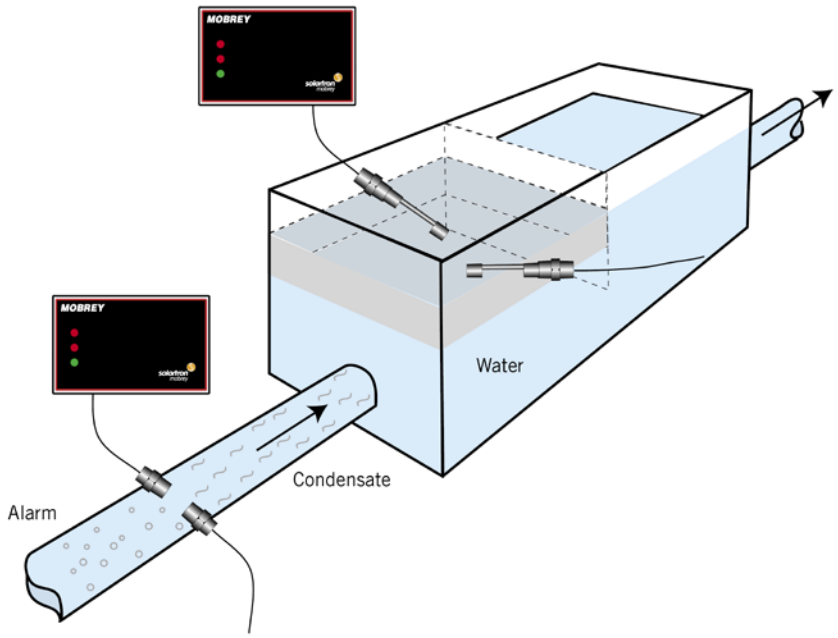
OIL DETECTOR (Ultrasonic)

Application : Oil alarm control for cooling water or condensate on board ships



1. Requirement

Numerous marine applications today employ the use of heavy fuel oil burning engines in order to supply power to a host of applications. In order for these engines to maintain maximum efficiency, it is often necessary to heat the heavy fuel oil so that it can more easily be pumped. So as to make the most economic use of resources, this is usually accomplished with either steam via heat exchangers or at the tanks, or with cooling water directly from the diesel engines themselves. These techniques, however, carry with them an inherent risk. In the event of any pipe failure or leakage from the heat exchangers oil may come into contact with the cooling water or condensate. As this presents a significant potential danger, monitoring this condition becomes of paramount importance. Note that as well as Marine applications, the technique of heating is also employed by power plants using heavy fuel oil burning engines.

2. The Solution

2.1 Cooling water pipes

A pair of sensors, type 442SD80, is installed in the cooling water pipe such that they are immersed by the liquid.
An ultrasonic signal is transmitted through the water from a transmitter crystal to a receiver crystal across the sensor gap.
The sensor pair is connected to a control unit that monitors this normal condition.
On the introduction of additional unwanted particles, such as oil droplets, the ultrasonic signal is interrupted and an alarm state is given.

2.2 Condensate tanks

A pair of sensors, type 402SD80, is installed on the port and starboard sides of the condensate tank at an inclination of 10° from the horizontal. Since the function of the sensors is such that, in air, the ultrasonic signal ceases to travel from the transmitter to the receiver crystal, the height of sensor installation is selected to ensure that the sensors are continuously covered by the condensate. In order to compensate for the ships movement, the system is configured such that the output signal is switched in parallel, i.e. no alarm will be given in the event that only one of the sensors is in air. In the event that oil finds its way into the condensate, it will be trapped in this fist compartment replacing the water, this will result in either both sensors being immersed in oil or one sensor in oil and one in air, causing an alarm state to be activated.

Specifications

Table 1. **Sensors**

	402SD80(Tank type)	442SD80(Pipe type)
Operating Temperature	-70 to 150°C	
Maximum Pressure	105bar	
Power Consumption	<10 mW at sensor	
Standard Frequency	3.7 MHZ	
Standard Cable Length	6m / 8m	
Cable Entry	Cable entry to sensor is IP65	
Sensor Cable	Standard is PTFE-insulated dual-coaxial with PVC sheath. Minimum bend radius is 1.4 in.(35mm)	
Photo		
Note : The 402SD80 and 442SD80 are for non-hazardous area use only.		

Table 2. **Control Unit**

	MCU201
Number of Level Switch Inputs	1
Power Supply / Consumption	110/120Vac or 220/240Vac selectable / 6VA
Relay Output	Double-Pole Changeover (DPDT) / Energized when sensor is wet or dry (selectable)
Relay Rating	5A at 230V
Box Dimensions	7.9 x 4.7 x 3 in. (200 x 120 x 75mm)
Box Rating	IP65 Polycarbonate
Fixing Hole & size	7.4x3.4 in.(188x88mm) / 0.16 in.(4mm)
Frequency Selection	By switch on PC board
LED indicators	Visible through the box lid
	Green for normal. Red for alarm condition. Amber LED for fault condition
	Selectable for wet/dry sensor, as appropriate for the application
Gain Potentiometer	Fitted with scale and separate range switch to adjust for sensor type and site conditions
Response Time	Selectable delay of 0.5, 2, 8 or 30 seconds
	Delay selectable for wet-to-dry or dry-to-wet changeover
	50 ms response in opposite direction
Sensor Cable Check	Selectable to monitor coax screen to sensor for continuity
	Fault lights fault LED and sets relay to alarm state
Photo	
Note : MCU201 control unit is for non-hazardous area use only.	