LAB SESSION 9

Use a capacitive sensor to measure the liquid level in tank and calibrate its output according to the level.

9.1 Learning Objective:

At the end of this study, the student will be able to:

- To use different parts of Liquid Level Test Module including capacitive sensor, I/V converter, comparator.

9.2 Apparatus

In order to complete the demonstration, we need these components from the equipment.

- 24V DC power supply (changeable source)
- 12V DC power supply
- 10KΩ potentiometer
- I/V converter
- DC Amplifier
- Power Amplifier
- Comparator
- Capacitive Sensor • Underwater pumps
- Voltmeter.

8.3 Main Parts of Liquid Level Test Module

1. Capacitive Sensor
2. Level pressure sensor
3. Potentiometer
4. Electrode contact sensor
5. Magnetic level switch
6. Optical level switch
7. Under water pumps

8.4 Related theory

The sensing means is based on our capacitive proximity sensing technology. Electrodes embedded in the front of the capacitive liquid level sensor detect changes in the capacitance as the fluid nears the sensor face. Once the trigger point is reached (either calibrated at Gems™ or set by the user once after installation) the capacitive level sensor switches creating the desired output. Because they are adjustable they can be used to sense aqueous and nonaqueous fluids, regardless of color.

Capacitance level sensors are used for wide variety of solids, aqueous and organic liquids, and slurries. The technique is frequently referred as RF as radio frequency signals applied to the capacitance circuit. The sensors can be designed to sense material with dielectric

constants as low as 1.1 (coke and fly ash) and as high as 88 (water) or more. Sludges and slurries such as dehydrated cake and sewage slurry (dielectric constant approx. 50) and liquid chemicals such as quicklime (dielectric constant approx. 90) can also be sensed. Dualprobe capacitance level sensors can also be used to sense the interface between two immiscible liquids with substantially different dielectric constants.

Since capacitance level sensors are electronic devices, phase modulation and the use of higher frequencies makes the sensor suitable for applications in which dielectric constants are similar.

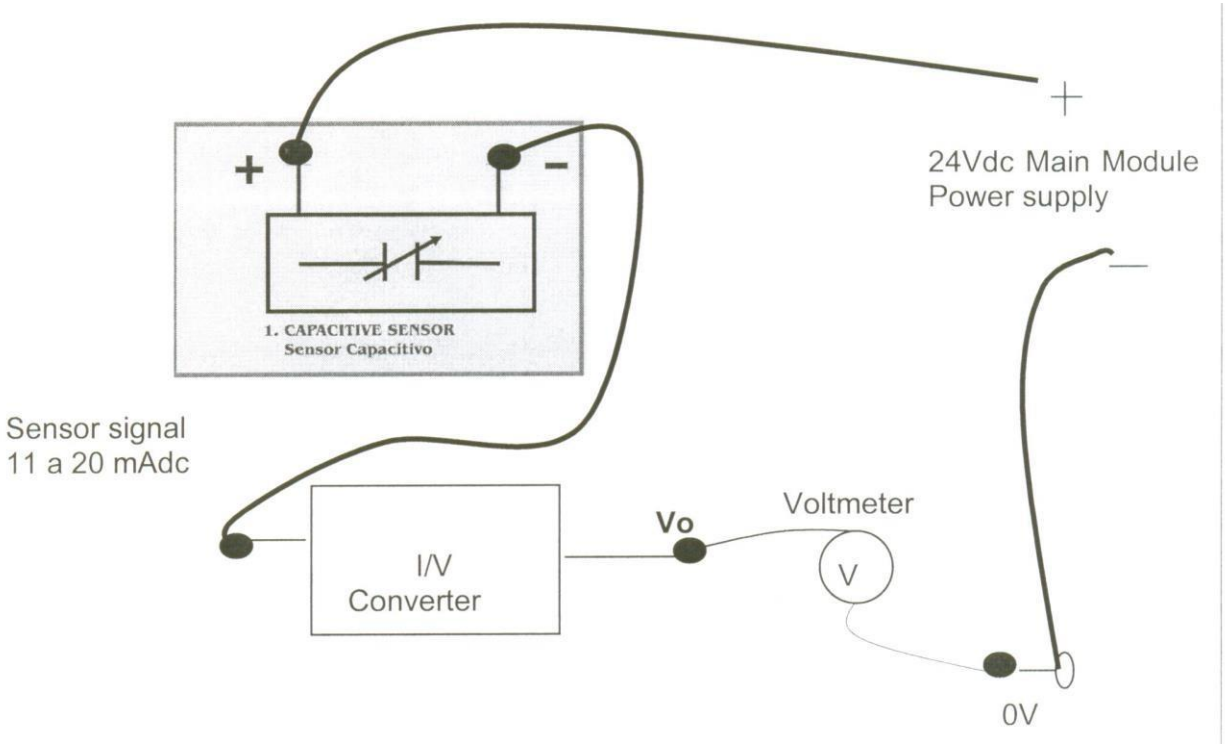

Figure98-1 Capacitive Sensor Circuit

9.5 Experimental procedure:

1) Set up the equipment and identify its components.

2) F or this practice we will connect using the provided cables the main module and the BS6 just as is shown in the previous diagram.

3) The capacitive level is excited with a 24V de voltage to obtain an output signal in mA dc that is proportional to the liquid level that covers the sensor gage.

4) This signal is the current that goes through the sensor with 24V dc excitation and goes from 11 to 20mAdc approximately from the lower level until the gage is respectively covered.

5) You must connect a multi meter at the Vo output to measure the obtained voltage in comparison to the water level.

6) Once all the system is connected you must activate the right pump motor in order to move the water of the right tank to the left tank where is the capacitive sensor.

7) As the water level covers the measure gage we can see how the voltage level at the Vo output rises.

8) If afterwards we clear the water from the left tank activating the corresponding pump, the
Vo voltage level will drop as the liquid level in the measure gage falls

9) Both pumps work with a 12V de voltage.

10) You must take special care while connecting the pumps with the corresponding power supply polarity.

11) To invert the pumps polarity can cause an irreversible damage.

12) Once we have the corresponding liquid level height voltage values, we can control the pump operation with a voltage comparator and other additional elements necessary to provide the necessary power to make the pump work.

9.6 Observations & Calculations

Table 9.1: Calculation of water level and output voltage

Obs. n	Water Level (cm)	Output (V)
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

9.7 Graph

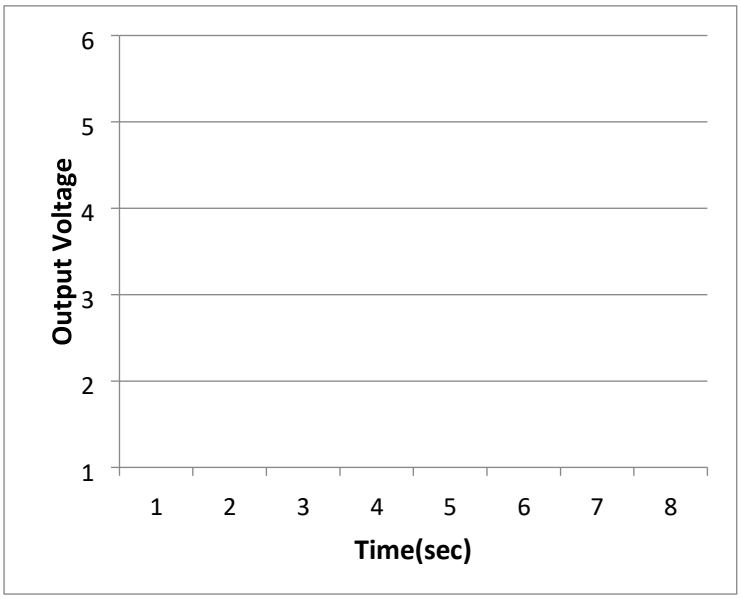

Figure 8-2 Characteristics of Capacitive Sensor

9.8 Conclusion: