Level Measurement and Control

This system is based on a closed loop circuit of two water tanks, integrating several level transducers and detectors for level measurement and detection and level control. Monitoring level evolution and comparing the distinct level transducer performance is one of the goals of this setup. Distinct types of detectors are also used for introducing redundancy in the system safety.

A BOSCH type aluminium structural frame supports on its lower part a stainless steel tank and an electrical steel enclosure (protection class IP 66) for mounting all the electrical and electronic conditioning circuits and the power supply. Inside the stainless steel tank there is a dual switch point series for protecting the submersible pump responsible for flow circulation.

The Plexiglas tank located on the upper part of the structure incorporates an ultrasonic level transducer (5), a magnetostrictive linear displacement transducer (3) and a submersible water level transmitter (pressure transducer) (1). A vibrating limit switch (2) and a maximum and minimum resistive switch (4) are used at different vertical locations for level detection, figures 1 and 2.

A low voltage DC motor controller is used for varying the water pump velocity, modifying the hydraulic flow debit. A flow meter measures the flow rate in the hydraulic circuit.

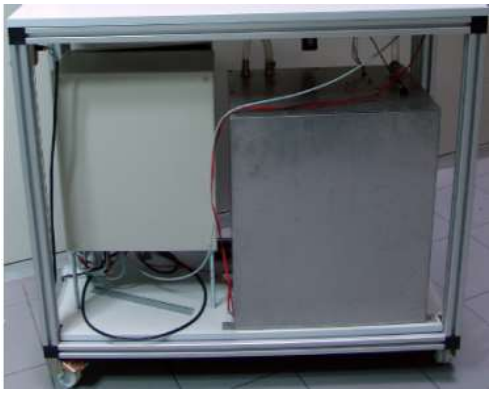

Figure 1: Lower tank and steel enclosure

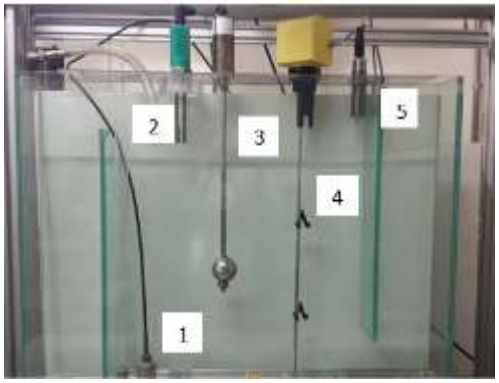

Figure 2: Upper tank

The user interface, figure 3, uses HTML and JavaScript and is embedded in the Moodle Platform.

Two modes for user interactivity have been implemented on the remote friendly user interface. In the manual mode the user gets the on/off control of the pump and can set up the water circulation conditions within the hydraulic circuit.

The automatic mode, once started by the user, executes a pre-defined procedure along which acquires 10 distinct values.

During the experiment, in the user interface, a live video complemented by an animation allow to follow it. Simultaneously, the level transducers response and the detector state are displayed on the graphical window. Finally, a file can be created with the experiment data. Based on this file the user can determine and analyse different transducers characteristic parameters.

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Level Transducers Characterization
Manual
Flow rate: Min Med Max
Filling
Draining
Automatic Procedure
Start
Stop
Status: Ready!
Live Video
Monitoring
A B C D E
Pick Points
Reset Table
Data Table
Level [mm] A [V] B [V] C [V] D [V] E [V]
Voltage vs Level
Transducers Voltage [V]
Water Level [mm]
Save Data
Reset System
Informations

Figure 3