SYSTEM FOR WATER LEVEL & FLOW REGULATION BY PID

- Power supply : 230VAC
- Overall dimensions: 1100 x 670mm Height 1980mm.
  Weight 104kg.

ref. DESNIV

EDUCATIONAL OBJECTIVES

- ***Studying, putting into service, getting started and setting of the system***
- ***Understanding and setting of the PID level regulation***
- ***Calculating the span & zero offset of a level measurement by hydrostatic pressure of wet column. Adjust the level transmitter***
- ***Wiring, putting into service & adjustment of components: transmitter, regulator …***
- ***Make current measurements as in industry, without opening loops, with the help of a multimeter.***
- ***Taking in hand the setting software of the frequency converter.***

TEACHING RESOURCES – 19 PRACTICAL WORKS

PRACTICAL WORKS ON THE MEASURING CIRCUIT

- Wiring the measuring loop which comprises the 4-20mA output differential pressure transmitter, a 24V DC power supply and the PID.
- Calibrating the level transmitter Dry column method.
- Calibrating the level transmitter Wet column method.
- Producing a calibration sheet for the transmitter, and a calibration curve.
- Calculating the scale range of the transmitter.
- Measuring the current in the loop, without opening it.
- Using a calibrator for measuring the transmitter current or generating a 4-20mA current on the PID input.

PRACTICAL WORKS OF REGULATION

- Producing a regulation loop diagram, with a view to wiring the correction component and the measuring circuit
- Producing an operating diagram through the identification of various components, namely: the regulator, the correction component and the process.
- Identifying the quantities at play, namely: the adjusted quantity, controlled variable, correcting variable and disturbances
- Determining the direction of the regulator depending on the direction of the process and the correction component
- Determining the static features of the procedure, with a view to calculating the following adjustments: integration constant, dead time
- Implementing various empirical methods for setting PID correctors
- Testing the performance of the loop, in servo-control mode and in regulation mode
- Displaying on a flatbed plotter or PC, or by manual measuring, the responses of the PID adjusters, by requesting the measurement input by position or speed level
- Implementing and verifying a level measurement for a dry column or a wet column

OPERATING PRINCIPLE

The objective is to adjust the water-level in a transparent polycarbonate column –diameter 160mm, height 1370mm. A pump draws the water from a 50-litre tank at the bottom of the column. The water constantly flows through the setting valve from the column towards the tank under gravity.
The PID regulator receives the “water-level” information from a 4-20mA sensor. It compares this signal with the level reference and controls the pump delivery via a frequency variator.
The system operates in two modes: servo control and regulation.
In regulation mode, a manual valve creates the disturbance.

SUPPLIED WITH A 4-20MA LOOP CALIBRATOR

- Programming in % of the output span to supply a typical intensity like 4 – 8 – 12 – 16 or 20mA
- linear ramps, manual ramps, auto ramps
- Display: 5 digits
- Carry case, user’s manual, external battery Pack (for 6x 1.5V AA batteries)
- Input for mains adapter DC 12V (not included)
- Dimensions : 88x168x26mm Weight : 330g

DESIGN

The DESNIV model uses only industrial components.

- A PID regulator – 4-20mA standard on the measuring input and on the output.
- An industrial three-phase pump, with a bronze body
- A differential pressure level sensor
- An industrial frequency variator

The column is large in size, as is the volume of water it contains. Therefore, it has high inertia. This means that the physical phenomena are very similar to those for high-capacity tanks used by the pharmaceutical and oil industries. Pressure differences due to the significant height of the water column can be used to adjust the water-level to the nearest 5mm.
The inputs and outputs for the following are grouped together on a terminal block which is separate from the electrical cabinet: sensor, regulator, variable speed drive and 24V DC power supply. Students wire up the control and measuring loops on this terminal block. They cannot come into contact with dangerous voltages, as these are confined to the electrical cabinet. The maximum voltage that can be accessed on the student terminal block is 24V DC.
The terminal block and the components allow all wiring errors and fault finding exercises.The “water-level” and “pump delivery” curve charts (curve charts used to determine the static gain, loop gain and critical gain, the dead time and the time constant) are noted either manually (the slow speed of the phenomena means that this procedure is possible), or using a PC combined with LOGINIV software (option) and the associated interface, or by using general software.
The DESNIV model does not need to be connected to the water network. In order to prevent any overflow, a binary level sensor stops the pump if the water rises up to the top section of the column.