

P3016

LEVEL CONTROL APPARATUS

3 TERM PNEUMATIC

INTRODUCTION

The primary objective of a control system is to maintain a process variable such as flow, level, temperature, etc. at a required value. Cussons P3016 Level Control Apparatus is designed to demonstrate various aspects of control engineering using a level controlled system to control the flow of water delivered by a centrifugal pump. The unit provides students with the opportunity of investigating the effects of a change of controller parameters (proportional band, integral action and derivative time) on the control capability of the system. Of particular benefit to the student is the fact that the unit is made up of typical items of control equipment currently used in industrial applications, thereby providing an excellent opportunity for familiarisation.

The range of investigations which may be carried out are:

- ◆ Manual (or open loop) on-off control
- ◆ Manual proportional control
- ◆ Determination of the characteristics of first order and a second order level system
- ◆ Demonstration of controller proportional action and integral action
- ◆ Demonstration of integral saturation
- ◆ Response of first order and second order systems to closed loop control:
 - Single Term – (proportional)
 - Two Term – (proportional plus integral and proportional plus derivative)
 - Three Term – (proportional plus integral plus derivative)

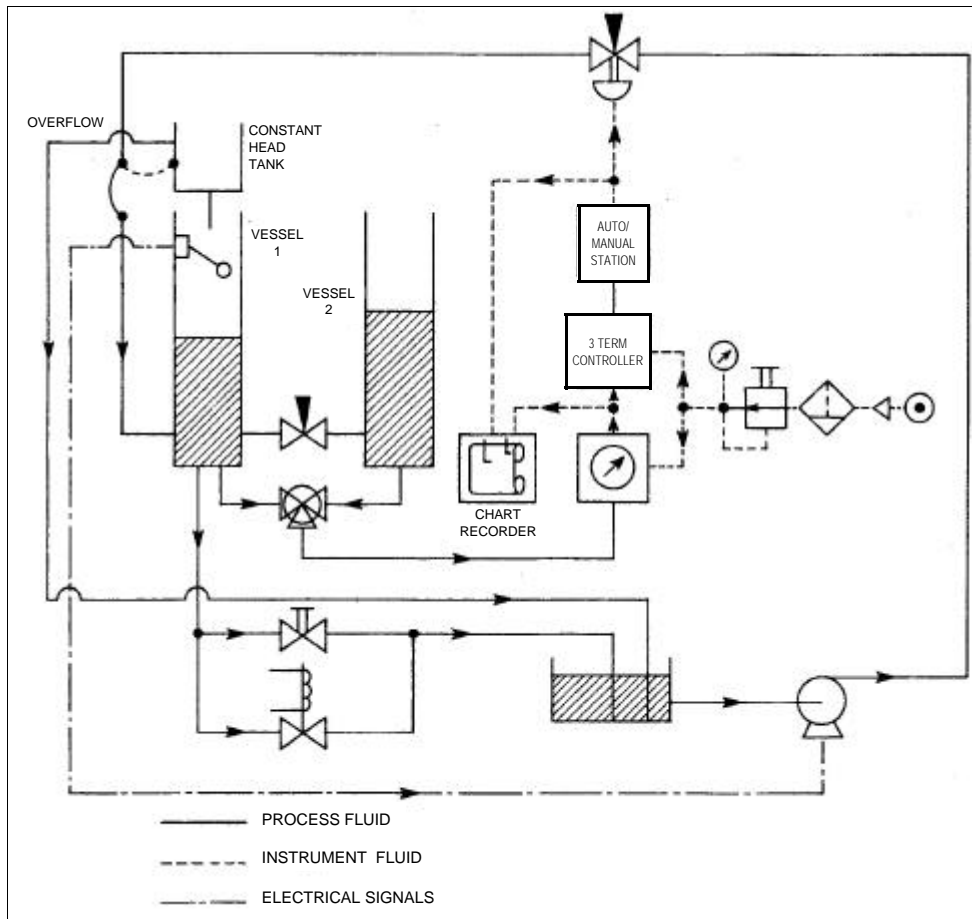
DESCRIPTION

This bench top unit comprises a process model, a water circulation system, a process control system and a chart recorder.

The process model is made up of two cylindrical water vessels, vertically mounted on a common base assembly and connected via an interconnecting pipe and valve allowing first and second order systems to be investigated. The first vessel is supplied complete with a constant head tank which fits on top of the vessel. Inlet connections to both the vessel and the constant head tank are of the self sealing quick connect type. Water is supplied to the first vessel from a sump tank by a centrifugal pump with the flow being controlled by a pneumatically operated valve. A “high level” float switch is also incorporated in the first vessel to provide on/off control of the centrifugal pump.

Flow out of the vessel back to the sump tank is controlled via a hand operated valve and a solenoid valve so that a variety of steady state and transient conditions may be produced. The water level in the vessels is determined by a level transmitter which may be switched via a ball valve to each vessel in turn. The level transmitter produces an input signal (directly proportional to level) to a three term pneumatic controller. The latter, acting in conjunction with an auto/manual station and the pneumatically operated modulating valve, affects an adjustment to the flow of water to the process model. The proportional, integral and derivative terms of the controller are independently adjustable. The flow of water to the process model may also be adjusted by manual control with the auto/manual station switched to manual mode. The level and controller output values are recorded to a base of time on the two pen vertically mounted chart recorder. The air supply to the apparatus passes through a filter unit prior to distribution.

A small, fully automatic air compressor is available as an optional accessory if required.



SCHEMATIC DIAGRAM

TENDER SPECIFICATIONS

Bench Top Level Control Apparatus utilising control components typical of current industrial applications.

The apparatus comprises:

1. Water flow circuit consisting of a sump tank constructed from clear acrylic material; centrifugal pump; pneumatically operated modulating valve; process model incorporating dual interconnected water vessels made from clear acrylic material with a "high level" float switch; self sealing quick connect water inlet and constant head tank; process disturbance facility comprising manual and solenoid valves.
2. Pneumatic control loop consisting of a differential pressure transmitter and ball valve for vessel selection, three term pneumatic controller with adjustable ranges of 2 to 200% proportional band, 0 to 40 repeats/min, integral action, and 0 to 20 mins derivative time, and an auto/manual station. The air distribution line is fitted with an input filter, regulator and pressure gauge.
3. 2-pen vertically mounted recorder.
4. A welded steel frame and backplate housing the foregoing components.

SERVICES

Compressed Air Supply: 3 to 10 bar pressure 1.5m³/h.

Electrical Supply: Single phase 220/240V 50Hz. The unit can be supplied to operate on an alternative electrical supply upon request at the time of order placing.

DIMENSIONS

1075 mm wide x 600 mm deep x 870 mm high

P3006 AIR COMPRESSOR

Fully automatic and compact air compressor with very low operational noise characteristics. Output 4.5m³/h, working pressure 8.5 bar.

SERVICES

Electrical Supply: As above.

DIMENSIONS

360 mm wide x 360 mm deep x 560 mm high

P3016/CK CONSUMABLES KIT

Consumables Kit comprising:

- 5 rolls x 30 yards chart paper
- 2 red pens and 2 blue pens

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