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TECHNICAL INFORMATION FOR APPLICATION
OF DIFFERENTIAL PRESSURE TRANSMITTERS IN PULSE COLUMN BOTTOM
INTERFACE CONTROL SYSTEMS

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OF DIFFERENTIAL PRESSURE TRANSMITTERS IN PULSE COLUMN BOTTOM
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The information in this report is based on experience with a similar unit installed on experimental pulse columns in the 321 Building. These installations were made to demonstrate the feasibility of the system. In one case, the installation on the 2A Prototype Column, the differential pressure cell (D/P cell) bottom interface control system was monitored by a capacitance-type instrument. The other installations were made on glass columns and were monitored visually.

SENSING ELEMENT

The changes in interface level are detected by a low-range differential pressure transmitter with a stainless steel diaphragm. The D/P cell must be fabricated of materials which are resistant to the solutions and stable in radiation fields. The Foxboro Model 5A D/P cell is the only known instrument which meets these requirements. The range required of the sensing element may be determined by multiplying the interface meander range by the difference in specific gravity of the two liquids forming the interface. For example, if the meander limits of the interface have been set at 24 inches, the heavy liquid specific gravity is 1.4 and the light liquid specific gravity is 1.0; then the range required is $24 \times (1.4 - 1.0) = 9.6$ inches of water, minimum.

RECORDER AND CONTROLLER

The signal from the differential pressure transmitter should be fed into a pneumatic recorder-controller similar to the Taylor Fulscope Type 122R with adjustable sensitivity and automatic reset.

The flow of liquid which is used to control the interface level should be regulated by a diaphragm-operated throttling control valve.

PHYSICAL ARRANGEMENT

The differential pressure transmitter (sensing element) must be mounted as close to the column as possible and on the same level as the bottom of the interface range. The lower sensing tap should be piped directly to the low pressure tap of the transmitter. Facilities for flushing out the connecting pipe through the low pressure chamber of the instrument should be provided. The high pressure chamber should be connected, by as direct a path as possible, to a point in the column located at the upper limit of the interface range. This high pressure leg should be piped so that it can be flushed with fresh solution of known specific gravity. It will be necessary to flush the impulse lines at least once each eight hours. Both high and low pressure pipe connections should be installed without traps.

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For an "A"-type column the impulse lines must be flushed with the scrub solution or a nitric acid solution of the same specific gravity as the scrub solution. For "C"-type columns the impulse lines must be flushed with 60 percent nitric acid. The flushing solution supply line should have a block valve as close as practical to and on the same level as the flush connection on each line. The instrument impulse lines, flush lines, and valve should all be stainless steel. The valve should be a positive shut-off type.

Air supply and output signal line should be the standard for the particular environment. In general, since these installations will be inside cells, the piping should be stainless steel. The signal must be rectified sufficiently to remove substantially all of the fluctuation imposed by the pulsing action of the column contents. This can be accomplished with a device such as the Ray Pressure Snubber with a No. 3 rod. If one snubber does not yield enough dampening, two may be used in series. The snubber(s) may be located at the recorder inlet. The recorder-controller may be mounted wherever required consistent with signal transmission limitations.

The interface level control valve should be installed in the same manner as with any other interface control problem.

ALTERNATE APPLICATIONS

This same type installation with the column impulse taps at appropriate locations can be used to detect flooding in pulse columns. To secure the best possible output signal, it is best that an instrument be connected across the extraction section and another across the stripping section.

Since the specific gravity of the solutions varies over a wide range with variations in metal concentration and extraction efficiency, this instrument system will only detect changes in organic-aqueous ratio when other conditions are unchanged. It is not applicable for estimating actual organic-aqueous ratio but only in sensing changes in that ratio.

In actual operation there is sufficient diffusion into the impulse lines to cause the signal to drift slowly. For this reason, it is necessary that the impulse lines be filled with fresh solution of a known specific gravity at fairly frequent intervals (once each eight hours is usually adequate).

RECOMMENDED EQUIPMENT

Sensing element: Foxboro Model 5A D/P Cell.

Recorder-Controller: Any unit with (1) input range to match the output of the sensing element, (2) automatic reset, and (3) adjustable sensitivity. .

Snubber: Ray Pressure Snubber with No. 3 Rod.

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FIGURE I

"A" Type Column Installation

"C" Type Column Installation.

FIGURE II