

INTER-OFFICE MEMO **TENNECO CHEMICALS, INC.**

TO J. C. Fisher AT Flemington DATE October 16, 1969

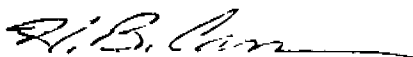
FROM H. B. Carr AT Flemington COPY TO E. J. Hourihan
C. W. Johnston
F. W. Kanzler
M. C. Spalding
M. W. Williams (2)

SUBJECT In-Process pH Analyzers

The Analytical Control Group has been updating files on instrumentation including laboratory and in-process types for future reference. Acting on a suggestion by M. W. Williams, literature and quotes have been requested on Process pH Analyzers.

Selected pages from a Beckman Instruments bulletin and a quote (attached) indicate that this approach merits attention for the Plastisol process both from the dollar expenditure involved and the significantly improved control to be gained. The multipoint analyses possible with one pH analyzer would provide continuous measurements for control of emulsifier storage tanks, batch mix tanks, latex blend tanks and, quite possibly, reactors.

Before pursuing this approach further with Beckman and other instrument houses, Analytical Control requests comments as to the feasibility, other suggestions, practicality, etc. from the recipients of this memo.


H. B. Carr

HBC:em ✓

Att.

Note: There was an excellent article on In-Process Instrumentation in the 10/13/69 issue of C & E NEWS.

THE APPLICATION OF pH AND ORP CONTROL SYSTEMS

Many industrial applications that utilize continuous pH/ORP monitoring require continuous recording and/or control. The necessary components required for a typical pH control system include:

- pH electrode station
- pH analyzer
- recorder
- indicating control station
- final control element (i.e., control valve or pump)

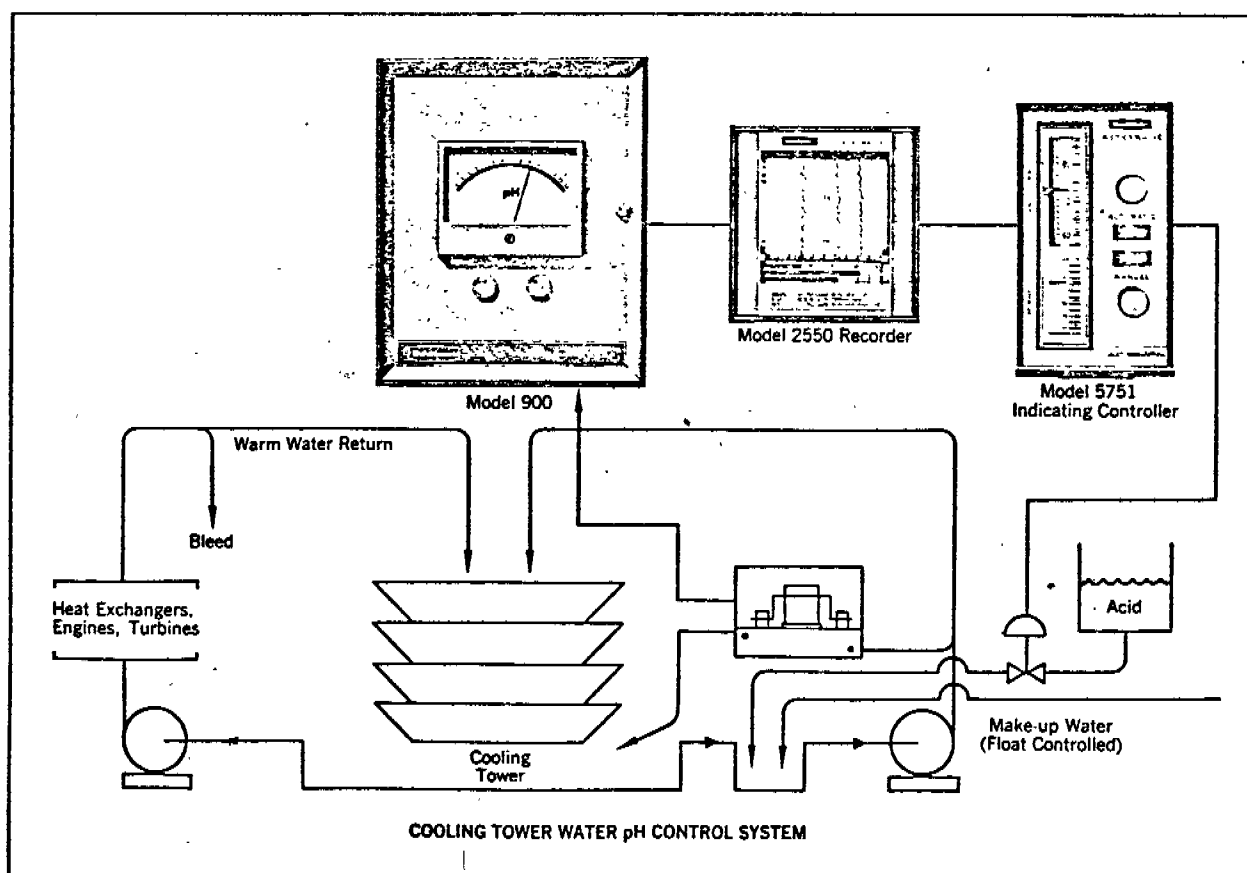
These items are all available from

Beckman and can be supplied as a complete, integrated control system to meet most any pH control requirement.

An example of a control system is found in cooling tower water treatment applications. Close pH control is essential so that cooling water is maintained at a balanced pH level. If the pH level is too low, excessive corrosion will result. If too high, excessive scaling will occur. If either imbalanced pH condition exists, the efficiency of heat exchangers and

other process plant equipment may be seriously impaired.

Complete instrumentation systems are designed by Beckman application engineers for almost any conceivable process pH or ORP control application. Design parameters such as dead time of the system (time between the reaction and the point of measurement), and mixing and reaction time are evaluated to insure the proper selection of system components that are best suited to a specific application.



BECKMAN MODEL 900 pH AND ORP ANALYZERS

The Beckman Model 900 pH Analyzer is an analytical instrument designed to provide a continuous measure of pH in applications ranging from food processing to water treatment.

The instrument provides accurate, reliable measurements, and gives the operator a wide choice of easily selectable ranges and outputs.

The Beckman Model 900 pH Analyzer, together with Beckman pH electrodes, electrode chambers, and accessories, provide the world's finest system for continuous pH measurement.

The Model 900 pH Analyzer incorporates an a.c. stabilized amplifier which converts the potential between two electrodes into a signal which provides a meter indication of the pH value, and which can also drive a recorder or activate a control device. The output signal has a stability of 0.005 pH over a 24-hour period.

Weather-Proof Case

The case of the Model 900 is kept desiccated and sealed from moisture assuring reliable operation under the most adverse weather conditions. It may be installed in any location without additional weather protection although a rain hood is generally considered good installation practice. Ambient temperature limits are -20°F to $+122^{\circ}\text{F}$.

External Controls

The standardize and function controls are located on the outside front of the analyzer case door. Thus routine electrode standardization is accomplished without exposure of high impedance electronic circuitry to atmospheric conditions. These controls are of the coin-slot type to pre-

vent accidental movement after adjustment.

Three Mounting Choices

The design of the Model 900 pH Analyzer permits it to be mounted in any of three modes. It may be panel or surface mounted or, with an accessory bracket, it may be mounted on either a vertical or horizontal pipe.

Easy Internal Accessibility

The Model 900 pH Analyzer is designed so that all components are conveniently located on the inside of the case door providing easy access for servicing, output selection, or pH range expansion. Functional circuit component boards may be removed and replaced easily, thereby minimizing downtime. By removing only two pins the entire door of the instrument, complete with circuitry, may be easily removed for repair. If operational downtime must be kept to an absolute minimum, a spare door may be installed in a matter of minutes.

Easily Read Meter

The Model 900 incorporates a $5\frac{1}{2}$ " readout meter calibrated in 0.1 pH units. The meter is mirror backed to eliminate parallax thus providing readout of the highest accuracy.

Choice of Output

The Model 900 pH Analyzer is available with either a current or potentiometric output. The current output version is designated the Model 900C. The potentiometric version is the Model 900P.

An alternate potentiometric output version, the Model 900PS, provides output zero shift and variable range expansion.

ORP Analysis

Two versions of the Model 900 Ana-

lyzer are designed specifically for oxidation-reduction potential (ORP) measurements. One has a current output and is designated the Model 900RC; the other has a potentiometric output and is designated the Model 900R. The physical dimensions of the Beckman ORP and pH Analyzers are identical. Most of the external features of the Model 900 pH Analyzers are identical to those of the Model 900 ORP Analyzers.

Integral Alarm/Control Option

All basic versions of the Model 900 pH and ORP Analyzers are optionally available with integral set-point contacts for alarm and/or control actuation. These built-in contacts eliminate the need to mount and wire separate contact devices.

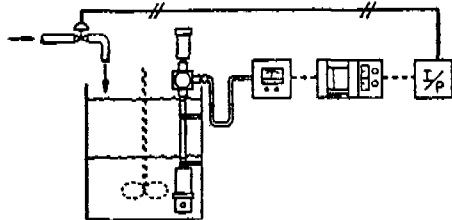
Two bold, red set-point indicators are clearly visible on the calibrated indicating meter of alarm/control versions of the Model 900. These indicators are easily positioned by two sealed, coin-slotted adjustments located directly beneath the meter. The upper set point is adjustable from 5 to 100% of full scale; the lower set point from 0 to 95%.

The meter indication of pH or ORP values is completely independent of, and unaffected by, the control point settings. Each double throw relay may be wired to provide contact closure or contact opening for operation of the set point. Complete flexibility permits High-Low, High-High, or Low-Low set point actuation.

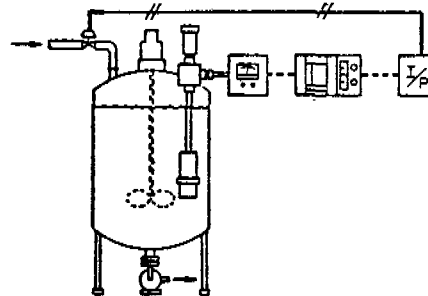
This alarm/control option is designated by an "A" suffix on the basic model numbers as follows: Model 900PA, Model 900PSA, Model 900CA, Model 900RA, and Model 900RCA.

From sketches below, please check the box which most nearly approximates your proposed installation.

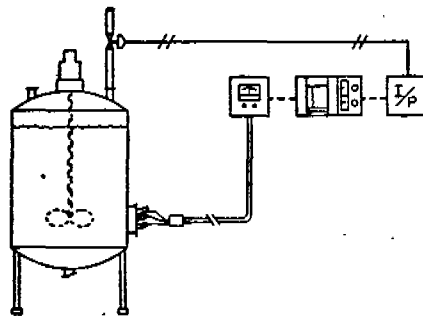
1. Measurement in Open Tank or Stream ☐



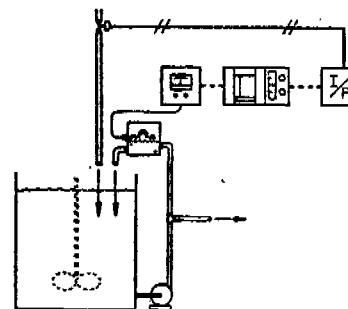
2. Measurement in Pressurized Tank (to approx. 40 psig) ☐



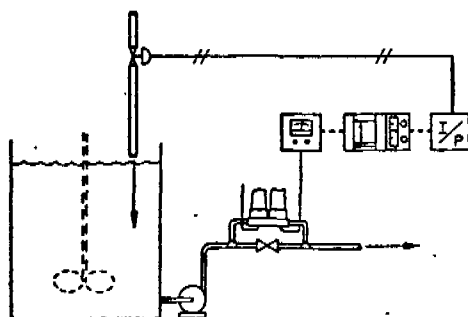
3. Measurement in Tank, Pressure to 100 psig ☐



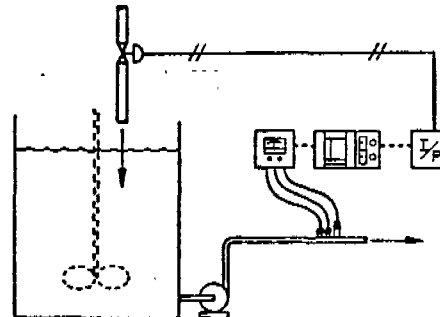
4. Measurement in Recycle Stream, Atmospheric Discharge ☐



5. Measurement in Piped Sample Stream (Pressure to 100 psig) ☐



6. Measurement in Main Process Pipeline ☐



7. Other (please sketch)

1.) 360.00 f. Electrode assembly each
150.00 Cable each

(Detach Here)

BECKMAN PROCESS pH ACCESSORIES (cont'd)

Electrode Switches for Multi-point Analysis

The Beckman Electrode Switch permits analysis of up to six different streams or solutions with only one pH analyzer. The switch is available in two models, the Model #74700 for automatic operation and the Model #2040 for manual operation.

Each desired electrode station must be provided with a glass electrode, a reference electrode, and a thermo-compensator. The electrodes are connected to the pH analyzer through the electrode switch.

The automatic switch may be used with most standard six-point recorders. It is actuated by the distributor switch in the recorder stepping in sequence to each electrode station. The recorder distributor switch should be of the "break before make" type, should have a dwell time of at least 20 seconds per point, and should be capable of opening and closing a 0.6 amp circuit at 7 volts a.c. A manual override on the Model #74700 allows selection of any one station for continuous analysis.

The manually operated switch allows an operator to select the electrode assembly at which pH measurements are desired.

The electrode assemblies may be located as far as 200 feet from the electrode switch. The gasketed and desiccated electrode switch case contains manual standardization controls for each electrode group.

Any combination of electrode chambers may be used with either electrode switch. The selection of electrodes and electrode chambers should be compatible with solution composition and electrode station mounting requirements.

#76280 Adaptor for #19565 and #19566 Reference Electrodes

This adaptor kit is required for flow chamber installations utilizing either the #19565 or #19566 Reference Electrodes. The kit comprises a 200 cubic centimeter plastic reservoir with mounting bracket, tube fittings, and tubing.

Model 900 Air Purge Kit

The Beckman #191343 Purge Kit for Model 900 pH and ORP Analyzers is designed to meet ISA (Instrument Society of America) recommended procedure for type Z air purge. When installed, the kit is designed to reduce the classification within the enclosure from Division 2, normally non-hazardous, to non-hazardous.

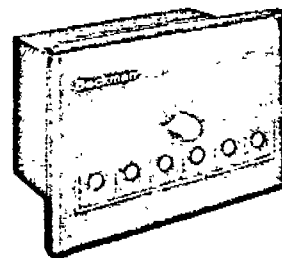
Only clean, dry air or suitable inert gas may be used for the purge supply. Recommended pressure for the purge supply is 20 psig. This provides a flow rate of approximately 4 liters per minute (8.4 cfh), and a case pressure of approximately 1 inch H₂O.

Model J Air Purge Kit

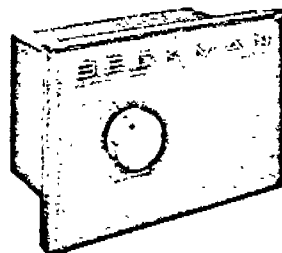
The Beckman #25280 Purge Fitting is available for use with Model J Analyzers. This fitting may be easily installed in the field; or on special request, it may be installed at the factory.

Model J Field Mounting Accessory

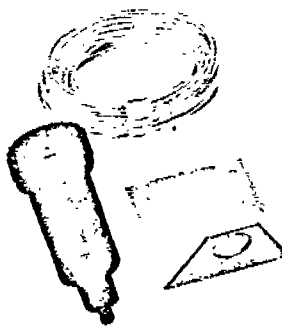
The #70999 Field Mounting Accessory, which consists of a drilled metal plate and wrap-around metal strap, allows the Model J Analyzer to be installed in a variety of locations where panel mounting would be impractical. The design of the plate permits the Model J to be secured either to floor flanges or to process piping. The analyzer may be mounted against a wall by using a spacer block with the accessory.



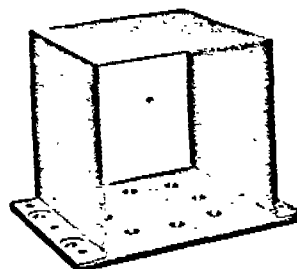
#74700 Automatic Electrode Switch



#2040 Manual Electrode Switch



#76280 Adaptor Kit



Field Mounting Accessory

BECKMAN ELECTRODES AND ELECTRODE CHAMBERS

Accurate, continuous pH monitoring begins with the proper selection of electrodes and electrode chambers.

The following electrode and electrode chamber descriptions should be used as guides to determine the most suitable combination of pH equipment as required by installation conditions and solution characteristics.

When used in the proper combination, Beckman designed electrodes and electrode chambers permit pH monitoring in almost any on-stream application.

BECKMAN ELECTRODES

As part of a complete pH analysis system, Beckman has designed glass

and reference pH electrodes to satisfy the rigorous requirements of continuous pH measurement under the most severe industrial applications. Through years of experience in industrial pH, Beckman engineers have also simplified the installation, maintenance, and the selection of these electrodes. Only Beckman manufactures electrodes which are designed specifically for the benefit of the industrial pH user and which incorporate these important features:

1. Short, compact electrode bodies are stronger than conventional electrodes, resist breakage. They also reduce the required length and bulk of electrode chambers which facilitates installation of the pH system.

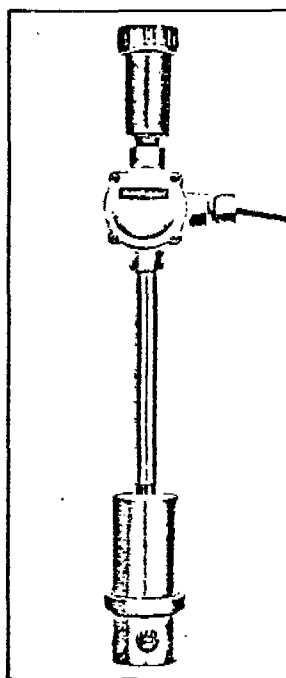
2. The wide diameter of the electrodes not only adds strength, it also provides the lowest possible electrical resistance in the pH-sensitive bulb since the resistance decreases as the area of the bulb increases. Lower resistance means greater sensitivity.
3. Electrode cables connect at electrode caps in a quick connect-disconnect manner. This speeds installation and facilitates removal for cleaning or replacement.
4. Large volume electrolyte capacities in the reference electrodes eliminates frequent refilling, lets the pH system operate untended for a longer period of time.



Beckman

Bulletin 4085

SERIES THREE pH ELECTRODE SUBMERSION ASSEMBLIES



FEATURES/BENEFITS

- *Maximum outside diameter of 3½ inches permits installation through much smaller openings than previously available submersion assemblies.*
- *Simplified construction permits quick assembly and disassembly for electrode cleaning, standardization, and replacement.*
- *Available in either polyvinyl dichloride or stainless steel to meet the requirements of almost any pH monitoring application.*
- *Close tolerance gland assembly with tight fitting O-ring seals insures leak-proof installation and operation.*

The Beckman Series Three pH Electrode Submersion Assemblies satisfy the requirements of almost any continuous, process pH application in which pH electrodes must be submerged in a tank, trough, flume or body of water. Series Three Submersion Assemblies are available in either stainless steel or polyvinyl dichloride for use in a wide variety of chemical applications and in a wide range of temperatures and pressures.

The design and physical dimensions of the polyvinyl dichloride and stainless steel submersion assemblies are essentially the same. The major elements of each are: an electrode cover over the electrode caps and terminals, a gland assembly through which the

electrodes are inserted and make contact with the sample, an electrode guard that protects the electrodes from breakage, and a reference electrolyte reservoir assembly.

THE ELECTRODE COVER

The electrode cover protects the electrode caps and terminals from the sample solution. A ¾-inch NPT pipe tap is located in the top of the cover, into which the desired length of ¾-inch pipe (supplied by user) is threaded. The pipe not only serves as support for the submersion assembly but acts as conduit for the electrode cable and the tubing that transports electrolyte from the electrolyte reservoir to the reference electrode. The electrolyte reservoir is mounted on top of the pipe and provides head pressure on the reference electrode greater than the pressure of the liquid being analyzed.

THE GLAND ASSEMBLY

The heart of the Series Three Submersion Assembly is a gland approximately 2.5 inches in diameter. A glass electrode and thermocompensator each fit through holes in the gland and are sealed by O-rings in a groove part way down each bore hole. A third hole in the gland accepts a newly designed reference electrode whose diameter and overall length is the same as that of the other elements. The reference electrode has an electrolyte fill hole in its outer shell which, when the electrode is in place, fits between two interior sealing O-rings which form an annular spacing ring around the electrode. This spacing ring is fed with electrolyte through a hole drilled in the body of the gland which connects to a Swagelok fitting on the top of the gland.

A three-point, screw-down retainer in the center of the gland holds the three elements in place.

The gland snap fits into the cover assembly. An O-ring in a groove around the outside of the gland forms a watertight seal with the cover.

COLORITE 016381

Beckman®INSTRUMENTS, INC.
2500 HARBOR BOULEVARD, FULLERTON, CALIFORNIA 92634
(714) 871-4848; TWX 910-392-1260; TELEX 06-78413DIVISION/OPERATION PIDPage 1 of 1ISSUE POINT ONE BALA AVE.BALA CYNWYD, Pa. 19004Date 9/10/69TENNECO CHEMICALS INC.
P.O. Box 116
BURLINGTON, N.J. 08016Customer Inquiry YOUR INQUIRY
OF 8/11/69
Quotation No. 2904-0436

Attention:

MR. F. KANZLERPlease refer to this Quote No. in
Future Correspondence

ITEM	QTY.	DESCRIPTION	UNIT PRICE	NET PRICE
1	1	MODEL 900C PH ANALYZER 0-14 PH OUTPUT; 1-5, 4-20, 10-50 (SELECT ONE).	\$710.00/EA.	
2	1	BECKMAN #72500 FLOW CHAMBER	245.00/EA.	
3	1	BECKMAN #19505 GLASS ELECTRODE	31.00/EA.	
4	1	BECKMAN #19555 REFERENCE ELECTRODE	31.00/EA.	
5	1	BECKMAN #19580 THERMOCOMPENSATOR	45.00/EA.	
6		150 FT. BECKMAN #76594 CABLE AT .70¢ FT.	105.00/EA.	
7	1	12" 24 HR. ROUND CHART RECORDER INPUT (ANY IN ITEM ONE)	300.00/EA.	
8	1	MODEL 5751 (3) MODE ELECTRONIC CONTROL STATION.	\$520.00/EA.	
THANK YOU FOR YOUR INTEREST IN BECKMAN INSTRUMENTS AND IF WE CAN BE OF ANY FURTHER ASSISTANCE, PLEASE DON'T HESITATE TO CALL US.				

PROPOSAL FOR ACCEPTANCE WITHIN 60 DAYS OF ABOVE DATE

SHIPPING POINT: 2-3 WKS. ARO FROM RECEIPT OF ORDERTERMS: F.O.B. FULLERTON, CALIF. NET 30 DAYS

SHIPPING POINT:

THE WARRANTY AND TERMS OF PAYMENT APPEARING ON THE
REVERSE SIDE ARE A PART OF THIS PROPOSAL**Beckman®** INSTRUMENTS, INC.

Signed

CHUCK WEAVER

Title

SALES REPRESENTATIVE