

# SYRUP CONCENTRATION MONITOR

## MODEL 971-C



### PRODUCT DESCRIPTION

This syrup concentration monitor is designed to measure syrup viscosity in tanks or pipelines and convert the measurement to a linear reading of percent dry substance. The instrument operates under pressure or vacuum and is unaffected by direction or velocity of syrup flow. The probe can be installed directly in equipment at a favorable point to minimize measurement lag, improve control of concentration, and eliminate troublesome sample withdrawal problems.

### FEATURES

- Simple installation
- Wide dynamic range
- Linear isolated output
- High accuracy and reliability
- Stainless steel sensor
- Designed for durability
- Low maintenance
- Field serviceable
- One-year limited warranty

### PRINCIPLE OF OPERATION

This instrument employs a measuring element consisting of a stainless steel probe terminating in a disc-type rotor. The 3" diameter stainless steel rotor (for the 50 to 75% range), immersed in the syrup, is rotated by a small shunt-type DC motor at approximately 1800 RPM. Since armature current is proportional to viscous drag, the monitor measures the armature current and converts it to syrup concentration.

Temperature has quite an effect on most syrup properties and viscosity is no exception. In the 50 to 75% range the temperature effect is about 0.25 Brix/ $^{\circ}$ C. However in factory processing operations, temperatures are generally quite constant so infrequent manual adjustment by means of a calibrated dial on the monitor is adequate. However, automatic compensation for wide variations in temperature can be supplied in the form of a thermal element mounted in the syrup near the viscosity probe and electrically connected to the monitor.

Viscosity is a syrup property that has been little used industrially for determining solids content, primarily because the relationship between viscosity and solids content is very non-linear. But in this instrument, as in the Ziegler Syrup Consistency Monitor, the probe gives an output that varies as the logarithm of viscosity over a range in excess of 100 to 1. The syrup concentration monitor extracts a second logarithmic function to produce the linear concentration scale.

Viscosity has several advantages over conventional methods of measuring syrup concentration. It is scarcely affected by the presence of entrained air bubbles as compared to any device based on syrup density which requires that material be thoroughly de-aerated before measurement to eliminate excessive errors. This can create intolerable time lag in control circuits. Scale accumulation on nuclear gauging devices causes cumulative errors and maintenance is often required to keep them within

acceptable limits. The high peripheral velocity of this sensor's rotor discourages scale accumulation and even so it has minimal effect.

This instrument is only sensitive to a relatively thin syrup film in contact with the disc and so is not affected by the direction or velocity of flow past it. In stagnant syrups such as those leaving evaporator bodies, its rotation provides considerable agitation to mix stratified streams. Thus, it can be installed directly under an evaporator body and provides good average readings even under very low flow conditions with minimum measurement lag. In contrast, refractive index measuring devices generally require high syrup velocity or mechanical assistance to keep an updated sample in the measuring zone.

## SPECIFICATIONS

### SENSOR

Type	Insertion Probe
Size	1-3/4"
Wetted Parts	316 stainless steel, high temperature plastic
Process Temp.	32 °F to 250 °F (0 °C to 125 °C)
Pressure	0 to 50 psig
Water Supply	Less than 0.5 gallons/hour at 10 psi above process
Mounting	2" NPT male
Wiring	#22 AWG or larger 3-conductor
Dimensions	
Diameter	1-3/4"
Length	24"
Junction Box	6 x 6 x 6"

### TRANSMITTER

Display	4-1/2" analog indicator
Range	50% to 75% solids
Input	Model 971-C Sensor
Output	4 to 20 mA into 600 ohms max., other outputs available
Resolution	0.5% of full scale
Repeatability	1.0 % of full scale
Accuracy	2%
Ambient Temperature	32 °F to 110 °F (0 °C to 50 °C)
Enclosure	NEMA 1 or NEMA 4X
Dimensions	
NEMA 1	11" W x 6" H x 4" D
NEMA 4X	11-7/8" x 7-1/4" x 6-3/4"
Mounting	
NEMA 1	Panel or wall mount
NEMA 4X	Wall or pipe mount
Power	115 or 230 VAC @ 50/60 Hz, 75 Watts.
Shipping Weight	24 to 30 lbs. depending on options

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