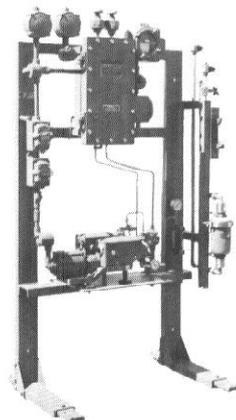


DISTILLATION ANALYZER

A second generation boiling point analyzer is now available in the form of Hallikainen's Model 1463. Measurement of the percentage recovered boiling point from 5% to the end point is possible with this analyzer. Latest solid state electronics and an improved design minimize the amount of maintenance required for successful performance.

Operation consists of controlling the liquid-vapor ratio by setting the incoming and outgoing liquid flow rates to the analyzer. A thermocouple measures a liquid temperature at the established vapor-liquid ratio. This temperature can then be directly correlated with the ASTM D-86 test.

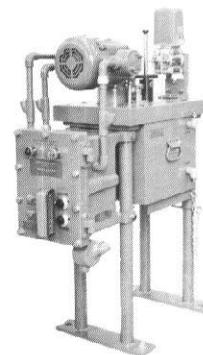
Programming may be accomplished with this analyzer to monitor multiple boiling points. The MULTIPLE POINT DISTILLATION ANALYZER can automatically monitor multiple boiling points on a single stream. To accomplish this, a programmer permitting variable time periods at different boiling point temperatures, is added to the DISTILLATION ANALYZER. Output from the analyzer is a single thermocouple which measures the respective boiling point as the analyzer is cycled.



CONTINUOUS VISCOMETER

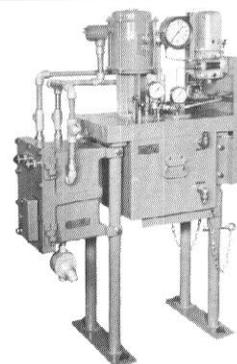
This CONTINUOUS VISCOMETER is designed primarily for use on petroleum products although it is satisfactory for use on any Newtonian liquid. Essentially, the instrument consists of a capillary tube through which a liquid, maintained at a constant temperature, is forced at a constant velocity. A transmitter is used to measure the pressure drop across the capillary. This pressure measurement is a linear function of viscosity in centipoise units. Through choice of a suitable capillary, measurements can be made over a wide range in viscosity to 7500 cps. at the bath temperature.

The analyzer has been compared in the refinery with the laboratory method of viscosity determination. An overall accuracy of better than 1% was obtained in this comparison.



VAPOR PRESSURE ANALYZER

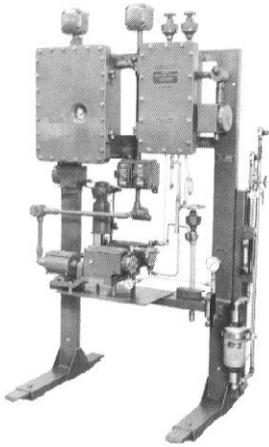
Application to Reid vapor pressure monitoring or control is where this analyzer fits into the hydrocarbon processing plant. With the advantages of simple design, fast response and direct RVP read-out, many VAPOR PRESSURE analyzers are currently used in gasoline and jet fuel blenders as well as monitoring crude oils in pipelines. Product capability runs from jet fuels through LPG products.



GRAVITROL LIQUID DENSITY ANALYZER

Continuous weighing of a flowing fluid is the accurate measurement principle of this analyzer. Spans to 0.015 gm/ml for electrical transmission and 0.025 gm/ml for the pneumatic model are available. Accuracies of measurement to ± 0.0003 gm/ml are possible with various models of the 1373. Sample contact materials include 316 stainless steel (std.), nickel, monel, tantalum, glass or stainless steel lined with P.V.C. or ebonite. Temperature compensation is an option providing maximum accuracy. Successful applications include chemicals, slurries, dairy products, hydrocarbons, soft drinks and sugar refining liquids.



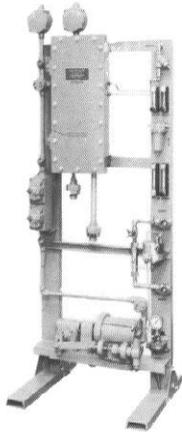


PERCENT EVAPORATION ANALYZER

This analyzer measures the percent of a petroleum product evaporated at a pre-selected temperature.

Operation of the instrument is based on the percent evaporation of a constant sample flow rate at an accurate, fixed temperature, with a variable pump-out rate determined by changes in a sample evaporation characteristics.

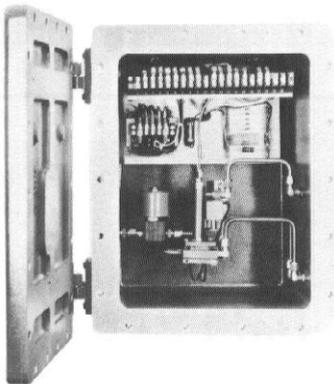
Fast response lends the analyzer to automatic control in blending or monitoring of a process.



LOW RANGE BOILING POINT ANALYZER

This apparatus is intended for use in determining the initial to 20% boiling point of light hydrocarbons, between 150°F. and 500°F. The measurement is continuous. The results obtained with this instrument compare very favorably with laboratory tests made in accordance with the ASTM D-86 distillation method. Accuracy and repeatability make it possible to monitor specification material, reducing the frequency of tests that would otherwise have to be made by the laboratory.

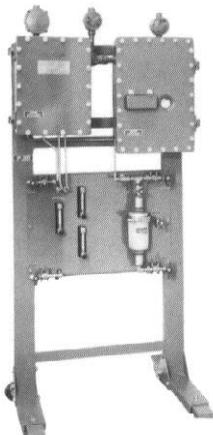
The explosion-proof construction permits installation of the apparatus in refinery plant areas.



FREEZING POINT ANALYZER

Model 1470 FREEZING POINT ANALYZER is a continuous process analyzer that measures the freezing point of a liquid as a means of purity determination. On-stream analysis eliminates laboratory time and cost of performing purity tests by the standard ASTM D1015-55 method.

In principle, the sample is supercooled below its freezing point and then caused to partially fuse into a solid by mechanical impact. Stirring of the sample during cooldown is not required. Applications include benzene, paraxylenes, phthalic anhydride plus many other materials where freezing point is a measure of purity.



PROCESS CLOUD POINT ANALYZER

Wax precipitation temperature is used as the principle of operation to determine the cloud point of a sample. As the analyzer's sample is cooled, convection currents are produced. When these currents cease, this indicates the cloud point. A thermocouple continuously measures the sample's temperature providing the output of the analyzer.

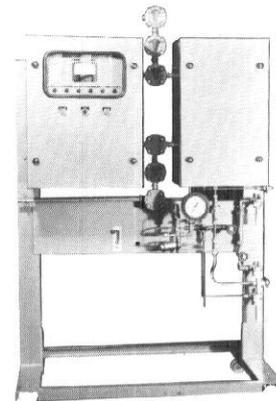
The standard range is -30°F. to $+55^{\circ}\text{F.}$ with a repeatability of $\pm 1^{\circ}\text{F.}$ The analyzer correlates with the ASTM D97 method. Application is for gas oils and cycle oils. Process control is possible using this analyzer with the inclusion of a trough-picker, standard with the instrument. On special order, lower cloud point ranges are possible.

PROCESS POUR POINT ANALYZER

ASTM D-97 is the laboratory test procedure for determining pour point of a lubricating fuel or crude oil. The POUR POINT ANALYZER can continuously monitor this same property from the process line, thereby giving rapid results.

The instrument operates by cooling a revolving sample cup containing a small sphere suspended in the sample liquid. A thermocouple attached to this sphere measures the temperature of the liquid. As the temperature drops, the viscosity increases and the sphere is then displaced. When a fixed displacement is reached, this is then indicated as the pour point.

Accuracy is within $\pm 3^{\circ}\text{C}$. of the ASTM test. The instrument is not affected by pour point depressants.



IN-LINE VISCOMETER

Absolute viscosity at the flowing temperature is measured with this instrument. Operation consists of flowing the entire process through a pipe elbow. A metering pump immersed in the housing and surrounded by the fluid, provides a constant flow rate through a calibrated capillary. Only a minute portion of the fluid is delivered by the pump. The pressure drop is measured across the calibrated capillary which then is a function of the viscosity. Up to 15,000 poise may be measured. Temperatures of up to 900°F. and pressures to 1,000 psig may be handled by various models of the IN-LINE VISCOMETER.

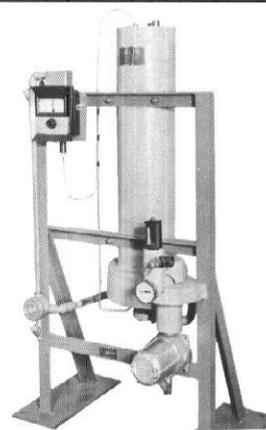


DIACON MOISTURE ANALYZER

The DIACON has been successfully applied to measuring the moisture content of liquids and gases. There are approximately 200 analyzers operating successfully in the field. Applications include dissolved water measurement in any saturated or unsaturated hydrocarbon from propylene to lubricating oil. Gas applications have been on pure gases or liquified gas products.

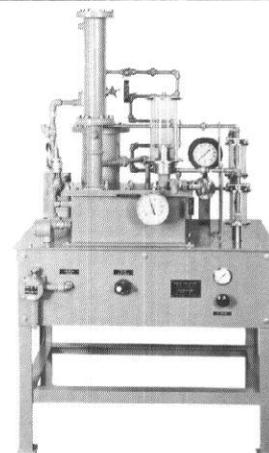
On liquid samples the analyzer operates completely in the liquid state. There is no need for troublesome sample systems requiring vaporization of the sample to the analyzer.

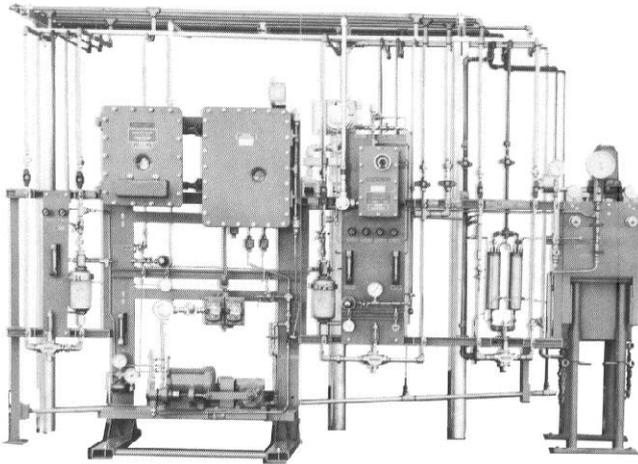
Range of the analyzer is parts per million by weight. Outputs are available for use in control or recording systems.



ACID ANALYZER

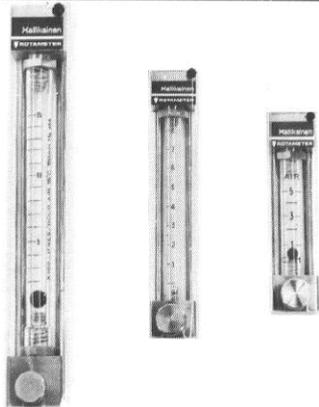
Many alkylation plants use sulfuric acid for the production of high octane aviation fuels. For economy, it is imperative that the acid consumption be held at a minimum. An important means by which reduction in acid use can be accomplished is through the operator's knowledge at all times of the acid strength in the reactor. For this reason an apparatus has been developed which continuously separates the light hydrocarbon vapors, the alkylate and the acid. A hydrometer is then used to measure the concentration of the acid. Recent developments permit addition of remote density read-out equipment.





SYSTEMS DIVISION

Complete on-line analyzer responsibility is available from this division. The following services can be performed; analyzer specification, bid evaluation, purchase, sample system design and fabrication, complete check-out and testing, field installation, startup and training of personnel. All of the above can be performed with Hallikainen instruments as well as those of other manufacturers.



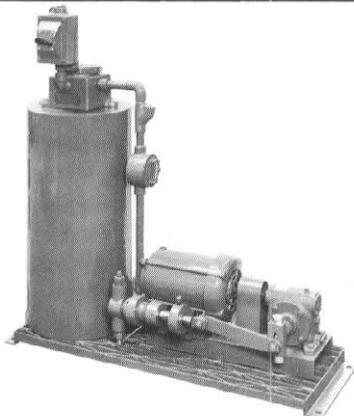
ROTAMETERS

Hallikainen ROTAMETERS are variable area flowmeters for liquid or gas service. Rotameter frames are available in stainless steel or brass in 2½", 4" and 6" sizes. These rotameters are designed to give excellent all around visibility and easy access to the tube. A plastic shield protects the borosilicate glass tube which can be easily removed from the frame. A single frame will accept a range of tubes with varying flow capacities.



COLOR ALARM

Hallikainen flow colorimeters are of the differential type. The COLOR ALARM is designed to sound an alarm, or provide a visual signal when a pre-set color limit is exceeded. Two instruments are used when signals for both lighter and darker colors are required.



SAMPLE RETURN SYSTEM

Process stream analyzers that operate at atmospheric pressure do not permit a sample to be returned directly to the process line under pressure. Pollution control may also dictate that instrument samples may not be returned to a drain or sewer. For these conditions the Model 1464 SAMPLE RETURN SYSTEM has been designed. The system consists of a 10 gallon atmospheric reservoir with level switches to stop and start the return pump.