

750 NATIONAL COURT, RICHMOND, CALIFORNIA, 94804

LABORATORY CLOUD POINT ANALYZER

MODEL 1433

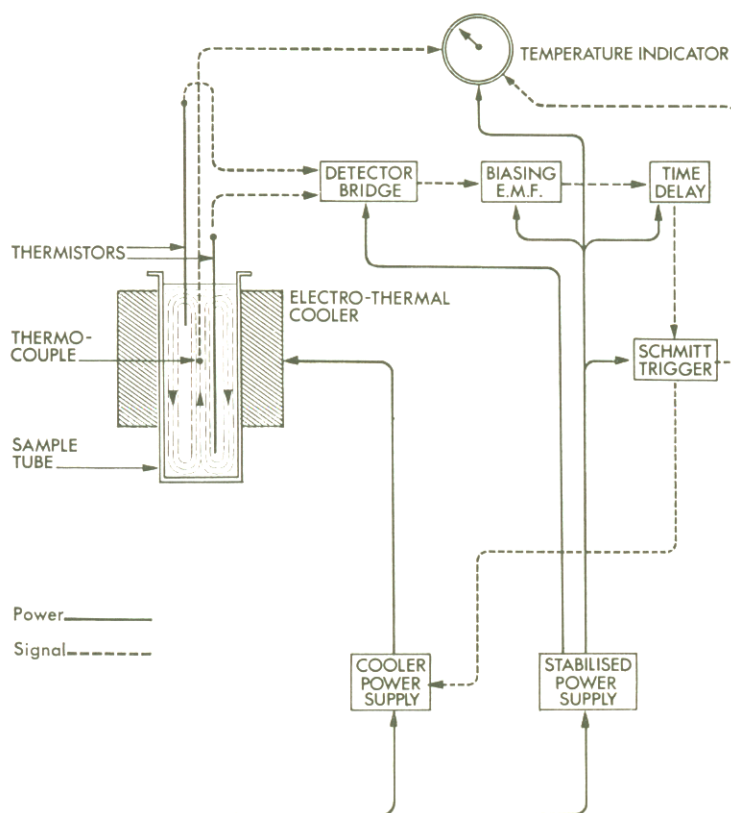
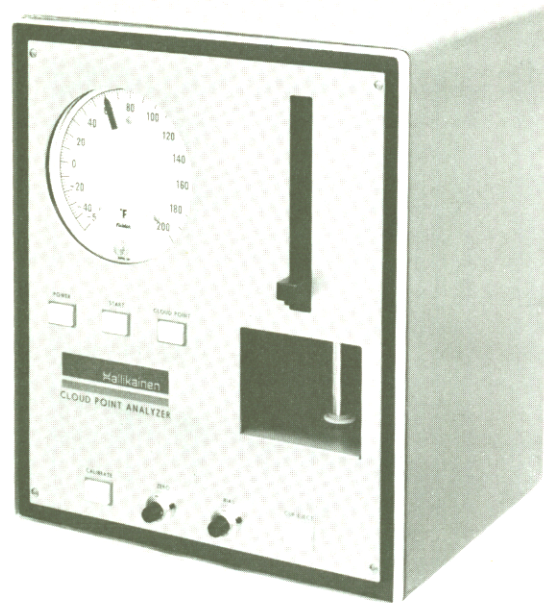
Shell Refining Limited Design

PRINCIPLE OF OPERATION

The HALLIKAINEN CLOUD POINT ANALYZER is an automatic instrument for detecting and indicating the wax precipitation temperature, or cloud point of gas oils. The instrument is based on the differential temperature method of cloud point determination. The principle of operation is as follows:- a small sample cell containing the oil under test is placed in the cooling chamber of an electrothermal refrigerating unit, and a detector assembly, comprising two thermistors and a thermocouple, is lowered into the oil to a pre-determined position. An automatic cycle of events is then initiated by operation of a "START" switch on the instrument panel.

It can be seen from figure below that when the cooling unit is energized the oil will circulate through convection falling at the walls of the tube and rising along the axis.

The resulting difference in temperature between top and bottom of the sample container is detected by the thermistor elements and causes electrical unbalance of the detector bridge circuit. The thermocouple, measuring sample temperature midway between the thermistor levels, is connected to the potentiometric indicator on the front panel of the instrument for cloud point monitoring. Detector bridge circuit output



is fed to a Schmitt trigger circuit biased to be inoperative while the detector is unbalanced.

With continued cooling the sample temperature decreases to its cloud point when wax precipitation takes place, preventing further convection. At this point the temperature difference between the thermistors disappears and the detector bridge circuit balances. This condition allows the Schmitt trigger circuit to operate switching off the supply to the cooling unit and clamping the potentiometric indicator. The cloud point temperature of the sample will then remain displayed until the operator, by lifting the detector assembly out of the sample cell, automatically resets the instrument.

In the initial period of the test when the sample is at a uniform temperature a time delay circuit prevents operation of the trigger circuit. The cooling unit incorporates a thermal trip to prevent overheating should the water supply fail.

The instrument covers a range of cloud points down to -40°C and will complete a test cycle in about 5 to 15 minutes depending upon the cloud point temperature of the sample.

ACCURACY

Accuracy of measurement is within ASTM requirements.