CS-HVA-1

Houillon Viscometer Automation System

ASTM D7279-14 Ready

The system meets the requirements of ASTM D7279-14 which is specific to viscosity measurement carried out using automated Houillon viscometers that provides rapid viscosity analysis. .

Robotic Automation

Designed for four Houillon viscometer baths, the CS-HVA-1 system operates completely unattended and requires no operator intervention save loading the four x 100 position sample trays. The CS-HVA-1 performs 800 viscosity tests per 8-hour shift

Auto-Solvent Filling

The automated system maintains optimal solvent levels in all viscometer baths to eliminate variability of solvent pressure for cleaning cycles and to minimize labor requirements.

Leading Edge Technology

The CINRG CS-HVA-1 Houillon Viscometer Automation system is a fully automated system that meets the requirements of ASTM D7279-14 which is specific to viscosity measurement carried out using automated Houillon viscometers that provides rapid viscosity analysis.

The system combines equipment from several leading equipment manufacturers with some innovative technology and sophisticated software that was developed by Wearcheck for use in their oil analysis laboratory. The system has a high degree of flexibility and can be customized to a large extent to suit local laboratory processing requirements.

Robotic Automation

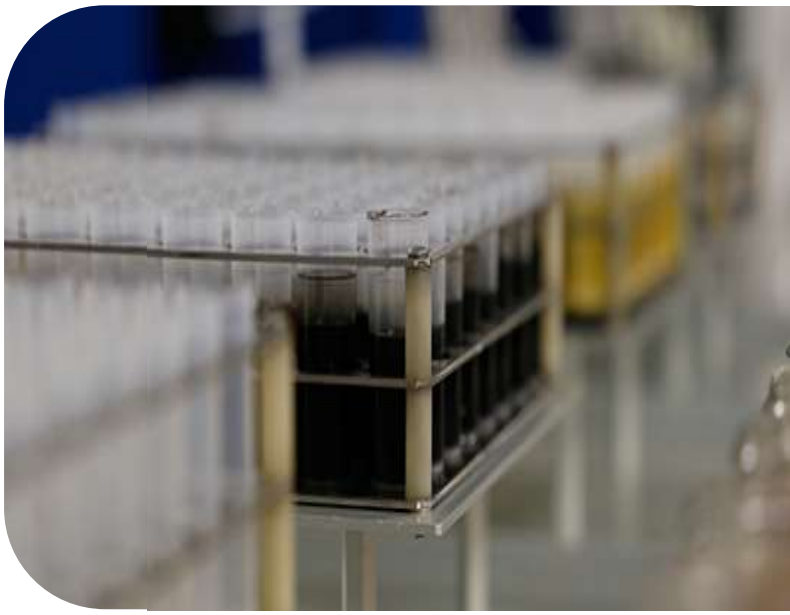
The system can be loaded with standard laboratory racks (lab rack geometery and positioning can be easily specified in the software setup) or 100 position sample trays. By using the sample trays up to 400 samples can be loaded at one time. A complete sample loading cycle (including cleaning and drying of the syringe needle) takes only 40 seconds allowing the CS-HVA-1 system to process 90 viscosity measurements per hour. Solvent requirements are low requiring only 3.5 ml of solvent per sample (in addition to the solvent used to clean the capillary tubes).

The system includes a liquid level measuring system to measure the oil sample level in the sample vials, sample bottles and the viscometer capillary tube to eliminate mis-sampling errors.

High Volume Sample Throughput

The sample table is designed to hold at total of four laboratory racks or four laboratory trays which can be mixed. A sample rack is any standard laboratory sample rack designed to hold normal sample bottles (±100ml). Four sample trays are provided with the system and each holds 100 standard sample vials (±7ml).

A typical standard laboratory rack holds 20 sample bottles, and a sample tray holds 100 sample vials, so the system sample capacity ranges between 4 x 20 = 80 samples and 4 x 100 = 400 samples per sample rack/tray load. The average run time for 400 samples is 4-1/2 hours and the system is designed to run completely unattended overnight and includes an idle timeout to automatically shut off the vacuum pumps. As such the system is capable of performing close to 1,200 viscosity measurements using only a standard 8-hour laboratory shift.



Highly Customizable Automation

A batch file containing both sample information and processing parameters is required by the application software in order to process samples and this can be imported from an external file in csv format. The sample information part of the batch file contains the sample ID, the sample position within the tray, the processing priority and if applicable, an expected viscosity for the sample.

The process parameters control how frequently process control standard are run and the upper and lower thresholds for the process control standards. Results can be set to be held until the process control standard is passed or to release immediately. Additionally samples can be set to automatically be retested if the time measurement is out of the set threshold.

Syringe sample and solvent aspiration and dispensing rates as well as cleaning volumes can be specified. The software also provides a setting for the idle time to automatically shut down the vacuum pumps (for overnight unattended operation).

Negligible Carry-Over

The system minimizes needle contamination by limiting the initial plunge depth into the oil sample being tested and further minimizes needle contamination by moving downwards at the same rate as the oil sample uptake during sampling. After dispensing the oil sample into the viscometer capillary tube the needle returns to the wash station and both the internal and external needle surfaces are cleaned with solvent and the needle tip is dried before processing proceeds to the next sample.

Priority Sample Processing

The sample batch file allows the user to set a priority flag within the batch to allow a sample to be processed out of sequence. It is not possible to edit samples that have already been processed or edit the sample that is in process at the time of editing.

Process Control Samples

The system allows for up to 2 different process control standards per capillary tube and up to 16 different process control standards for the four bath system. Both upper and lower thresholds can be set for each process control standard, and the software allows you to determine how often, and how many standards are run per capillary tube. When a process control standard fails the capillary tube is set to off, and the previous results are quarantined and sent to a fail directory.

Test Result Reporting

The software generates individual text files for each viscosity measurement containing an operator ID, the bath and tube numbers, the measured time, the tube factor, the calculated viscosity and the upper and lower time thresholds of the tube.

Improved Viscosity Accuracy

Allowing the robotic software to make capillary tube loading decisions is the key to improved viscosity result accuracy. The software stores the capillary tube factors and combined with user settings of upper and lower test time thresholds the software is able to accurately select an appropriate viscosity tube to perform a given fluid sample viscosity test based on the anticipated viscosity of the fluid. The system has an optional setting to re-perform the viscosity test if the time threshold is not met using a different capillary tube based on the previous viscosity result.

The CS-HVA-1 software allows you to store multi-point calibration results for each capillary tube in the four Houillon Viscometer set-up. Multi-point capillary tube calibration has been proven to expand the viscosity range of any given capillary tube without compromising accuracy of viscosity results.

The end result is higher accuracy viscosity results from the existing Houillon instrumentation combined with dramatically reduced labor requirements for performing high volume viscosity testing. Definitely a win-win solution.

The CS-HVA-1 was designed for commercial oil laboratories to replace the labor intensive work of loading multiple Houillon viscometer baths by hand pipettor and to improve the accuracy of viscosity tests by allowing the robotic software to make the best capillary tube selection based on the predicted viscosity of the given fluid. The system we developed has freed up a laboratory technician and dramatically improved process control standard results giving this instrument the quick payback that we were looking for.

Bill Quesnel - President

Specifications

System Performance

Parameter	Specification
Sample Through-put	40 sec/sample (4-1/2 hrs for 4 trays of 100 samples = 400 samples)* Throughput 90 samples per hour*
Solvent Usage	3.5 ml/sample**
Sample Batch Size	4 x 100 samples (tray has 100 positions, and system can hold up to 4 trays). Standard laboratory racks can be defined in the software and used directly on the sample table and/or mixed with trays (typically 20 samples per laboratory rack).

Robotic Automation

Parameter	Specification
X-Drive	Zaber linear slide with integrated stepper motor, encoder and controller - belt driven with 3000mm travel
Y-Drive	Zaber linear slide with integrated stepper motor, encoder and controller – lead screw driven with either 250mm or 500mm of travel depending on the size of the sample table.
Z-Drive	Zaber linear slide with integrated stepper motor, encoder and controller - belt driven with 295mm travel.
Supporting Frame	80/20 aluminum extrusions and standard 80/20 fasteners and brackets.
Communication Interface	B & B electronics USB to 4 ports Serial Port interface linked to custom EPROM for Viscometer baths to allow an 8 fold increase in the speed of serial communications. (Not required for newer VH1 and VH2 models). Requires only one single USB cable to link PC.

Syringe Pump

Parameter	Specification
Model	Gilson 402 Dilutor
No. of Syringes/Valves	Dual syringe/dual valve

Sample Level Sensor

Parameter	Specification
Model	Baumer UNKC 09
Accuracy	±0.1 mm from 3mm to 150mm

Physical Specifications

Parameter	Specification
Dimensions	126" (W) x 48" (H) x 36" (D - depends on sample table width) (320cm x 122cm x 92cm)
Weight	125 lbs (57 kg)
Voltage Requirement	100-120-230/240VAC selectable, 50/60 Hz.
Input Current	3.5A @100-230V

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