High-throughput productivity
in a compact multi-vapor platform

The new generation in vapor sorption analysis

DVS HT

The new generation in vapor sorption analysis

A wide range of synthetic and natural chemistry-based industries are increasingly dependent upon rapid and efficient analysis of raw materials, active ingredients, and proprietary formulations to remain competitive. In 1993, **Surface Measurement Systems** introduced its pioneering **Dynamic Vapor Sorption (DVS)** technique for automated water and organic vapor sorption studies. This single sample configuration of the DVS-1 produced a 10 to 100 fold decrease in analysis time and greatly improved accuracy when compared with manual methods. With the **DVS-HT High Throughput** system, productivity is further increased by another 10 to 20 fold via a novel robotic-based system that incorporates a rotating carousel performing tests in parallel mode. Despite its compact dimensions, the HT offers a fascinating range of state-of-the-art features as standard equipment, including multi-vapor compatibility to accommodate a wide range of water and organic vapor experiments, and built-in video microscopy to capture visual images of transitions and transformations in real-time.

DVS-HT Application areas

- Stability studies to select optimal drug, and excipient combinations
- Rapid screens of salts, solvates, hydrates, polymorphs and co-crystals
- Large scale pre-formulation and formulation studies
- Characterization of polymers, food ingredients, and fine particles
- Process optimization monitoring of surface and bulk chemistry
- Quality control of incoming raw materials
- Batch uniformity testing in QC
- Investigation of batch-to-batch variations in material formulations
- At-line PAT support of production performance to specifications

What is DVS-HT?

The **DVS-HT** is an all new platform for high quality, high-throughput, gravimetric sorption analysis. The system is fully-integrated with highly developed control, safety, analysis software with advanced information and communication systems, which combine to provide a compact, simple-to-use instrument, with a virtually infinite combination of experimental conditions from which to set up and save experiments.

Multiple samples, typically weighing from 5 to 20 mg, but up to 1g if required, are loaded onto the sample carousel that lifts automatically for easy sample loading access while the system is in standby mode. Once loaded, the sample chamber closes and each sample is automatically weight monitored using the most sensitive and stable digital microbalance available, while the vapor concentration or temperature is varied according to a user-programmed, continuously-monitored profile. The microbalance and samples are maintained in separate temperature zones to ensure true thermal isolation and thus optimum baseline stability. A unique optical sensor measures the partial pressure of water and a wide range of organic molecules to confirm target vapor concentrations are achieved.

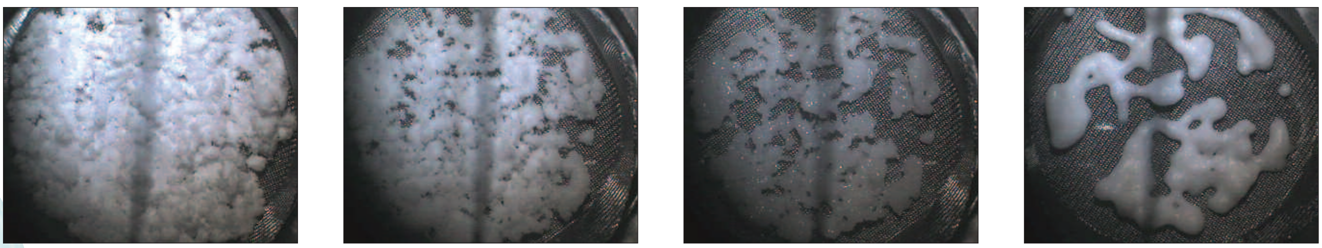
DVS-HT sample pan (far left) *and 10 place carousel.*

During the measurement, all samples are subject to the same experimental conditions as selected in the method editor, and the progress of the experiment is displayed for each sample on the main control screen.

Sequential experiments can be made using different conditions of temperature, humidity (or organic vapor) partial pressure steps or ramps, and selection of vapors which can be automatically accessed from one of the dual internal reservoirs.

Visual confirmation of the effects of the experiment are constantly available and recorded by an integral advanced video imaging system which automatically stores annotated images of each sample in real-time.

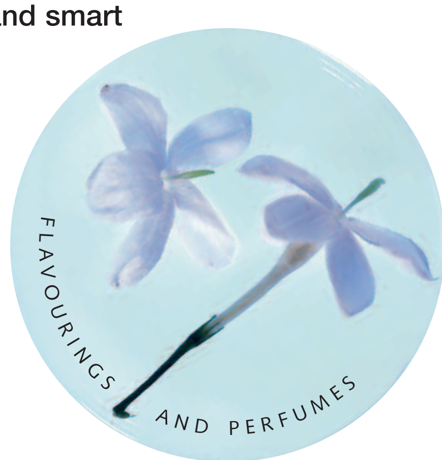
The resulting data is automatically saved to a pre-selected network location where it may be analyzed and reported using the DVS Analysis Suites.



Colour video images of spray-dried lactose captured during a water sorption experiment.

Key DVS-HT Operational features

- 10 sample parallel operation for true high-throughput performance
- Fully-automated control of temperature and vapor concentrations
- Independent temperature zones for samples and microbalance
- Water and organic vapor capability
- Proprietary universal real-time sensor for water and organic vapor partial pressures
- Dual auto-filling and auto-switching solvent chambers
- Optional open or closed loop instrument control
- Integrated programmable video image acquisition system
- Small 50cm footprint includes built-in upgradeable computer
- Touch screen user interface
- Automatic sequencing of methods
- Software wizards and smart diagnostics
- Optional FDA 21 CFR Part 11 software compliance tools
- Networkable and e-mailable data



DVS-HT Standard analysis software suite provides:

- Close integration with the DVS-HT control software to facilitate fast and effective analysis of DVS data
- Vapor sorption kinetics and isotherms
- Ability to print and plot the results from multiple DVS Data Files into a single chart. For example, it is possible to plot the mass data from 10 samples into a single chart

Optional DVS-HT Advanced analysis software suite provides:

- Surface energy and work of adhesion
- BET surface area measurement
- Heat of sorption
- Diffusion constants and activation energy
- Access to amorphous content
- Glass transition / Re-crystallisation RH onset

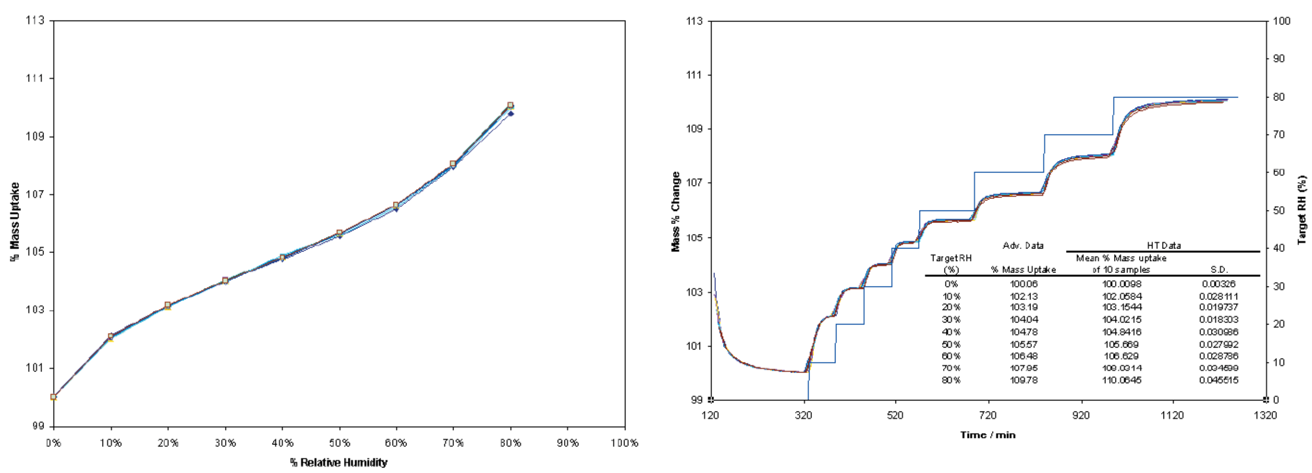
Optional Advanced Isotherm modelling software suite:

A unique package of more than 20 standard isotherm models, with single key report generation and best fit selection for:

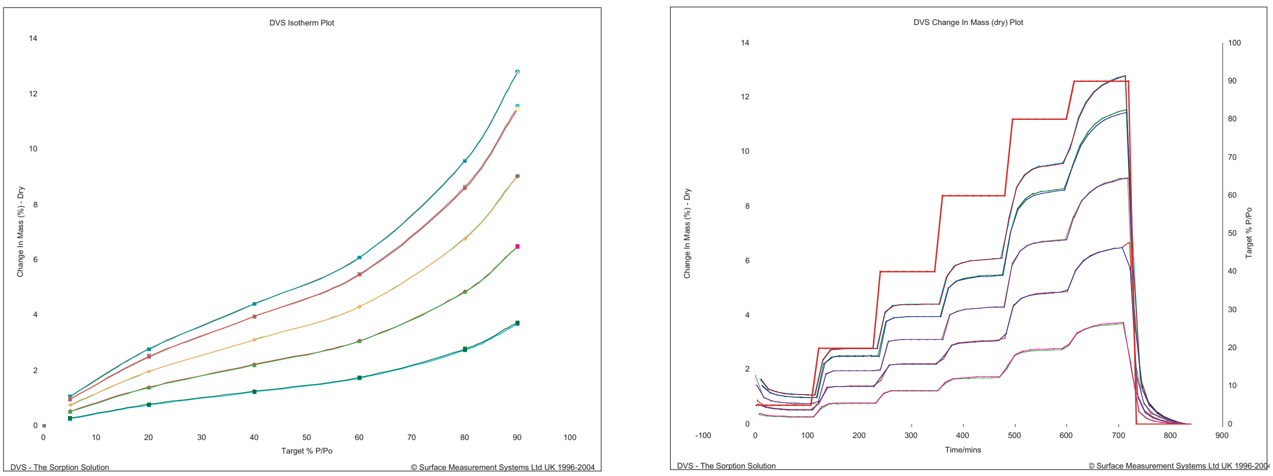
- Prediction of shelf life and storage stability (isotherms)
- Understanding interactions with organic vapors
- Understanding hysteresis effects
- Characterizing surfaces

High Throughput – High performance measurements

- Moisture uptake behavior of food and natural materials
- Stability and caking of food ingredients
- Moisture sorption of hydrophobic pharmaceutical ingredients
- Surface energies and surface areas of powders
- Determination of deliquescence points
- Moisture induced glass transitions
- Determination of amorphous content
- Pharmaceutical stability drying and thermal degradation
- Adsorption of porous materials



10 samples of Avicel PH101 measured in parallel on the DVS-HT compare closely with the same material measured on the DVS Advantage with standard deviations in equilibrium moisture uptake at 0.03% of mass.



Half cycle experiment of 5 samples in duplicate, showing different water uptakes.

DVS-HT Specifications

TEMPERATURE PERFORMANCE

Temperature Range	10–70° C
Temperature Accuracy	±0.25° C
Temperature Readability	0.01° C

RELATIVE HUMIDITY

RH Range	0%–98%
RH Accuracy	±0.5%

MASS PERFORMANCE

Maximum Capacity	1.0g
Dynamic Range	150mg
Weight Resolution	0.1µg
Noise Induced by Sample Handling	< 1.0µg

ORGANIC VAPOR PRESSURE

P/Po Range	0%– 97%
P/Po Accuracy	±0.6%

SAMPLE PANS

Material	Stainless steel
Dimension	10mm

VIDEO

Format	PAL
Active pixels	752 x 562
Resolution	0.013mm

SYSTEM DIMENSIONS

H 76cm W 52cm D 64cm

SYSTEM WEIGHT 90kg

GAS REQUIREMENTS

High purity nitrogen • 3-5 bar 700sccm peak

POWER REQUIREMENTS

400W (nominal) • 800W (peak) • 110 to 240 volt

Due to continuing product improvements, specifications are subject to change without notice

The Surface Measurement Systems scientific support advantage

A dedicated team of PhD scientists based in two continents is available to assist with application and experimental design questions. They are supported by fully equipped laboratories providing all the necessary resources to demonstrate feasibility, and also to provide analysis on a contract basis if desired.

While the DVS-HT technology is inherently reliable, worldwide service and technical support is available, including on-demand and planned maintenance contracts.

HEAD OFFICE

Surface Measurement Systems Ltd
5 Wharfside, Rosemont Road
Alperton, London HA0 4PE

Tel: +44 (0) 20 8795 9400
Fax: +44 (0) 20 8795 9401
email: smsinfo@smsuk.co.uk
www.smsuk.co.uk

USA, CANADA and MEXICO

Surface Measurement Systems, NA
2222 South 12th Street, Suite D
Allentown, PA 18103

Tel: +1 610 798 8299
Fax: +1 610 798 0334
email: info@smsna.com
www.smsna.com

SURFACE MEASUREMENT SYSTEMS

Design: Kingfisher Design • *Photography:* Michael Owen