



DVS Intrinsic – Compact and Economical Dynamic Vapor Sorption System





The easy-to-use solution to complex water sorption challenges from SMS:

- High quality water isotherms and efficient water activity measurements
- Step-by-step software wizards guide users through routine procedures
- Smallest, compact design that makes optimal use of limited bench space – only 26cm wide
- Advanced electronics and simplified user interface
- Accommodates wide variety of sample geometries and up to 4 gram capacity
- SMS UltraBalance™ provides unrivalled sensitivity and baseline stability
- Built-in Network Connectivity for easy data sharing and remote analysis
- Expandable operation of up to 5 units from 1 PC via DVS-IntrinsiLink™
- Simple self-install and easy maintenance minimizes total ownership costs



Applications

- Studying hygroscopicity of powders, fibres and solids
- Kinetics of water sorption and desorption
- Water induced morphology changes
- Food shelf-life prediction studies
- Effects of moisture on texture

Materials studied

- *Pharmaceuticals*: powders, tablets, API's and excipient materials
- *Food*: powders, processed food, biscuits
- *Natural materials*: grains/seed, wood
- *Building materials*: aggregates, cement, ceramics
- *Personal care products*: cosmetics, hair care, contact lenses
- *Packaging materials*: paper, plastics

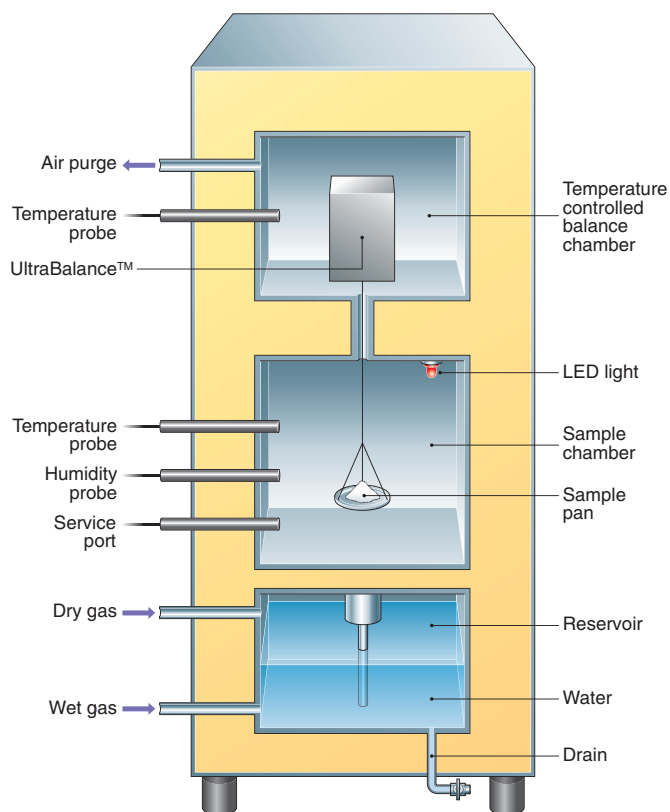


The advantages of DVS water sorption analysis

The water sorption properties of solid materials are recognised as critical factors in determining their storage, stability, processing and application performance. These properties are routinely determined for many natural and man-made materials and have traditionally been evaluated by storing samples in sealed jars containing saturated salt solutions of established relative humidity and then regularly weighing these samples until equilibrium is reached. However, there are a number of disadvantages associated with these manual jar methods, including:

(i) The prolonged period of time (often many days and commonly many weeks) taken for the samples to reach equilibrium, which necessitates the use of large samples sizes (typically 10-100g) to compensate for inherent analytical balance inaccuracies.

(ii) Measurement errors associated with the required removal of samples from storage containers for periodic weighing often results in extraneous weight loss or gain and thus contributing to measurement errors.



Schematic of the main components of the DVS Intrinsic

(iii) The inability to measure the kinetics of water sorption/desorption uptake and release in real time limiting the utility of these static measurement techniques.

(iv) The risk of mould formation or other sample contamination resulting from lengthy equilibration times and exposure to variable laboratory temperatures and humidities.

(v) The highly labour intensive nature of the process increasing operational costs and diverting productive use of skilled scientist and technician time.

As an alternative, the **DVS Intrinsic** is a highly sensitive, accurate and rapid means for automated determination of moisture sorption properties of solids.



Operate up to 5 Intrinsic from a single PC with InstrinsiLink™



What is the DVS Intrinsic?

The **DVS Intrinsic** rapidly measures uptake and loss of moisture in the sample by flowing a carrier gas at a specified relative humidity (RH) over a sample suspended from the weighing mechanism of our highly sensitive and stable digital microbalance, the **SMS UltraBalance™**, (below) which detects the sorption/desorption of water vapor by the increase/decrease in mass of the material. The instrument is capable of accommodating a sample mass up to 4g and with dimensions as large as 40mm, so many differing sample sizes and geometries can be easily accommodated. Changes in sample mass of 0.1 μ g and unrivalled long-term stability are hallmarks of



the Intrinsic and which are required for the accurate measurement of water sorption phenomena. These measurements may take from a few minutes to a few hours to complete depending upon the sample size and material. Indeed, a major factor in determining the water sorption behaviour of materials is the need

to establish rapid water sorption equilibrium. Therefore, the **DVS Intrinsic** also allows sorption behaviour to be accurately determined on very small sample sizes (typically 1-20 mg) thus providing great savings in the time required to reach equilibrium. Larger sample sizes can, however, easily be accommodated but typically require longer equilibration times.

Temperature stability of the measurement system is essential for accurate measurements, and this is

achieved using solid state electronic control which avoids the use of noisy and maintenance-intensive external water baths. The Intrinsic has a temperature control to $\pm 0.1^\circ\text{C}$ ensuring excellent instrument baseline stability as well as accurate control of the relative humidity generation. Separate temperature-controlled zones for sample and microbalance ensure stable baseline performance, while high-precision mass flow controllers mix dry and water saturated carrier gas flows in the correct proportions to provide precise RH control. Humidity and temperature probes are situated in the sample chamber to give independent verification of system performance. The **DVS Intrinsic** can perform isoactivity measurements in which materials are kept under constant RH conditions while linearly or stepwise varying the temperature.

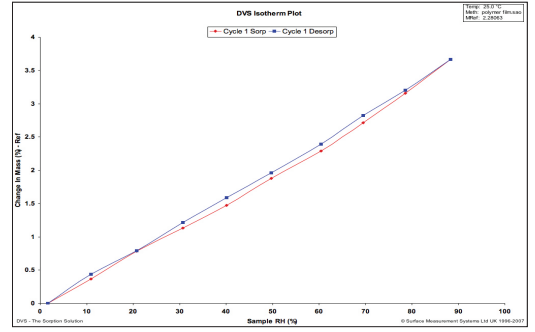
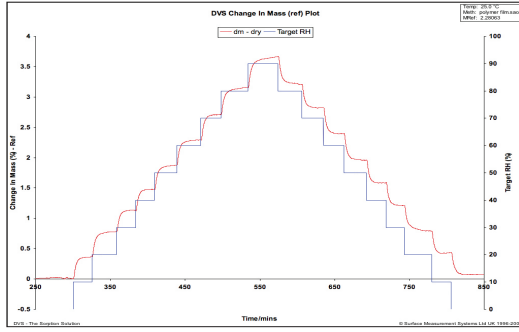
The **DVS Intrinsic** is fully automated, under the control of the DVS-WIN software package supplied with the instrument, providing a flexible and easy to use interface for setting up and running moisture sorption/desorption experiments. All routine set-up and operational functions are supported by software wizards that guide the user step-by-step through each operation. Increased throughput can be easily accommodated via a unique feature of the instrument – **DVS-IntrinsicLink™** – in which up to five Intrinsic systems may be linked to a single PC. In addition, the DVS Data Analysis Suite, which runs from within Microsoft Excel, provides a powerful environment for rapid plotting and quantitative data analysis, all of which can be done remotely via the built-in network connectivity feature of the Intrinsic allowing data sharing and analysis between multiple users.

Right: *Sample pan seen through portal window of the DVS Intrinsic*

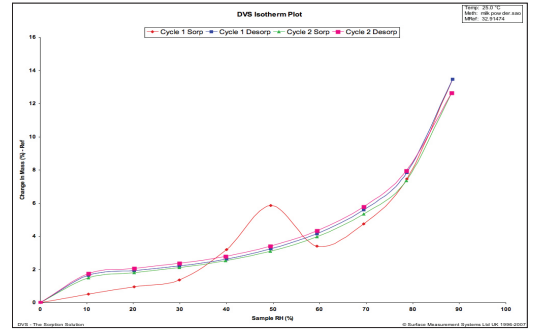
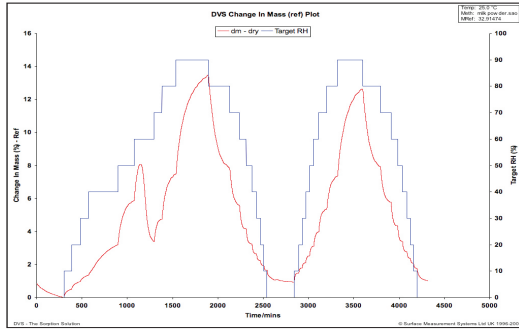


DVS Intrinsic Data plots

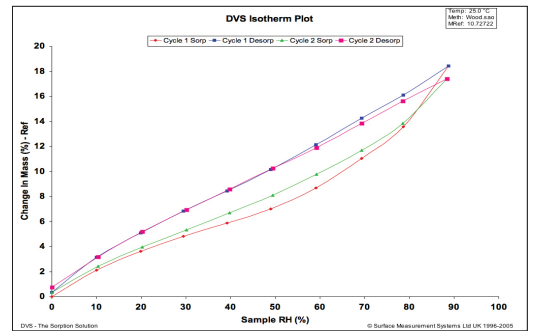
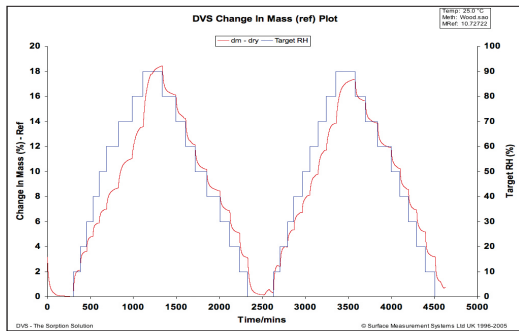
Polyamide film kinetic and isotherm plots



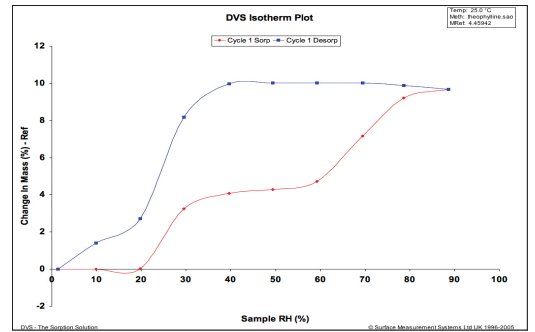
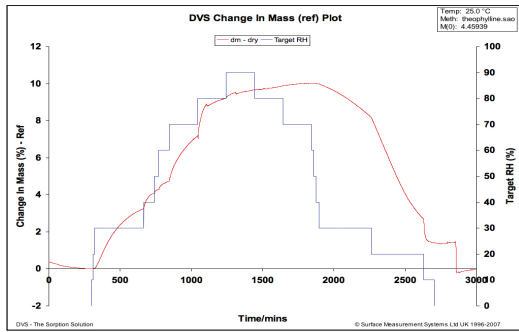
Milk powder, two cycles, showing amorphous recrystallisation



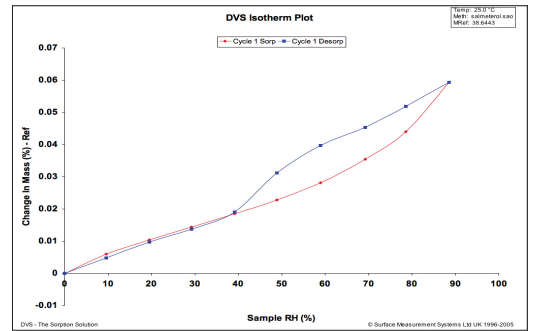
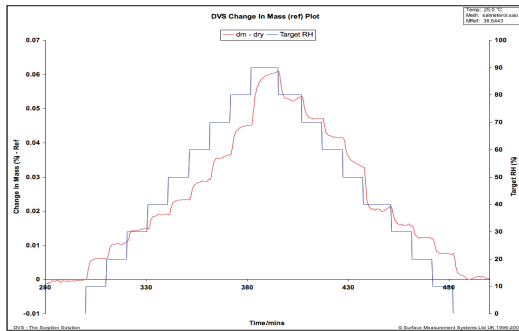
Wood fibre, two cycles



Theophylline - hydrate formation



Salmeterol Xinafoate - hydrophobic drug



DVS Intrinsic Specifications

Temperature range 20–40°C (standard)

Maximum mass

(low/high mass instrument) 1g/4g

Mass change

(low/high mass instrument) 150mg/1.0g

Stability

(24 hours @ 25°C and 0%RH) <5µg/< 20µg

(low/high mass instrument)

Mass resolution

(low/high mass instrument) +/- 0.1µg/1.0µg

Humidity Range 0-98%RH

RH Accuracy +/-1%RH

Temperature stability +/-0.1°C

Typical gas flow rate 200sccm

Sample chamber

40mm wide x 50mm deep x 50mm high

Reservoir volume 100ml reservoir capacity

Heating system Peltier + Cartridges

Weight 22 Kg

Size approximately

26cm wide x 39cm deep x 47cm high

Air supply 3 to 4 Bar

Computer interface TCP/IP and USB

Continuing the success of Dynamic Vapor Sorption

Surface Measurement Systems have always put their technology first and are recognised as the leading supplier of the highest quality vapor sorption concept. To ensure that the efficiency of DVS remains optimal throughout its lifetime, the product is manufactured to exacting standards of quality. The careful selection of high performance materials enables SMS to meet the stringent requirements of their customers.

