

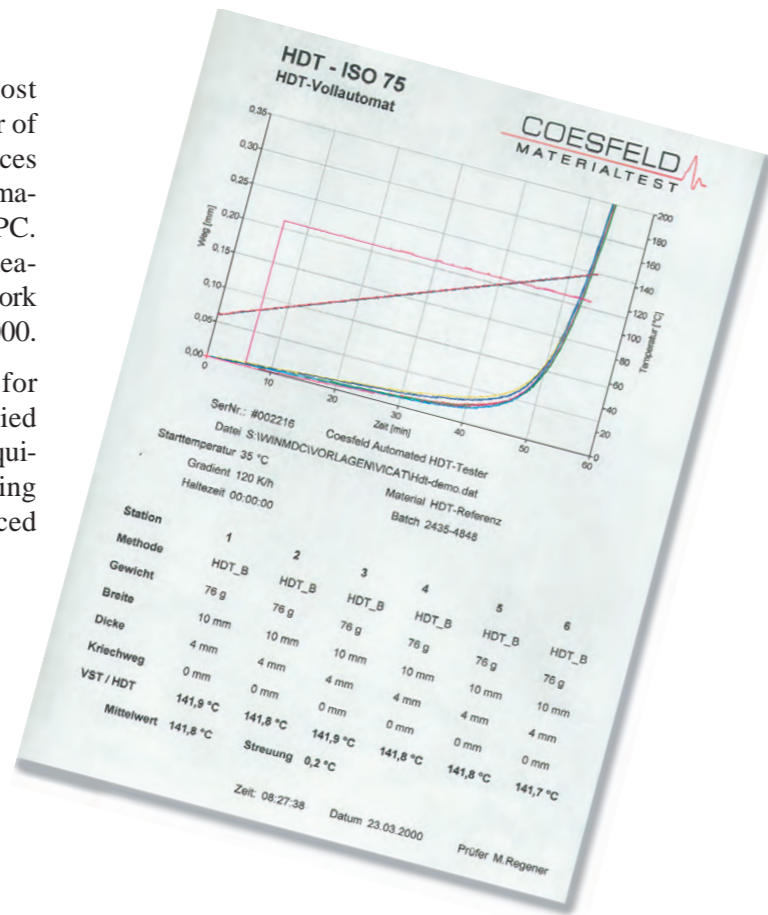
#	Anz	Meth	Grad	StartTemp	MaxTemp	Material	Batch	Auftrag/Datei	Zeit	Mittel / Abw.
1	3	C	120	23	150	2600	345-GA-775	445-6665	05.05.1999 03:52:19	146.7 - 0.5
2	3	C	120	23	150	2600	345-GA-778	445-6670	05.05.1999 03:52:19	146.7 - 0.4
3	3	C	120	23	150	2600	345-GA-859	445-6800	05.05.1999 05:24:42	146.3 - 0.2
4	3	C	120	23	150	2600	545-GA-455	500-2395	05.05.1999 05:24:42	147.7 - 2.1
5	3	C	120	23	150	2600	20-XA-145	445-6539	05.05.1999 06:59:11	146.5 - 0.6
6	3	C	120	23	150	2600	646-DA-642	445-6541	05.05.1999 08:59:11	146.4 - 0.4
7	3	C	120	23	150	2340	21-VFA-15	3454-5392	16.06.99 12:44:05	
8	3	C	120	23	150	2340	21-VFA-16	3454-5393	16.06.99 12:44:05	
9	3	C	120	23	150	2340	21-VFA-17	3454-5394		
10	3	C	120	23	150	2340	657-XB-1345	6000-352		
11	3	C	120	23	120	2600	21-VD-4644	603-4545		
12	3	C	120	23	120	2600	21-VD-4656	603-565		
13	3	C	120	23	150	2340	657-XB-1345	6000-352		
14	3	C	120	23	150	2340	21-VFA-67	3454-3286		
15	3	C	120	23	150	2340	657-XB-8382	6000-2344		

Test job list: the list shows the tests which are currently running (bright green), those which were concluded correctly (medium green) and those which ended with an error message (red).

### Log and remote diagnosis

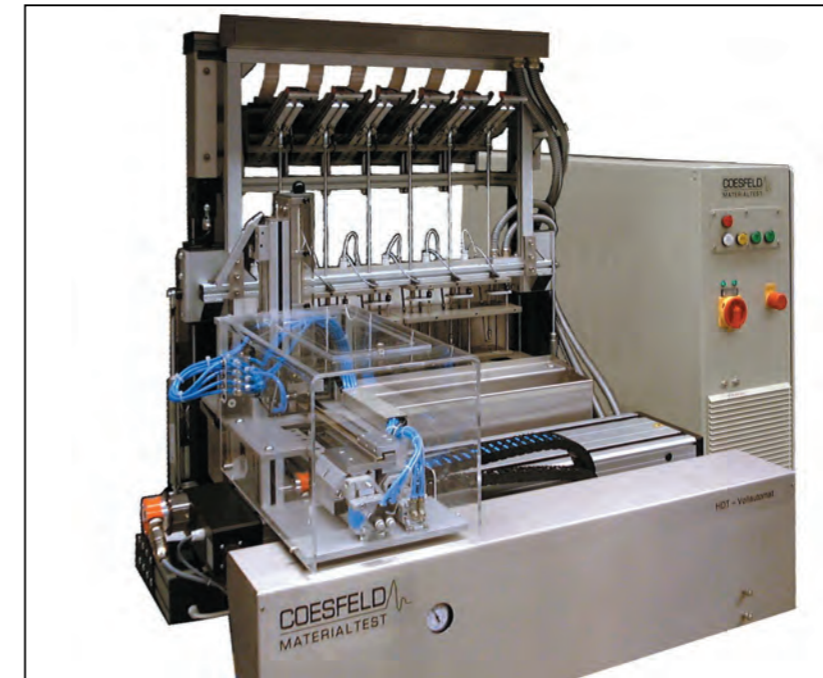
Automatic diagnosis logs enable rapid, low-cost remote diagnoses. The programmable controller of the fully-automatic HDT tester has security devices to ensure that the appliance's technology is not damaged even with incorrect parameterising at the PC. With the appropriate reference materials each measuring point can be calibrated online in the framework of measuring equipment monitoring under ISO 9000.

The measuring logs can be printed separately for each group of specimens, either using the supplied form, or can be designed by users to their own requirements. The individual elements (logo, measuring curve, measuring parameters, etc.) can be placed using drag-and-drop.



Practical report:

## Fully-automatic HDT tester



Fully-automatic HDT measuring of up to 90 specimens is possible with the HD tester from COESFELD – an important contribution to the process of automation in every test laboratory. This article describes the appliance and the test procedure. Two members of the Test Engineering Section of BAYER AG report on their experiences using the fully-automatic HDT tester.

### <DT measuring in conformance to standards

The deflection temperature of plastics under load HDT (heat deflection temperature) is a parameter for hard rubber and plastics. It is the temperature at which the distortion of the specimen reaches its standard deflection after heating. The three methods under DIN EN ISO 75 f stipulate that the specimens must be tested laid flat with a nominal edge fibre tension of 1.80 MPa (HDT/A), 0.45 MPa (HDT/B) or 8.00 MPa (HDT/C).

### Comfortable test layout – thanks to the fully-automatic appliance

The test device consists of a fixed metal frame in which a rod can move vertically without obstruction. At the bottom of the rod there is a pressure fin. The support for the specimen is on the base of the frame. The receptacle consists of cylindrical metal specimens 64 mm apart (standard clearance). The supports are attached to the base of the frame in such a way that the force applied vertically to the specimen bodies through the pressure fin acts in the middle between two supports. The supports and the pressure fin are rounded with a radius of 3.0 (± 0.2) mm and must be longer than the width of the test specimen.

Previous test appliances have a plate at the top of the rod for attaching weights. The fully-automatic HDT has the advantage that weights no longer have to be handled manually. The calculated loads are applied down to the exact gram with a lever system by means of a computer-controlled slide.

### Feeding and scanning the specimens

For measuring in accordance with DIN EN ISO 75 f (test specimens laid flat) the thickness h of the test specimen has to be determined. According to a standard table this fixes the standard deflection at which the deflection temperature of plastics under load is recorded. The fully-automatic HDT tester automatically scans the thickness h and width b of the 80 mm long specimens. This excludes the possibility of operating errors.

The fully-automatic HDT tester also enables specimens to be fed in and removed automatically. This means that there is no down time between measuring, and oil-smearing fingers are a thing of the past as well.

A single magazine can hold 90 specimens and a second magazine can be added.



Measuring head: this contains the temperature measuring device and the position sensor.

### Tempering

The specimens are heated in an oil bath to guarantee a high tempering quality. The heating process is monitored with seven PT-100 sensors which record a temperature range of 0°C to 250°C with a measuring accuracy of  $\pm 0.1^\circ\text{C}$ . The reproducibility is in fact  $0.05^\circ\text{C}$ .

The fully-automatic HDT tester has an efficient cooling system through a heat exchanger.

### Software

A special highlight is the software for the fully-automatic HDT tester. The clear operator interface is self-explanatory and can therefore be operated intuitively. The operator can vary the most important measuring parameters without special prior knowledge and after just a brief familiarisation period. After the start measuring is carried out fully automatically, even over 1-2 days. A test report can be printed out automatically after each measuring. After the heat deflection temperature is reached, the computer automatically saves all values and provides a temperature record for the six measuring points.

As an alternative, the measuring parameters for the test jobs can be read in from LIMS via a database interface and the measured values can be transmitted there.

System managers have a large selection of (password-protected) options available with which the program sequence can be adapted to individual requirements. The operator then only needs to enter one or two parameters. The remaining settings are set in one of the individually compiled and saved measuring programs.



### Practical experience

Dipl.-Ing. Dr. Bahzman Sabri (photo), manager of the Test Engineering Section in the Plastics/Research and Development/Engineering Division of BAYER AG in Uerdingen, and his colleague Martin Meyer, played a substantial part in the development of the fully-automatic HDT tester. This was the first fully-automatic HDT tester, built by COESFELD in Dortmund. This appliance is an important component of full automation for measuring the deflection temperature of plastics under load in the field of test engineering for the development of technical thermoplastics.

### Measuring can be reproduced exactly

The PC takes over the control of the measuring series. Feeding the specimens, scanning and removing are all automatic. The starting temperature and the temperature increase of 120 K/h can be recorded exactly through the PC controller. This leads to a reduction in down time and non-productive time (dimension measuring, fitting, etc.).

The specimens are subjected to loads through a computer-controlled lever system, so that there are no subjective factors. Applying weights accurately to a gram is therefore possible without having to handle individual weights.

### Automation enables improved capacity utilisation

A measuring operation take approx. 30 to 90 minutes, because the cooling rate is much higher thanks to the external cooler. Fifteen operations can be carried out consecutively with a magazine that can hold 90 specimens. This makes it possible to have measuring periods of 22 hours with a single

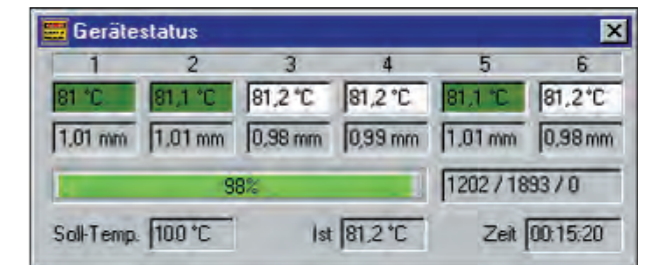
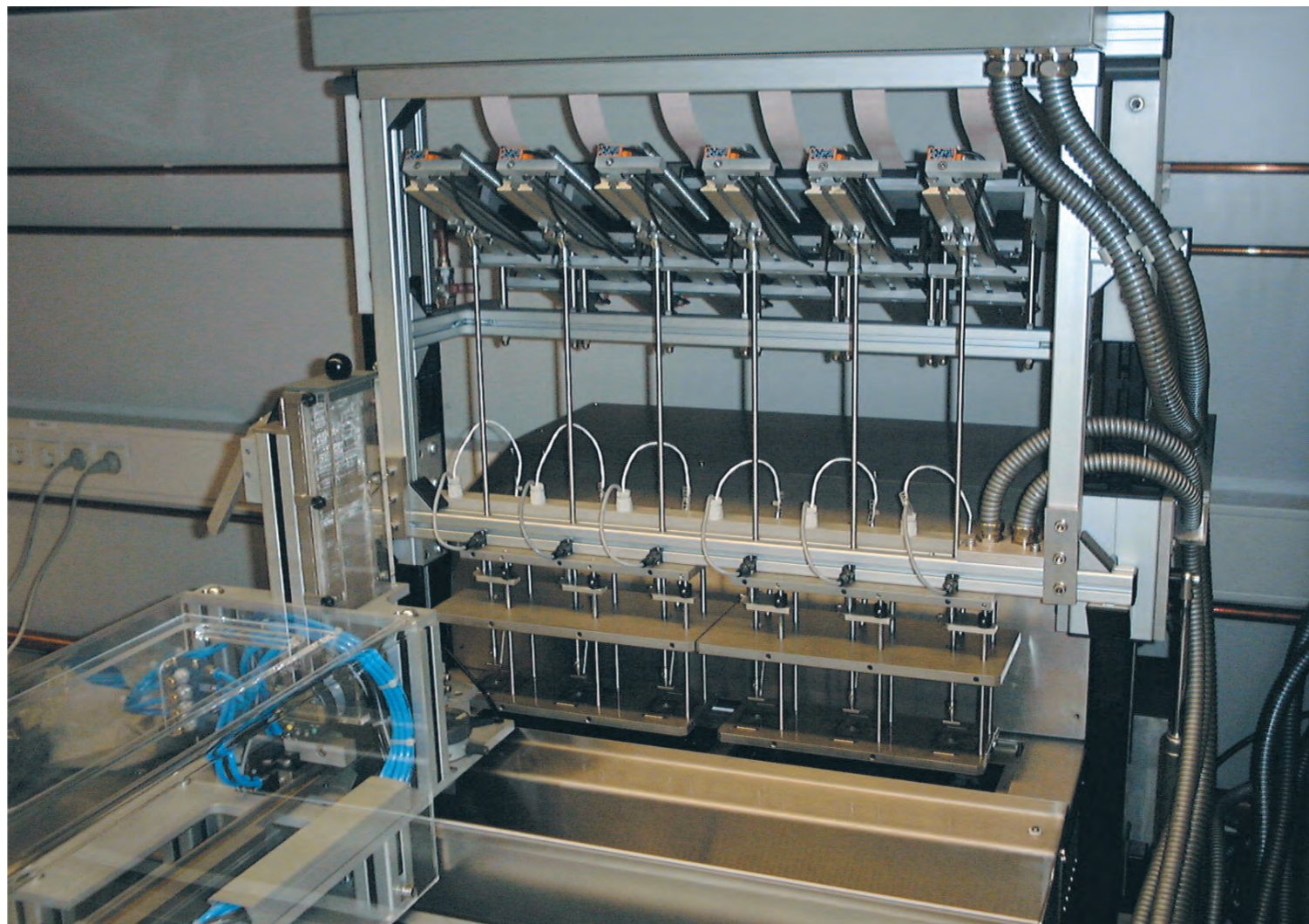
magazine. Another shift can be occupied with the measured values series. The existing magazine can easily be extended by another one, thus doubling the automatic measuring cycle.

### Software simplifies processing of measuring results

The distribution of measured values is smaller than with hand appliances, because of the lack of human influences. The measuring results are transmitted to the customer via the LIMS (Laboratory Information Management System). From the LIMS the data is exchanged with COESFELD's fully-automatic HDT testers through the Access database interface.

### Checks are easy to carry out

All components can be checked at any time without any great effort, which makes it easy to eliminate minor faults. Calibrations with reference materials are easy to carry out. COESFELD carries out maintenance at regular intervals.



Appliance status: during the test the operator sees a green bar showing a percentage figure related to the expected HDT. A blue bar shows progress during cooling. The green highlighted measuring points show that the HDT has already been measured; white means that measuring has not yet been carried out. The grey fields show how far the pressure fin has moved down since the start of the test.

Applying weights and feeding: there are slides on the six levers which enable loads to be applied exactly to the gram. The feeder unit can be seen in the foreground in which the specimens are scanned. The magazine can be extended.