



HUNG TA INSTRUMENT CO., LTD.

Moving Die Rheometer (M.D.R.)



Advanced Testing Systems
helping engineers worldwide develop safer,
more reliable materials and components.



H T-2556 MOVING DIE RHEOMETER (M.D.R)

Specifications of M. D. R.

Features :

- ◆ Curved, streamlined appearance for high quality visual sensation.
- ◆ Computer-monitored for better control of machine in real time.
- ◆ Servo-driven for more stable vibration frequencies and control with better accuracy.
- ◆ Highly sensitive temperature control, automatic PID calculation and computer transmission for better temperature control.
- ◆ Direct heating ensures constant temperature and accelerates heating and warming rates. ◦
- ◆ Heating from room temperature to 190°C in 8 minutes
- ◆ Time needed for changing temperature settings :
< 3 minutes from 170°C to 190°C ; < 4 minutes from 190°C to 170°C.
- ◆ Warming up to the set temperature in less than 1 minute during testing with $\pm 0.3^{\circ}\text{C}$ compensation control range.
- ◆ Light-weight upper and lower dies for easy installation and removal.
- ◆ Windows-based user interface is easy to learn and use and equipped with powerful analysis functions; interface is provided with multiple languages for the user's choice.
- ◆ Modular database is easy to use and build.
- ◆ Data sampling rates are high and therefore possibility of lost data is low
- ◆ Capable of importing and exporting report in formats of Excel, Word, html and pdf, making it easy for data transmission and storage.
- ◆ Complete data storage for reanalysis and confirmation, thus preventing human errors.



Unsealed Die

M.D.R. Functions :

Die Type	Unsealed	Sealed	Unsealed	Sealed
Model	2556	2556-S	2556-F	2556-FS
Foaming			✓	✓
Servo drive	✓	✓	✓	✓
Vulcanization curve	✓	✓	✓	✓
Viscosity curve	✓	✓	✓	✓
Visco-elastic torque curve	✓	✓	✓	✓
Visco-elastic ratio curve	✓	✓	✓	✓
Kinetic loss angle curve	✓	✓	✓	✓
Vulcanization rate curve	✓	✓	✓	✓
Foaming pressure curve			✓	✓
Foaming rate curve			✓	✓

H T-2556 / 2556S MOVING DIE RHEOMETER (M.D.R)

Moving Die Rheometer

Mechanical Specifications :

- ◆ Servo-driven for more stable vibration frequencies and control with better accuracy.
- ◆ Highly sensitive temperature control, automatic PID calculation and computer transmission for better temperature control
- ◆ Provide different kinds of vibration frequencies with high applicability.
- ◆ Direct heating ensures constant temperature and accelerates heating and warming rates.
- ◆ Light-weight upper and lower dies for easy installation and removal.

Program Specifications :

- ◆ Computer servo control for accuracy, stability and reproducibility
- ◆ Mechanical error detection for better stability
- ◆ Windows-based user interface is easy to learn and use and equipped with powerful analysis functions
- ◆ User interface is provided with multiple languages for the user's choice.
- ◆ Modular database is easy to use and build.
- ◆ Free-style report editing functions allow users to develop their own reports, graphics and logos
- ◆ Data sampling rates are high and therefore possibility of lost data is low.
- ◆ Test graphics display: die loading/unloading temperature, S' , S'' , S^* , $\tan\delta$, δ and many more
- ◆ Real-time display of test data and graphics
- ◆ Easy increase or decrease of test duration during tests for greater flexibility
- ◆ Side-by-side display of curves and data for convenient cross-reference
- ◆ Conversion of units: lb-in, kg-cm, dN-m, N-m and many more
- ◆ Optimized scale for automatic graphic display and manual adjustment of scale range for greater visualization
- ◆ Data graphic comparison for easy data reproducibility
- ◆ True presentation of graphic data point by point
- ◆ Capable of importing and exporting report in formats of Excel, Word, html and pdf, making it easy for data transmission and storage
- ◆ Improved data search and sorting for easy reading
- ◆ Complete statistical analysis functions

H T-2556 / 2556S MOVING DIE RHEOMETER (M.D.R)



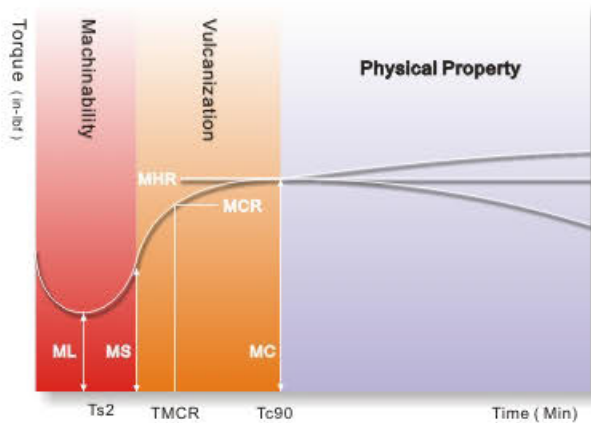
Machine Specifications :

Model	2556	2556S
Standards	ASTM-D5289 · ISO-3417 · GB-T16584	
Die type	Unseal die: accurate and free adjustment of clearance between dies is allowed	Sealed die
Temperature control	Computer control through connection, PID, SCR control	
Temperature range	Room temp. -200 / 170°C ~ 190°C < minutes / 190 – 170°C < minutes	
Temperature	Temperature compensation range $\pm 0.3^{\circ}\text{C}$; minimum reading: 0.1°C	
Vibration frequency	100 cpm (1.66 Hz); servo motor driven	
Vibration angle	$\pm 0.5^{\circ}$ · $\pm 1^{\circ}$ · $\pm 3^{\circ}$	
Torsion range	Elasticity : 1-200 lb-in / viscosity: 0.3 ~ 200 lb-in	
Drive motor	AC motor imported from Japan	
Standard accessories	Standard torsion calibrator, pair of gloves, screwdriver	Standard torsion calibrator, pair of gloves, screwdriver, 10 O-rings
Standard attachment	Computer system (TFT color monitor, hard drive, color ink jet printer)	
Program	Available in Chinese (both traditional and simplified) and English	
Air pressure	4.6 kg / cm ² (0.46 MPa) (buyer to provide air compressor)	
Power supply	1 ϕ · AC 220 V $\pm 10\%$ · 50/60 Hz ± 3 Hz · 10 A	
Dimension (WxDxH) cm	Machine : 58 x 72 x 172 ; computer desk : 90 x 63 x 105	
Weight (kg)	300	

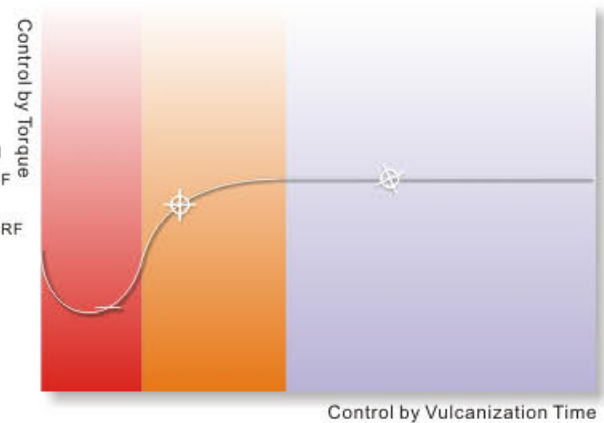
Moving Die Rheometer

Curve :	Data :
Vulcanization (elasticity) curve (S')	Ts1 ~ Ts10 scorching time
Viscosity curve (S'')	Tc10 ~ Tc90 vulcanization time
Visco-elastic torque curve (S*)	Maximum vulcanizing torque (MH)
Visco-elastic ratio curve (tanδ)	Minimum vulcanizing torque (ML)
Phase angle curve (δ)	Ts1~Ts10 / Tc10~Tc90 corresponding vulcanization rate (CR)
Vulcanization rate curve (CR)	CRI1~CRI10 / Tc10~Tc90 vulcanization rate index (CRI)
Upper and lower die temperature curves	Ts1~Ts10 / Tc10~Tc90 corresponding viscosity (S'')
	Ts1~Ts10/Tc10~Tc90 corresponding torque (S*)
	Ts1~Ts10/Tc10~Tc90 corresponding visco-elastic ratio (tan δ)
	Ts1~Ts10/Tc10~Tc90 corresponding phase angle (δ)
	Other options

Vulcanization Data



Control by Torque and Vulcanization Time



- TS : Initial scorching time
- TC : Vulcanization time
- ML : Minimum torque
- MH : Maximum torque
- MS : Torque at TS
- MC : Torque at TC
- MCR : Maximum vulcanization rate
- TMCR: Time corresponding to the maximum vulcanization rate
- MHR : Maximum recovery torque
- MHF : Maximum torque (on plateau)
- MHRF: Final recovery torque
- Ts2 = ML + 2 in-lbf
- Tc90 = (MH - ML) x 90 % + ML

H T-2556F / 2556FS FOAM FORCE RHEOMETER



HT-2556FS
FOAM FORCE RHEOMETER

Machine Specifications :

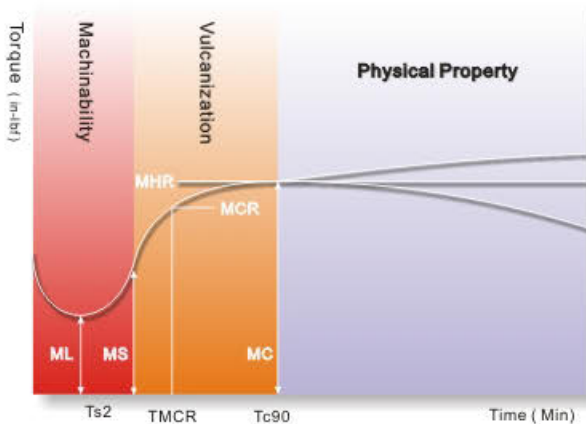
This unit is primarily used to determine the properties of vulcanization and visco-elasticity of rubber and provides detection of foaming rubber. The curves and data provided by this unit are the most important benchmarks for product improvement, mass production conditions and development of new recipes

Model	2556F	2556FS
Standards	ASTM-D5289 · ISO-3417 · GB-T16584	
Die type	Unseal die: accurate and free adjustment of clearance between dies is allowed	Sealed die
Temperature control	Computer control through connection, PID, SCR control	
Temperature range	Room temp. -200 / 170°C ~ 190°C < minutes / 190 – 170°C < minutes	
Temperature	Temperature compensation range $\pm 0.3^{\circ}\text{C}$; minimum reading: 0.1°C	
Vibration frequency	100 cpm (1.66 Hz); servo motor driven	
Vibration angle	$\pm 0.5^{\circ}$ · $\pm 1^{\circ}$ · $\pm 3^{\circ}$	
Torsion range	Elasticity : 1-200 lb-in / viscosity: 0.3 ~ 200 lb-in	
Drive motor	AC motor imported from Japan	
Standard accessories	Standard torsion calibrator, pair of gloves, screwdriver	Standard torsion calibrator, pair of gloves, screwdriver, 10 O-rings
Standard attachment	Computer system (TFT color monitor, hard drive, color ink jet printer)	
Program	Available in Chinese (both traditional and simplified) and English	
Air pressure	4.6 kg / cm ² (0.46 MPa) (buyer to provide air compressor)	
Power supply	1 ϕ · AC 220 V $\pm 10\%$ · 50/60 Hz ± 3 Hz · 10 A	
Dimension (WxDxH) cm	Machine : 58 x 72 x 172 ; computer desk : 90 x 63 x 105	
Weight (kg)	300	

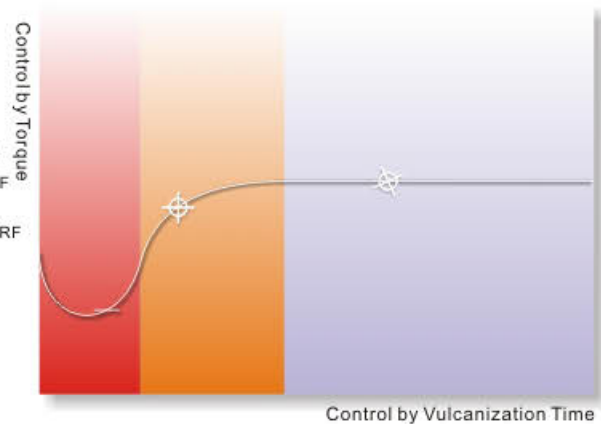
Foam Force Rheometer

Curve :	Data :
Vulcanization (elasticity) curve (S')	Ts1 ~ Ts10 scorching time
Viscosity curve (S'')	Tc10 ~ Tc90 vulcanization time
Visco-elastic torque curve (S*)	Maximum vulcanizing torque (MH)
Visco-elastic ratio curve (tanδ)	Minimum vulcanizing torque (ML)
Phase angle curve (δ)	Ts1~Ts10 / Tc10~Tc90 corresponding vulcanization rate (CR)
Vulcanization rate curve (CR)	CRI1~CRI10 / Tc10~Tc90 vulcanization rate index (CRI)
Upper and lower die temperature curves	Ts1~Ts10 / Tc10~Tc90 corresponding viscosity (S'')
	Ts1~Ts10/Tc10~Tc90 corresponding torque (S*)
	Ts1~Ts10/Tc10~Tc90 corresponding visco-elastic ratio (tan δ)
	Ts1~Ts10/Tc10~Tc90 corresponding phase angle (δ)
	Ts1~Ts10/Tc10~Tc90 corresponding foam force (P)
	Maximum foam force (P max)
	Minimum foam force (P min)
	Ts1~Ts10/Tc10~Tc90 corresponding foaming rate (PR)
	Maximum foaming rate (MPR)
	Upper and lower die temperatures corresponding to max. and min. elasticity (°C or °F)

Vulcanization Data



Control by Torque and Vulcanization Time



H T-8756P AUTOMATIC DISK RHEOMETER

Automatic Disk Rheometer

Features :

- ◆ Traditionally in a rubber factory, the master technicians often depend on their experience to adjust the recipe to meet the die thickness or the hardness required for the products. It gets the job done at the end after several trials and errors. However, there is no way to tell whether the "best-fit" recipe is reached in addition to the precious time and materials wasted along the way. Today thanks to computer technology, the display of vulcanization curves allows a beginner engineer to achieve reasonable material proportions and well-balanced scorching and vulcanization recipes with no problem at all. It saves materials and time and ensures quality. This is the biggest contribution of this unit to the rubber industry
- ◆ The best die release time for vulcanized rubber is closely in connection with quality control during mass production. With the assistance of computer technology and precision mechanical structure, this unit determines the best die release time for various recipes of vulcanized rubber.
- ◆ This unit is designed to ASTM D-2084-79, BS1673 Part 10 and ISO 3417.
- ◆ The disk rheometer comes with a brand new computer program. Its functions and performance provide significant improvement in the display of curves, including vulcanization curve, vulcanization rate curve and upper and lower die temperature curve.
- ◆ It calculates more than 30 types of data, including MH, ML, TC and many more.
- ◆ Optional statistic function: Statistical Process Control Program (SPC), which provides individual values and moving torque control chart, average control chart (X-R), normal distribution chart and histogram for ML, MH, Ts2, Tc90, etc.
- ◆ The Windows-based program provides support for traditional Chinese / simplified Chinese / English. It identifies and displays the correct language automatically. It allows display of English on a Chinese system for the convenience of English-speaking people.
- ◆ Streamlined design with a good look
- ◆ The background color, font, color of temperature curves and other curves are user-definable for all graphics to meet your specific needs.
- ◆ Report contents are also user-definable; i.e. it is allowed to have a specific report format corresponding to a specific recipe.
- ◆ It is capable of detecting and displaying sensors' zero position and number of vibrations.

Display Functions :

- ◆ Curve types
- ◆ Upper and lower die temperature curves
- ◆ Vulcanization curve : S'
- ◆ Viscosity curve : S*
- ◆ Visco-elastic torque curve : S
- ◆ Visco-elasticity rate curve : tan PA
- ◆ Kinetic loss angle curve
- ◆ Vulcanizing rate curve : CR

Data Types :

- ◆ Vulcanization time of a given point (Tc50, Tc60, Tc90)
- ◆ Minimum torque (MI)
- ◆ Vulcanizing rate of a given point
- ◆ Kinetic loss rate of a given point
- ◆ Visco-elasticity rate of a given point

H T-8756P AUTOMATIC DISK RHEOMETER



Machine Specifications :

The vibrating disc is equipped with a vibrating system. The unit is used to determine the vulcanization and visco-elasticity properties of rubber, making this unit one of the most important pieces of equipment for production, research, formulation and quality control.

Model	8756P
Maximum Torque	200 lbf-in
Torque Sensing Range	25 , 50 , 100 , 200 lbf-in 4 stages
Temperature Range	Room Temperature / RT ~ 200 °C
Temperature Control	Computer control through connection, PID, SSR control, accurate to $\pm 1^{\circ}\text{C} \pm 1^{\circ}\text{C}$
Air pressure Source	Buyer to provide air compressor
Heating	Electric Heating
Temperature Detection	PT 100 Ω
Rotor	High-precision machining and production mode ~ 200 °C
Rotor Held By	Air Pressure
Vibration Frequency	100 cpm (1.67 Hz)
Vibration Angle	$\pm 1^{\circ} , \pm 3^{\circ} , \pm 5^{\circ}$
Test Duration	User-defined from 3 to 600 minutes
Pressure	Pneumatic at 4.15 kg/cm ²
Data Reported	Ts1 , Ts2 , Tc10 , Tc50 , Tc90 , ML , MH
Torque Calibration	Standard Torque Calibration
Power	1 ϕ , AC 220 V , 50/60 Hz
Dimensions (WxDxH) cm	132 x 62 x 116
Weight (kg)	200

H **T-8752** **MOONEY VISCOMETER (MV)**

Mooney Viscometer (MV)

- ◆ This unit is used to test the properties of natural rubber, including Mooney viscosity and Mooney scorching.

Full computer control, capable of displaying Tq3, TQ5, TQ18, TQ35, TS1 and TS2

Automatic Measurement System

- ◆ Viscosity Sensor: Strain Gauge
- ◆ Mooney viscosity calibration : Fuzzy logic computer system
- ◆ Manual / auto switching system for easy learning and operation
- ◆ Full computer control, pull-down menu, displays in dialogue box and control system
- ◆ Monitoring throughout the entire test; what you see is what you get. Automatic calculation, printing and saving are possible.
Capable of calling the curves desired 4+1 minutes and 1 minute of recovery time for viscosity and rubber, respectively, and time needed for rubber scorching Tq3, Tq5, Tq18, TQ35 by Ts1 and Ts2
- ◆ Capable of saving and calling test conditions to save time
- ◆ Allowable tolerance for test curves is user-definable for complete control of test subject quality.
- ◆ Capable of calling any curve for comparison and displaying the viscosity of any point on the curve
- ◆ The user may select multiple test values for averaging.
- ◆ Test may be terminated according to test requirements. The user may ask for test data or just cancel the test.
- ◆ This unit is designed to ASTM D1646, Bs1673, ISO-289, JIS-K6300 and CHS 10273 and 10274.

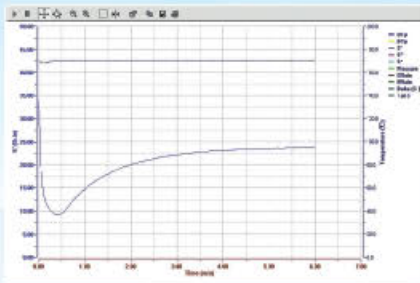
H T-8752 MOONEY VISCOMETER (MV)



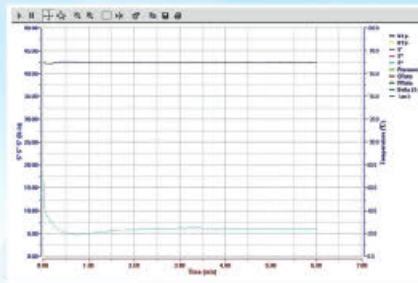
Machine Specifications : This unit is designed to test the Mooney viscosity, stress relaxation and premature vulcanization of raw rubber (manmade or natural).

Model	8752
Mooney viscosity	200 M Max.
Temperature range	200 °C Max.
Pressure system	Air Pressure (compressed air)
Heating system	Electric Heating
Specimen size	45 x 9 ~12 mm (diameter x thickness)
Rotor	L-Type and S-Type
Rotor rpm	2 ± 0.02 rpm
Disc holding pressure	Approx. 1173 ± 0.581 kg
Motor drive	25W, 200/220 V, 50/60 Hz, 1500/1800 rpm
Electric heating pad	Embedded Heating Coil, 550 W x 2 sets
Option	Printer, Air Compressor
Operating pressure	7 kgf/cm ² (bar) Max., 3.8 kgf/cm ² in general
Power	1 φ, AC 220V, 1.2 KVA, 50/60 Hz
Dimensions (WxDxH) cm	Main unit : 80 x 45 x 140 ; Computer Desk : 90 x 63 x 105
Weight (kg)	260

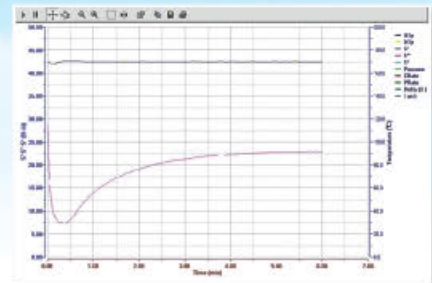
Examples of Curve Display for HT-2556, HT-2556F, HT-8756P, HT-8752



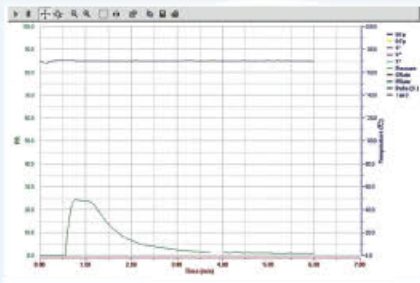
S' Curve



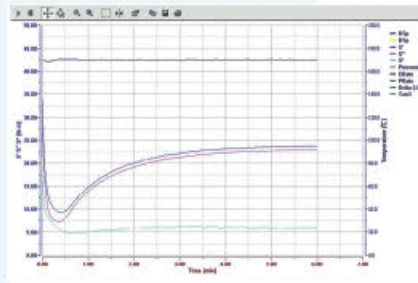
S'' Curve



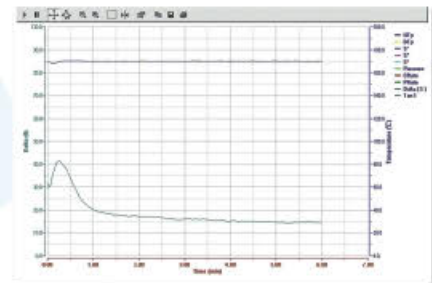
S* Curve



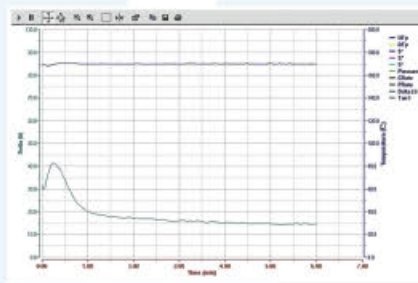
Vulcanizing Rate Curve



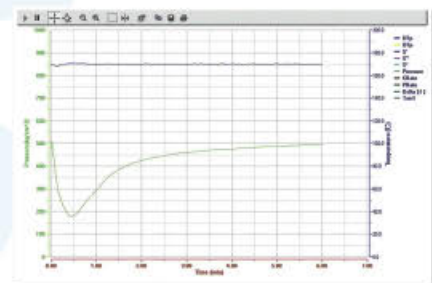
Foaming Rate Curve



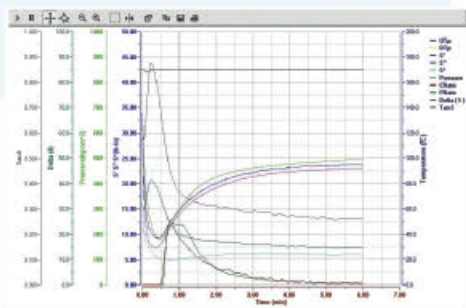
Delta (Δ) Curve



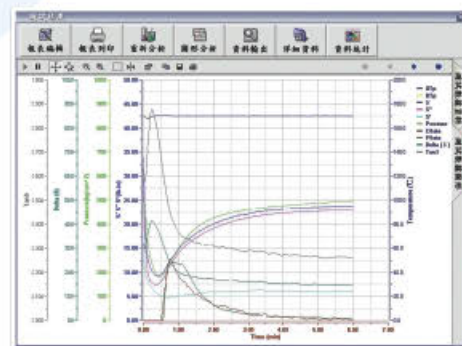
Tan (δ) Curve



Pressure Curve

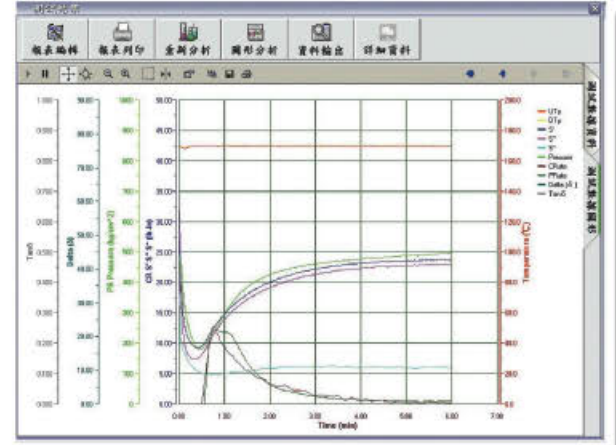
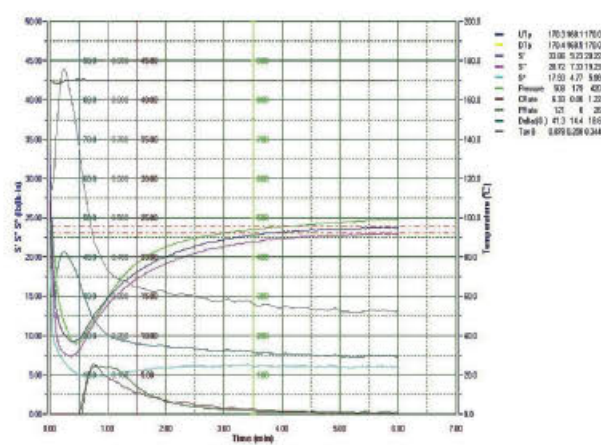
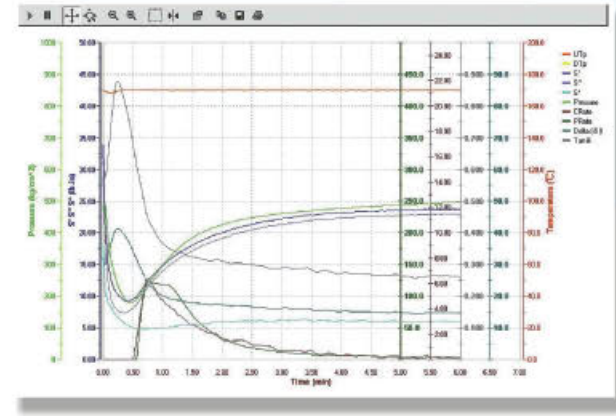
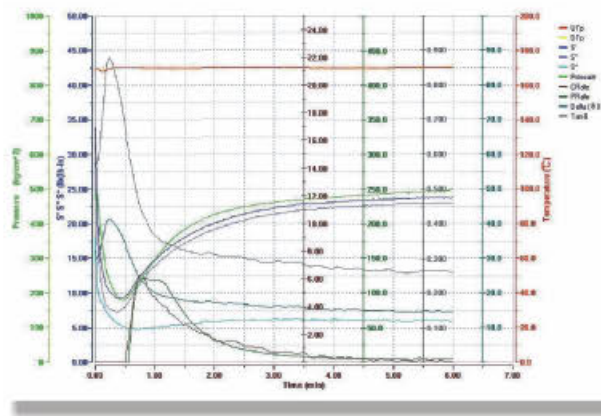
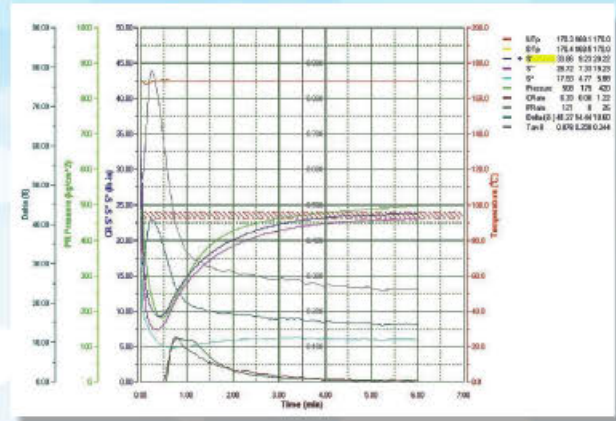
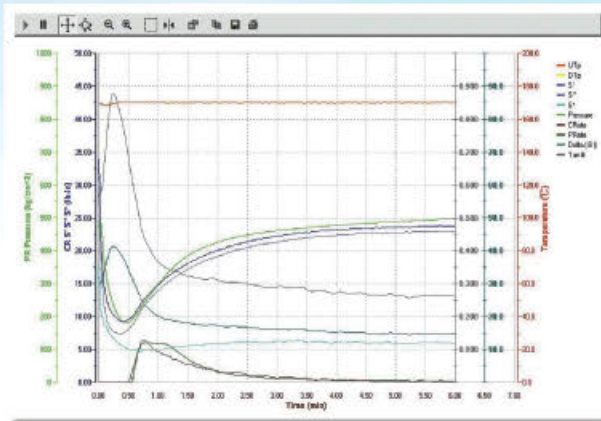


Compound Curves



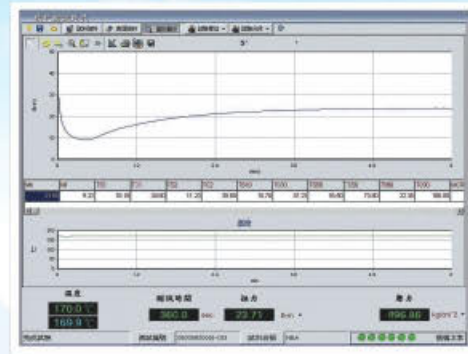
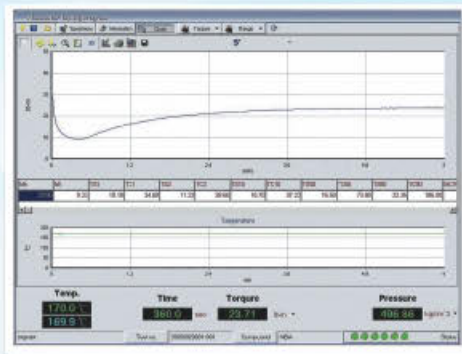
Curve Display Window

Examples of Curve Display for HT-2556, HT-2556F, HT-8756P, HT-8752

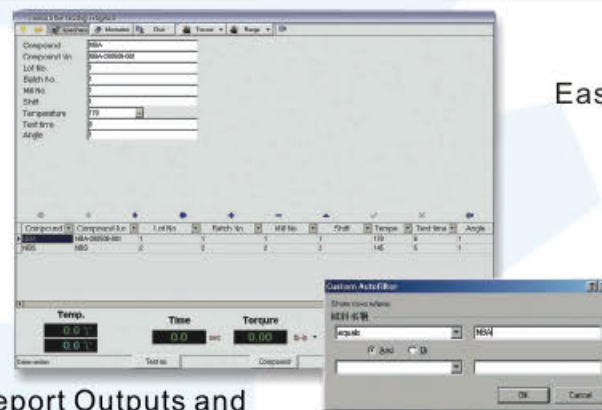


Examples of HT- 8752 Mooney Viscometer Display

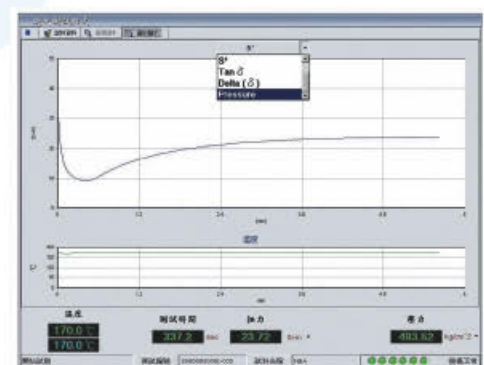
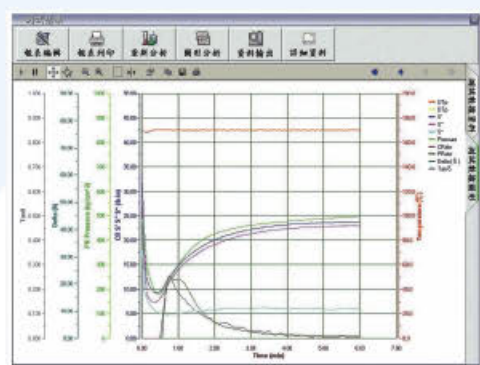
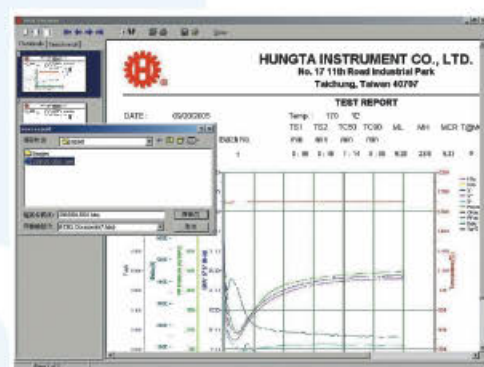
Excellent Human-Machine Interface



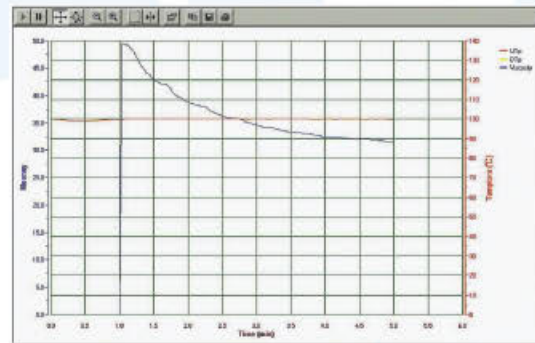
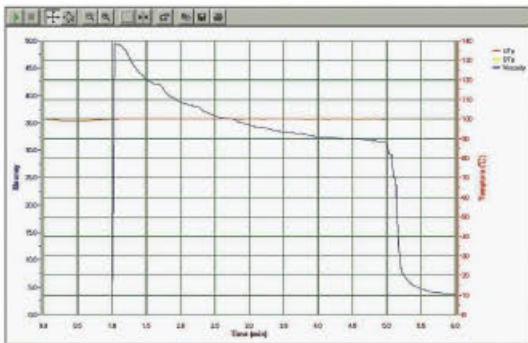
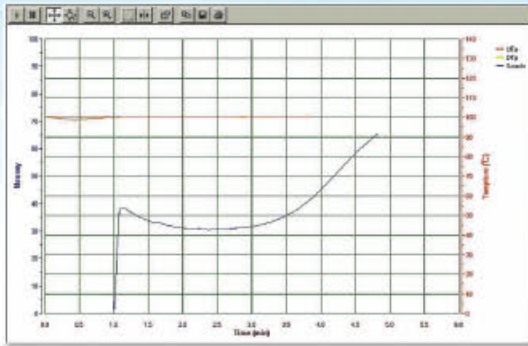
Easy Settings and Search



Outstanding Report Outputs and Graphic Displays



Examples of HT- 8752 Mooney Viscometer Display



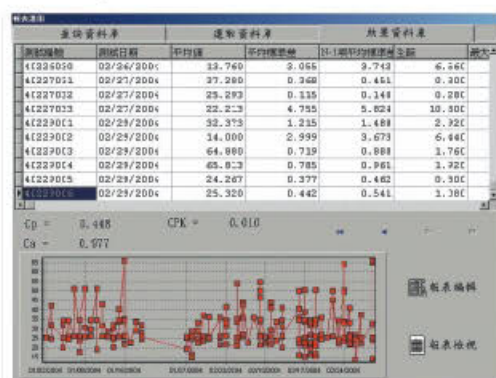
Functions Provided by The Optional Program

UCAD, the program that provides functions of optimized recipe and experiment design

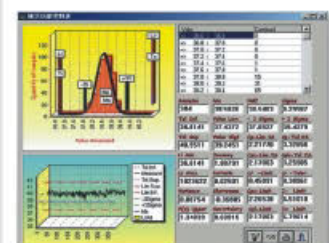
When a change of one or several ingredients is required for a recipe, this program analyzes the influence and changes between the ingredients and physical properties of the new recipe, therefore making the optimization of recipe very easy.

The mathematic model of the program allows reasonable arrangement of experiment points in the experiment space. Effective data are obtained despite the reduced number of experiments to be run. With applicable equations, this program achieves the best-fit combination among the physical properties, costs and manufacturing techniques for the product, i.e. the optimized recipe

Quality Control Chart



Normal Distribution Chart





Website : www.hungta.com
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