限りある資源と美しい自然を大切に

SERIES FT-1200

CONSTANT STRESS/STRAIN FLEXOMETER

UESHIMA SEISAKUSHO CO., LTD.

Features

○The feedback servo-control system using detected static and dynamic stress and strain has realized high precision and stability of a test.

○A much wider range and selection of loading conditions (e.g., constant stress amplitude) can be employed which were not available with conventional machines.

○Allows simulation of actual conditions of use of various rubber products.

○Allows continuous measurement of creep and basic viscoelastic data at large deformation.

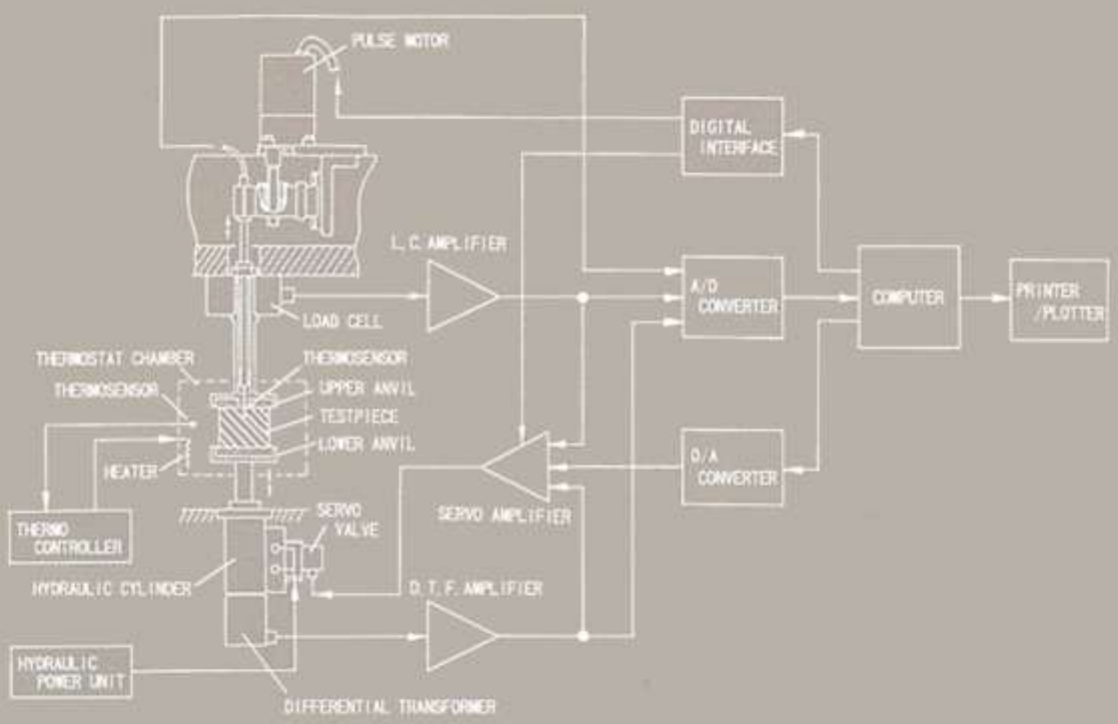
○Tan δ can be measured and indicated in real time from the dynamic stress and strain waveforms.

○Blow-out point can automatically be detected with one sample only.

○A new mechanism was developed in order to measure the true heat buildup of the sample to a high degree of accuracy.

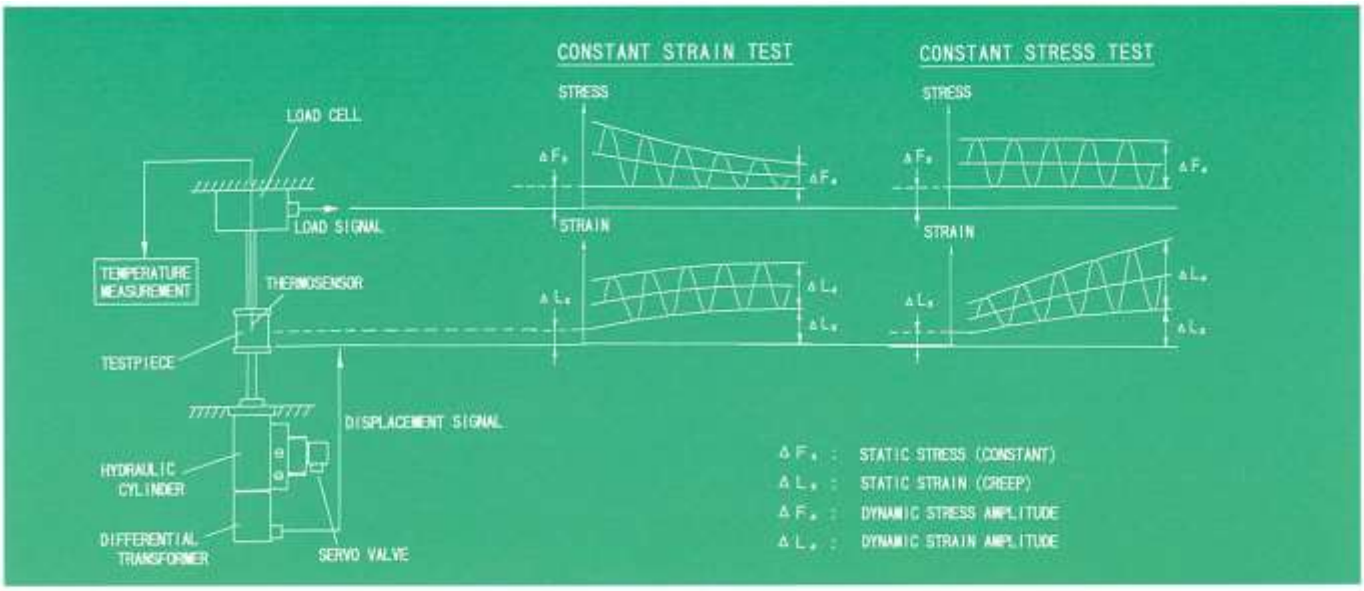
○The hydraulic servo-actuator system has made the machine simple, reliable and durable, allowing the sample to be tested under a wider range and more severe conditions.

Configuration



① Main Part of Flexometer
② Hydraulic Cylinder
Servo Valve
Differential Transformer
③ Load Cell
④ Termo-sensor Sticking Mechanism
⑤ Thermostatic Chamber
⑥ Thermo-control Panel
⑦ Testpiece
Upper and Lower Anvil
⑧ Hydraulic Power Unit
⑨ PC
⑩ Monitor
⑪ Color Printer

Test Method



Development

Anticipating the needs of the rubber industry in the next century a revolutionary testing machine has been developed. Rubber materials such as tyres, belts and vibration isolators all undergo large amplitude cyclic deformation under conditions of actual use. This testing machine yields data concerned with the resistance to fatigue, caused by internal heat generation, resulting from such cyclic deformation. The laboratory data obtained is in excellent agreement (0.99 or higher correlation coeffcient) with product test results.

Various types of Flexometers have been employed since the 1930's in order to obtain temperature rise data and to determine creep chatacteristics of tyre rubbers under repeated dynamic loading. The data obtained disagreed with product test results for the following reasons :

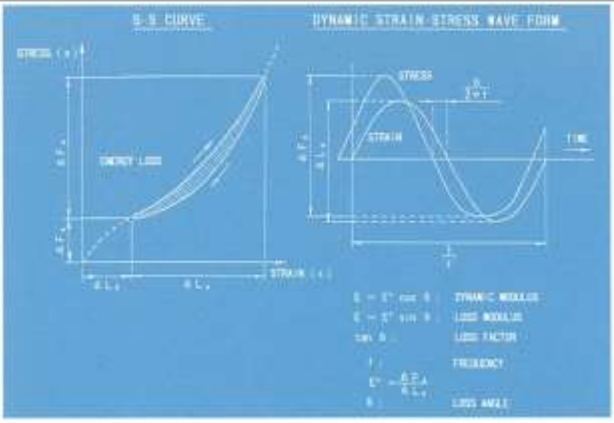
(1) Tyre rubbers are subjected to cyclic deformation of 'constant stress amplitude' under conditions of actual use but the conventional machines were only capable of simulating a 'constant strain amplitude' dynamic load.

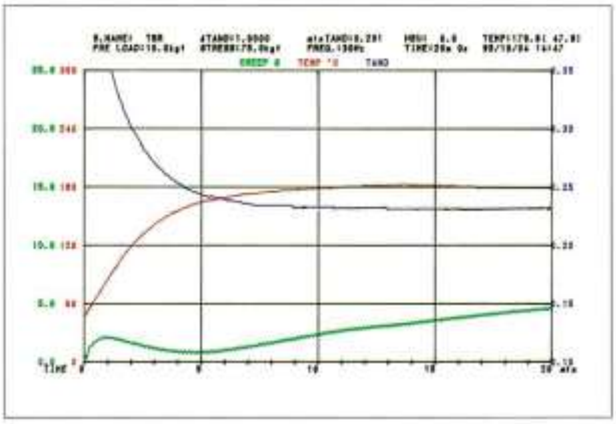
(2) Amount of preloading, and value of freequency employed were differed widely with conditions in actual use.

Furthermore, conventional machines had no means of detecting 'blow out' (a consequence of degradation of tyre rubber caused by temperature increase due to repeated deformation). Determination of the 'blow out' point required a large number of samples to be tasted. The samples had to be cut open and 'blow out' identified by an expert. As a result the test was both time consuming and costly to carry out.

More recently, visco-elastic testing machines have been used to predict the durability of not only tyre rubbers but also rubbers used in vibration isolators. However, the visco-elastic tester provides data relating to the behaviour of rubber under minute deformation where the realtionship between stress and strain is linear. The data so obtained cannot be used to safely predict the behaviour of rubber under actual service conditions.

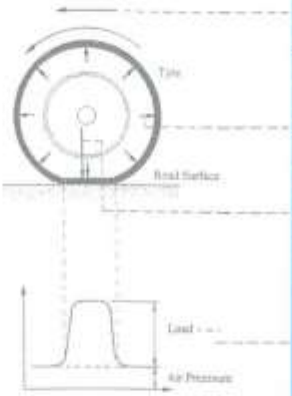
By combining these two existing approaches, MODEL FT-1250 has been developed as a 'Large Deformation Visco-Elastic Flexometer'. By introducting an hydraulic servo-control system instead of a complicated conventional mechanism, the static and dynamic components of the load have been unified (hydraulic cylinder supplies both) and a simplified testing machine has been realised. This type of system also allows the simultaneous measurement of both stress and strain. The feedback servo-control mechanism has made the 'constant stress amplitude' test possible which could not be performed on a conventional machine. Suitable test conditions for each product can be selected and varied over a wide range. The stress and strain data are read in and the visco-elastic parameters are calculated in real time. This feature gives us the means to detect the 'blow out' point with excellent repeatability. The machine also incorporates a new type of temperature sensing mechanism which allows the temperature at the exact centre (origin of heat gengeration) of the sample to be continually monitored and not on the surface as was the case with conventional Flexometer.





MODEL FT-1250 was initially developed as an improved Flexometer but we feel that it has potential for unlimited application in the field of rubber testing.

Sample Application



RUNNING CONDITIONS OF AUTOMOBILE TYRE	FLEXOMETER TEST CONDITIONS CONVENTIONAL FLEXOMETER	 MODEL FT-1250
RUNNING SPEED Loading Frequency (f): 10Hz 30Hz 50Hz Passenger Car Tyre (O.D.=600): 68 204 339km/h Light Truck Tyre (O.D.=750): 85 255 424km/h Truck/Bus tyre (O.D.=1000): 113 339 565km/h Heavy Duty Truck Tyre (O.D.=1350): 153 458 763km/h	**FREQUENCY** 30Hz FILXED	5-50Hz VARIABLE
AIR PRESSURE Passenger Car Tyre: 400-800kgf (2.7－5.3kgf/cm²) Trunck/Bus Tyre: －5800kgf	**PRE-LOAD** 10,20kgf/cm² (25,50kgf)	0～7kgf/cm² (0～50kgf variable)
LOAD Passenger Car Tyre: 400～800kgf (2.7～5.3kgf/cm²) Truck/Bus Tyre: ～5800kgf	**CONSTANT STRESS AMPLITUDE** － (Constant Strain Only)	0～150kgf p-p variable (0～21kgf/cm² p-p variable)
LOADING WAVEFORM Common for Any Type of Tyre 	**DYNAMIC LOADING WAVEFORM** 	

Specification

MODEL	FT-1250	FT-1260
Type	Compression Flexometer	
Testpiece	(1)Shape　　:Cylindrical (2)Dimensions：ϕ30.0×25mm、ϕ17.8×25mm(Option for FT-1250)	
Preloading	(1)Method　:By hydraulic cylinder with servo control (2)Load　　:50 to 500N	
Dynamic Loading	(1)Method　:By hydraulic cylinder with servo control (2)Mode　　:(A)Constant strain amplitude (B)Constant stress amplitude (3)Amplitude：(A)1 to 6.5mmp-p　(B)50 to 1500Np-p	
Load Detector	5000N rating load cell	
Displacement Detector	20mm stroke differential transformer	
Frequency	5 to 50Hz	
Temperature Range of Thermostat Chamber	50 to 150℃ (50 to 100℃±1℃、100 to 150℃±3℃)	
Measuring of Testpiece Temperature	By a needle type thermocouple continually position-controlled at the center of the interior of the testpiece	
Testpiece Supply	One testpiece, manual operation one by one	30 testpieces, automatic operation and measurement
Measurement	(1)Output Data (a) Temperature of testpiece (b) Creep (c) Visco-elastic parameters ・Storage modulus(E') ・Loss modulus(E'') ・Loss factor(tanδ) (2)Indication：Graphic display	
Electric Supply	Main part of Flexometer:Single phase　AC200V　15A Hydraulic power Unit　:3-phase　AC200V　25A	
Cooling water Requirement for Hydralic Power Unit	Temperature :Lower than 28℃、 Flow rate　:20ℓ/min	
Dimensions	Main part of Flexometer：750(W)×835(D)×1470(H)mm Hydraulic power Unit　：1010(W)×730(D)×950(H)mm	Main part of Flexometer：750(W)×914(D)×2050(H)mm Hydraulic power Unit　:1010(W)×730(D)×950(H)mm

UESHIMA SEISAKUSHO CO.,LTD.

<Manufacturer>

Ueshima

UESHIMA SEISAKUSHO CO., LTD.

6-5-22,Yaho,Kunitachi-shi,Tokyo 186-0011,Japan

TEL.81-42-572-1397 FAX.81-42-573-1520

E-mail:sales@ueshima-seisakusho.com

https://www.ueshima-seisakusho.co.jp

※Please be noted that the contents in this brochure may change without prior notice due to improvement of the equipment. 027-468264-6