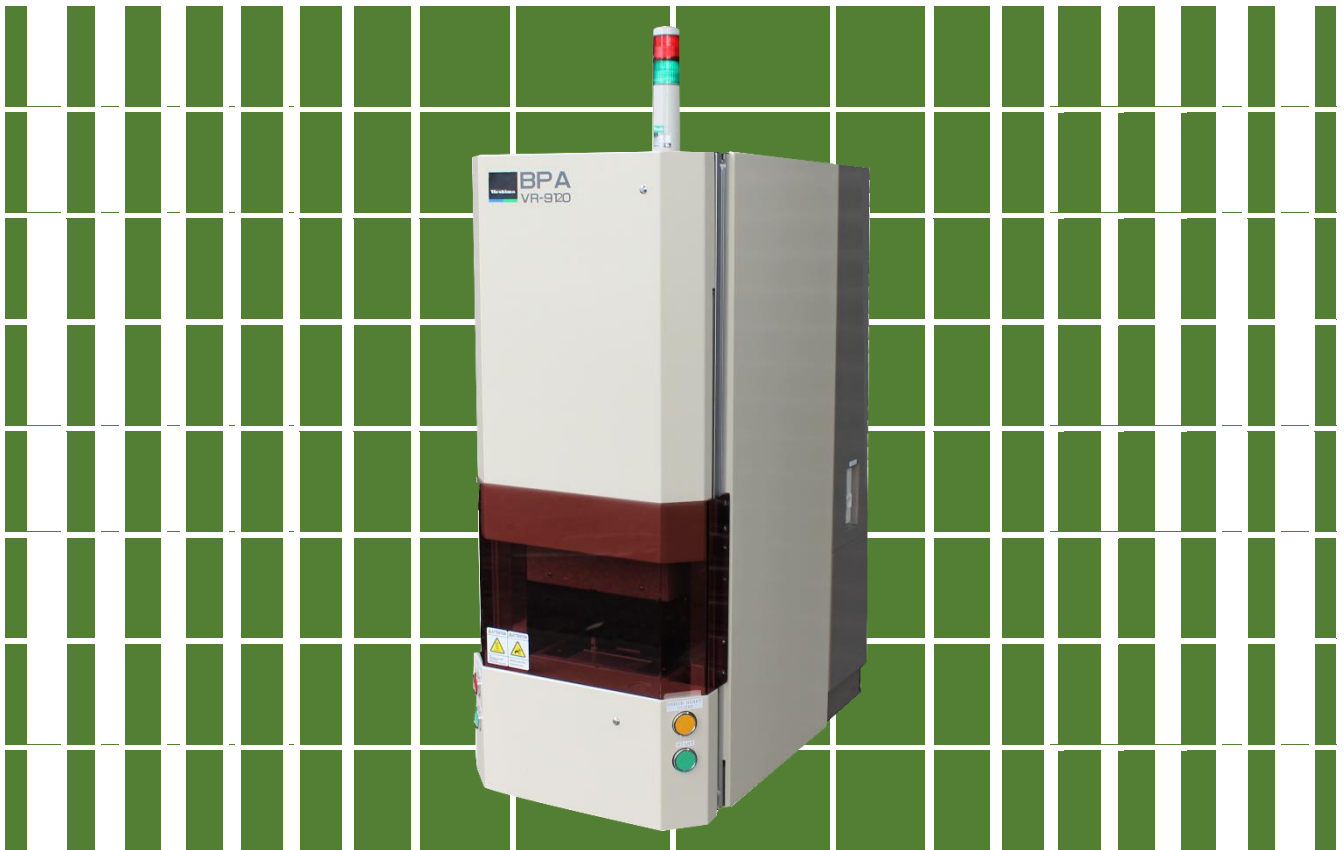# BPA MODEL VR-9120
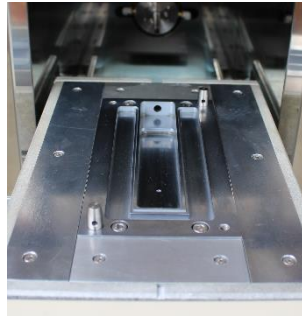## BLOW-POINT ANALYZER

Patent application number
2015-197328

Control the quality of the vulcanizing process
Improvement of Productivity！
Reduction of Energy!
Improvement of Abrasion Properties,Durability！

UESHIMA SEISAKUSHO CO., LTD.

Outline

In process of tire manufacturing (vulcanizing process), under cure by inadequacy of treating temperature and curing time causes bubbles inside of tire, which is exact source of burst of tire under use.

On the other hand, over curing of tire causes not only reducing intrinsic physical property of rubber (viscoelastic property), but also decreasing efficiency of productivity and wastage.

Appropriate curing time for compounded rubber can be obtained using not an actual tire but a rubber test piece by means of Blow Point Analyzer. Optimized conditions for tire manufacturing can be obtained using effective data obtained from the Blow Point Analyzer.

Principle

■ Measurement condition parameter is worked out by FDR(Flat Die Rheometer)'s cure data and active energy.

■ Thermal diffusion coefficient is calculated from rise of temperature data by new designed mold and fixed type sensor.

■ Measure blowing limit point with sliced surface of cured test piece, and calculate minimum "Blowing limit curing rate" and "Equivalent curing time"

Acquired Result

■ **Thermal diffusion coefficient** χ

This declare measured thermal properties of rubber with specific composition.

■ **Blowing limit curing rate** BP %

This indicate curing rate of blowing limit condition.

■ **Equivalent curing time** $t_{eq}BP$

This time means processing time to BP %.

Feature

■ Excellent temperature uniformity realized by advanced heat design.

■ Built-in sensor and unique mold

Test material can be set and removed very easily without touching the sensor. The unique mold enable accurate computation of thermal diffusion coefficient using a single temperature sensor.

■ Automatic calculation of curing time has minimized the test time.

■ Elaborate data analysis

Thermal diffusion coefficient is calculated in Consideration of thermal overshoot caused by reaction heat involved in vulcanization process. Highly accurate approximation is used for the analysis.

Measured Item

■ Test piece temperature curve (T_i to t curve)

T_1=Rt、 T_0 =Heat plate temp、 T_i =Test peace temp

■ Work out unsaturated temperature rising rate α

$$\alpha = \frac{(T_0 - T_i)}{(T_0 - T_1)}$$

■ Blowing limit point of after curing test peace.

Measurement Procedure

■ Input measurement condition.

■ Set test piece

■ Start→Self-finish

■ Remove cured test peace, cut with special cutter, measure and take picture blowing limit point.

■ Data analysis and save.

■ Data filed with measurement date and data number.

Outline of BPA and FDR
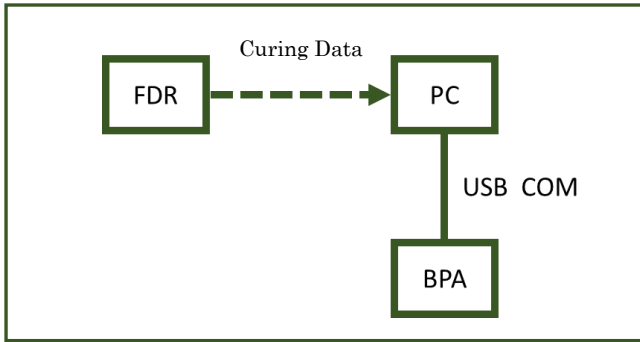
The curing data of sample is taken by FDR in advance. The necessary pressuring curing time at BPA test is calculated preliminarily by the curing data, tc (10), tc (90), expected BP% and activation energy. It releases pressure automatically from the comparison with the equivalent curing time derived from the temperature rising data during the curing test. If there is difference between the temperatures of FDR test and BPA test, it is converted by using Arrhenius equation.

Graphic Display

Specimen Shape and the Sensor
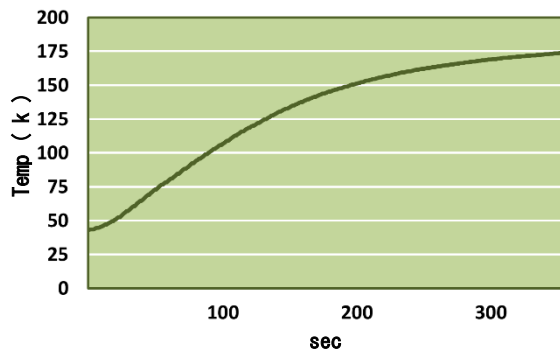
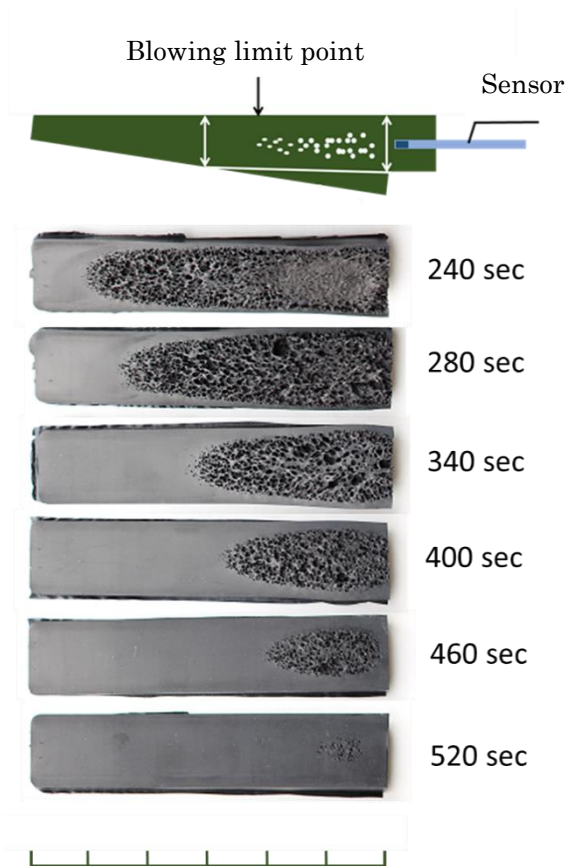
Rise of temperature of test piece
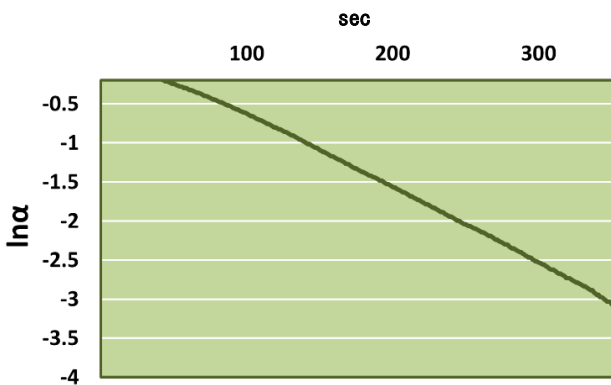
Time dependence of unsaturated temperature rising rate α

The time dependence of logarithm In α of unsaturated temperature rising rate α is regarded as linear equation by Newtonian approximate value, and the slope on the graph can calculate the thermal diffusion constant

Curing Time and Blowing Condition

It is seen remarkably that non-blowing domain is increasing as the curing time increases.

Specification

Name	Blow - Point Analyzer (BPA)
Model	VR-9120
Press method	Air cylinder(no oil feed type) inside diameter of φ200
Mold configuration	Slot wedge type t=6～20mm L=140mm W=30mm
Test temperature	Rt+10℃ to 200℃
Temperature resolution	±0.3℃
Heating method	Flex heater 200V 3kW
Temperature detector	Heating plate : Platinum resistance thermometer (Pt100) Test piece　 : Sheathed thermocouple (Grounding T type/class 1)
Maximum test time	Curing time : 99999sec　　Depressurization time : 999sec
Guard cover	Colored acrylic
Safety device	(1)Both hands use push switch (2)Antiover heat curcuit (Heater off at 220±8℃) (3)Operation indicator & Alarm indicator
Communication I/F	USB
Utility	(1)Power source AC200 to 220V　single phase 20A　50/60Hz (2)Compression air 0.7 to 0.8MPa (Dry air)
Operating environment	(1)Temperature :　5 to 40℃ (2)Humidity　 : 　35 to 80%RH (without condensation)
Body size & weight	Apr. 333 (W) ×557 (D) ×780 (H)　mm(w/o projection)、 apr.120kg
Standard accessory	(1)Special slot wedge type mold : #620 (L140、t6 to 20) (2)Special temperature sensor for test piece temperature measurement (3)Software for data processing. (4)Pneumatic drive sample cutter(replacement blade type) 　 model : SC-3425 (5)Camera and camera stand for take picture of cutting face of cured 　 sample.

Option

●Thick slot wedge type mold : #630 (L140、t6 to 30)
●Special rack