

# OXYGEN BARRIER PROTECTS THE PERFORMANCE AND LIFE OF RUBBER TIRES

When you are on the road, a set of good tires can take you farther and assure you reach your destination safely.

## Challenge

Oxygen Transmission Rate (OTR) testing is an important step to assess rubber's barrier properties. Rubber manufacturers want reliable OTR testing with high throughput so they can take the product to market sooner. To simulate heat increase in tires due to kinetic induced friction, rubber's OTR testing is commonly done at high temperatures. Additionally, at higher temperatures, these rubber samples can stretch or sag. Is there an OTR analyzer that can test rubber samples with these test requirements?

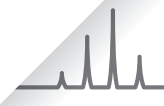
## Why testing the Oxygen Transmission Rate is Important for Rubber Products

In 1844, Charles Goodyear developed the vulcanized rubber process to create and manufacture pliable, waterproof, moldable rubber. Since then, rubber has been adapted to multiple applications, including tires used on vehicles.

In a typical tire for any car, rubber polymers (butadiene rubber and styrene butadiene rubber) are used in combination with natural rubber. Physical and chemical properties of these rubber polymers determine the performance of each component in the tire as well as the overall tire performance. Inside the core of a tire, another rubber, namely halobutyl rubber, is also important. This material makes the inner liner a barrier to keep the tire inflated. How long the pressurized air can be kept inside the inner liner plays a major role in the performance and usable life of the rubber tire. Therefore, oxygen transmission rate must be tested. The lower the OTR, the better the oxygen barrier, guaranteeing a longer usable life. Rubber products to be tested are usually in the form of flat sheets. So, the OTR data usually are reported with the unit of  $\text{cc}/(\text{m}^2 \cdot \text{day})$ .



Rubber Tires on Vehicle



# SOLUTIONS TO BARRIER TEST NEEDS FOR RUBBER PRODUCTS

## Solutions to Test Rubber Samples

AMETEK MOCON developed the OX-TRAN Model 2/28 H, the High Throughput Oxygen Permeation Film Analyzer. It has the capability to test OTR 0.05 – 2000\* cc/(m<sup>2</sup> · day) with temperature range of 20 - 60°C. The wider temperature range accommodates the test conditions desired by rubber goods manufacturers.

\*2000 denotes the expanded detection capability with masked or reduced area cartridges.

For thick samples (Such as Rubber sheets) testing, optional special Side-by-Side Dual Film Test Cartridges (10cm<sup>2</sup> or 5cm<sup>2</sup>) are available to test thicker samples up to 1/8" (3.18 mm or 125mil). The cartridge's reduced test area also can minimize the stretching effect of the rubber materials. Below is an example of tested OTR for rubber materials.

Test Sample: Rubber A and Rubber B

Sample Thickness: 86mil

Test Gas: 100% O<sub>2</sub>

Test Temperature: 60°C

Test Instrument: MOCON OX-TRAN 2/28 H

Test Area: 10 cm<sup>2</sup>.

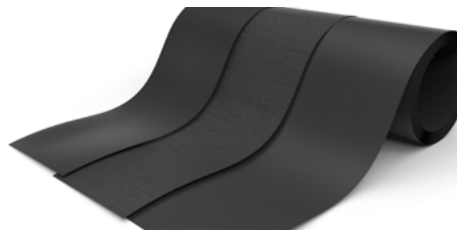
Sample ID	OTR result cc/(m <sup>2</sup> · day)		
	Rep 1	Rep 2	Average
Rubber Sample A	340	338	339
Rubber Sample A	259	261	260

Table 1. Rubber sheet Test Results from OX-TRAN 2/28

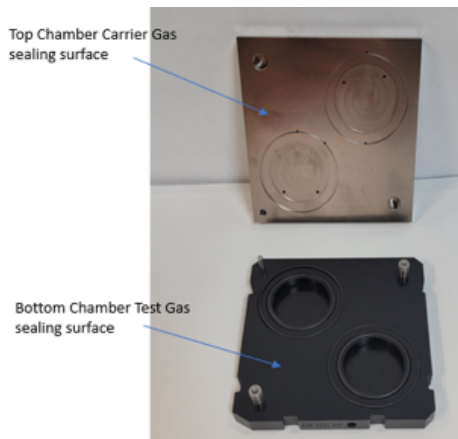
## Benefits of MOCON OX-TRAN 2/28 Oxygen Permeation Analyzers

- Conforms to ASTM D3985 with our Coulox absolute oxygen sensor for guaranteed accuracy.
- Designed for high throughput testing, which benefits the QA/QC process.
- Has all the same automatic testing and ease of use benefits as our other MOCON Next Generation film analyzers.
- Special features including thick test sample (up to 1/8") capability and reduced test area cartridge
- Wide test temperature range 20 – 60°C.

Roll of Rubber Sheets



Side-by-side Dual-film 10cm<sup>2</sup> Test Cartridge for Thicker Sample Testing



Side-by-side Dual-film 10cm<sup>2</sup> Test Cartridge for Thicker Sample Testing



## Conclusion

If you are challenged to test rubber sheets, AMETEK MOCON's OX-TRAN 2/28 H OTR Analyzer and special Dual-Film test cartridges will assist you in evaluating sample barrier properties fast and accurately.

To discuss your unique rubber testing applications, please contact your local MOCON Sales representative.

