SYMPOSIUM ON AGING OF RUBBERS

INTRODUCTION

By G. C. Maassen[1]

To try to increase the life expectancy of rubber articles has been the problem of the rubber compounder and chemist ever since the discovery of rubber as an item of commerce.

With the advent of improved accelerators and antioxidants, plus improved techniques in their application, the life of rubber articles was very definitely increased. It then became a problem to predict the life expectancy of the finished article. Tensile strength has for a long time been considered one of the criteria for measuring quality of rubber. And, since rate of deterioration of tensile strength would be a means for determining the expectancy of useful life of a rubber article, methods were devised for accelerating tensile decay.

In 1916 W. C. Geer announced the Geer Oven which exposes the sample to circulating air at 70 C. (158 F.) at atmospheric pressure. After being subjected to these test conditions for 24, 48 or 96 hr., marked deterioration of tensile properties took place in rubber compounds commercially available at the time.

As technological progress was made, the aging resistance of rubber compounds improved to such an extent that the time consumed in causing tensile deterioration in the Geer Oven became impractical. To increase rate of tensile decay the Bierer-David Oxygen Bomb was introduced. In this equipment the rubber was subjected to an atmosphere of oxygen at 70 C. (158 F.) and 300 psi. oxygen pressure.

With further progress in compounding techniques even the oxygen bomb was too slow. In the late 1920's U. S. Rubber Co. introduced the air pressure heat test. In this test the sample is exposed to air at 80 psi. pressure at a temperature of 127 C. (260 F.). Although this test was originally designed to serve as an accelerated aging test for inner tubes, it has been used as an accelerated aging test for many other commodities.

Because of the history built up through the years and because the equipment was available, these same tests were used when synthetic elastomers were introduced to replace and to augment rubber. As time has passed, it has become more and more apparent that the accelerated aging tests used for natural rubber are not applicable to the same degree when the synthetic elastomers are considered.

It was therefore deemed advisable and necessary that a symposium be held to review the various methods for accelerating aging of natural rubber and synthetic elastomers. From this review it is hoped there will evolve a method or methods for aging which will have universal application to all polymeric elastomers. Such a method or methods is or are necessary so that results may

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be reduced to a common denominator. It is the hope that from this symposium such a method will suggest itself.

The committee arranging the symposium was constituted as follows:

G. C. Maassen, *Chairman*, R. T. Vanderbilt Co.
T. A. Bulifant, Barrett Div., The Allied Chemical and Dye Corp.
H. E. Charles, Hazard Insulated Wire Works Div., The Okonite Co.
L. E. Cheyney, Waterproof-Ohio Div., Pollock Paper Corp.
L. V. Cooper, Firestone Tire and Rubber Co.
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H. E. Outcault, St. Joseph Lead Co.
M. G. Schoch, Jr., Hewitt-Robins Inc.
R. D. Stiehler, National Bureau of Standards

The committee wishes to express thanks for assistance rendered by Simon Collier, Chairman of Committee D-11, Arthur W. Carpenter, Secretary of Committee D-11, Mr. H. K. Nason, member of the Administrative Committee on Papers and Publications, and Messrs. R. E. Hess and G. A. Wilson of A.S.T.M. Headquarters staff.

Finally, the committee also wishes to express thanks to A.S.T.M. and Committee D-11 for the privilege of holding this symposium.