PREDICTION OF SERVICE LIFE OF RUBBER PRODUCTS BASED ON ARRHENIUS THEORY

Joy Joseph, Jacob K.Varkey and Manoj Kurian Jacob

Rubber Research Institute of India, Kottayam-686 009, Kerala, India

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Different types of rubbers have different ageing properties. Service life of rubber products is determined by the differences in ageing properties of the rubbers used in the products and the conditions to which the products are exposed to during their service life. The present work is an attempt to predict the service life of products made up of nitrile rubber (NBR), ethylene propyle diene (EPDM) rubber and NR based on the Arrhenius theory. Logarithm of days in air to reduce the tensile strength to least serviceable level of 10 MPa for NBR and EPDM and 20 MPa for NR were plotted against 1/T where 'T' is the temperature in Kelvin scale. When the results were extrapolated to 1/T for room temperature (3.3×10^{-3}), we got log days for room temperature as 7.5 for NBR. This indicates that the product made out of the formulation used can give a service life of 1808 days in air. In a similar way it was predicted that the service life of the NBR product of the formulation studied was only 992 days in sea water. Similarly the service life of EPDM and NR of the formulation used in the present study was estimated as 2208 days and 633 days, respectively in air, and that in sea water was estimated to be 854 days and 81 days, respectively.

Key words: Ageing, Ethylene propylene diene rubber, Natural rubber, Nitrile rubber, Service life, Tensile strength

INTRODUCTION

Different types of rubbers like natural rubber (NR), Ehylene Propylene Diene rubber (EPDM), Nitrile butadiene rubber (NBR) *etc*. are widely used in manufacturing thousands of rubber products (Stevensan, 1990). Various types of synthetic rubbers are being used in places where natural rubber (NR) fails to give service (Eby, 1979). Though many synthetic rubbers are available in the global market NBR, EPDM, Silicone and SBR are some of the most widely used synthetic rubbers in non-tyre sector (Celina *et al*., 2005).

Though NR is the most widely used polymer in rubber products some of the properties like ageing resistance to air and sea water make NR unsuitable for certain products (Gent, 1992; Shlyapnikov 1996; Suits, 2001). In such situations NR has to be replaced by other types of rubber. In this context it is worthwhile to predict the service life offered by a product under specific conditions, made out of rubber. The present work is an attempt to predict the service life of products based on NBR, EPDM and NR.

Nitrile rubber, also known as Buna-N, Perbunan, acrylonitrile butadiene rubber, and NBR, is a synthetic rubber copolymer of acrylonitrile (ACN) and butadiene. Trade names include Nipol, Krynac and Europrene. NBR is a family of unsaturated copolymers

Correspondence: Joy Joseph (Email: joyjoseph@rubberboard.org.in)