

**RECOMMENDED SHELF LIFE OF  
AGRICULTURAL RUBBER PRODUCTS**

by

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## **INTRODUCTION**

The Engineering Services Branch of Alberta Agriculture was asked to outline recommended shelf lives for rubber products used with agriculture machinery. Numerous standards organizations and industrial manufacturers were contacted to determine if industrial standards for rubber shelf life existed. From discussions with manufacturers in Canada and the United States it was concluded six different standards organizations outlined shelf life of rubber components. The United States' Department of Defense standard used input from all relevant standards organizations and technical sources to come up with a standard for the military. From the military standard a general guideline of recommended shelf life of rubber products used in agriculture was made.

## **STANDARDS ORGANIZATIONS**

Six standards organizations have outlined shelf life of rubber components.

Those organizations are:

- The United States Department of Defense
- The United States Federal Government
- Aerospace Materials Specification
- American Society for Testing and Materials
- National Aerospace Standards
- Society of Automotive Engineers Standards

The United States' Department of Defense Military Standardization Handbook overviews the standards presented by the six organizations and provides guidance as to the time periods during which elastomeric products may be stored without deterioration. A copy of the standard can be ordered from:

Document Engineering Company  
Van Nuys, California 91405  
United States  
Telephone: (213) 873-5566

## **DEFINITIONS**

The following definitions have been used in the United States' Department of Defense Standard MIL-HDBK-695C.

***Age Resistance*** - Resistance to deterioration in storage by environmental factors such as heat, light and ozone.

***Cure Date*** - Cure date is the date the rubber is fully cured.

***Shelf Life*** - Shelf life is defined as the maximum period of time, from cure date to the date the elastomeric product is used as a component part in subassemblies, assemblies and systems. During the shelf life time, the stored elastomeric product is expected to retain its characteristics as originally specified.

## **FACTORS INVOLVED**

As outlined by the military standard, the most important factors involved in the shelf life of rubber products are:

1. The initial quality level of the product.
2. The quality assurance provisions of the specification under which the item was procured.

3. The age resistance of the rubber from which the product was fabricated.

The following guidelines were used to establish the expected shelf life periods listed in the standard.

- a) It was assumed each rubber product met the initial requirements of the applicable specification.
- b) It was assumed each rubber product was packaged and stored in the manner prescribed in order to minimize deterioration due to such factors as temperature, humidity, ozone, sunlight, oils, solvents, corrosive liquids and fumes, insects and rodents.
- c) The severity of the specification requirements for an item was considered, especially those requirements which relate to age resistance such as resistance to accelerated air aging, resistance to ozone, compression set and cyclic performance at temperature extremes.
- d) The type of rubber from which the item was fabricated was one of the most important criteria used in assigning the expected shelf life value.

### **AGE RESISTANCE OF VARIOUS RUBBERS**

TABLE 1 (adopted from MIL-HDBK-695C) is a guideline for shelf life of various elastomers used in the fabrication of rubber components. As outlined in Part D of the "Factors Involved" section of this report, the rubber used in manufacturing is one of the most important criteria when assigning shelf life values. TABLE 1 should be used once manufacturing specifications on the components are found. While the age resistance of raw rubber does not always correspond to the age resistance of

the finished product, most of the standards outlined on the shelf life of rubber follow  
TABLE 1.

**TABLE 1. Age Resistance Generally Associated with Products Fabricated from Various Rubbers.**

TYPE OF RUBBER	COMMON OR TRADE NAME
<b>Maximum (Up to 20 years)</b>	
Silicone Fluorosilicone Polysulfide Fluorocarbons Polyacrylate Fluorophosphonitrilic	Silicone Silastic LS Thiokol Fluorel, Viton Acrylic PNF
<b>Average (5 to 10 years)</b>	
Chlorosulfonated polyethylene Isobutylene/Isoprene Polychloroprene Polyether Urethane Polypropylene oxide Ethylene/propylene diene Ethylene/propylene Epichlorohydrin homopolymer Epichlorohydrin ethylene oxide	Hypalon Butyl Neoprene Urethane Propylene oxide Ethylene propylene terpolymer Ethylene propylene copolymer Hydrin 100, Herclor H Hydrin 200, Herclor C
<b>Minimum (3 to 5 years)</b>	
<sup>1</sup> Butadiene/acrylonitrile Butadiene/styrene Cis-polybutadiene Cis 1, 4, polyisoprene Cis 1, 4, polyisoprene Polyester urethane	Nitrile, NBR SBR Butadiene Natural, pale crepe Synthetic natural Urethane

<sup>1</sup>NBR, when compounded for o-ring seals, may have a shelf life as high as 10 years when aging resistance requirements are specified in the specification.

**TYPICAL SHELF LIVES OF AGRICULTURAL PRODUCTS**

TABLE 2 outlines typical shelf lives of rubber components used in agriculture based on their typical elastomer construction. Table 2 should be regarded as only a

general guideline and product distributions or manufacturers should be contacted to actually determine manufacturing elastomers used with referal to TABLE 1 for the most precise information.

**TABLE 2. Typical Shelf Life of Elastomer Agricultural Products**

<b>DESCRIPTION</b>	<b>TYPICAL SHELF LIFE WITH COMMONLY USED ELASTOMERS (Years)</b>
Bearing Components	3 to 5
Belts	3 to 10
Cables	5 to 10
Diaphragms	3 to 5
Gaskets	3 to 10
Grommets	3 to 5
Hose	3 to 10
Hose Assemblies	3 to 10
Hose, High Pressure	5 to 10
Hose, Low Pressure	3 to 5
Rings	Up to 20
Seals	5 to 10
Silicone Rubber	Up to 20
Tires	3 to 10
Washers	Up to 20

**REFERENCE**

Military Standardization Handbook, Rubber Products: Recommended Shelf Life. United States Department of Defense, Washington, DC. Standard Number MIL-HDBK-695C, March 1985.