Will storing my CNA gasket and sheet for too long degrade performance?

This month's "Sealing Sense" was prepared by FSA member Daniele Freitas.

Like all rubber-based products, compressed non-asbestos (CNA) gaskets can undergo changes in physical properties because of the natural aging process. These changes can affect performance and may result from a single factor or a combination of factors. The main contributor to the aging process is atmospheric oxidation, but other important factors contribute to it—such as heat, humidity, light and other atmospheric conditions. In practice, a single unfavorable effect seldom prevails. The effects are usually combined randomly.

Furthermore, CNA gaskets are products that can be manufactured from different kinds of rubber, fiber, filler and additives. As a consequence, the aging process can affect these constituents differently. For these reasons, it is advisable that users follow their manufacturers' guidelines to ensure maximum CNA shelf life during storage.

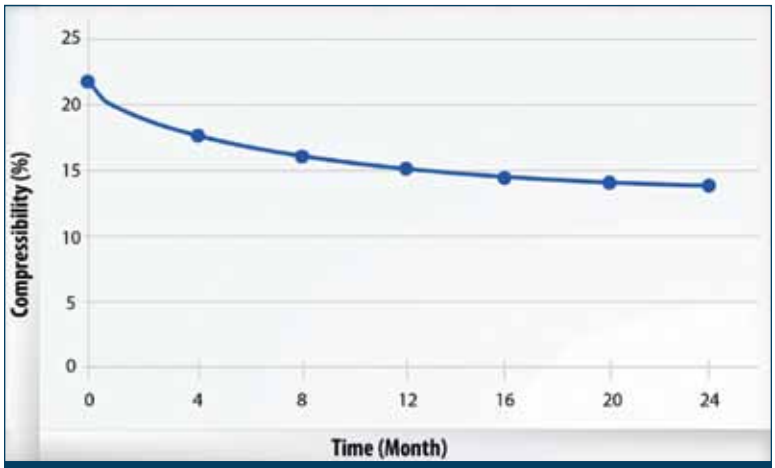

Figure 1. CNA compressibility change after aging

CNA Gaskets

Gaskets are essential components for the proper function of a broad range of equipment and process systems. A gasket must create a seal between two stationary faces of a mechanical joint, which can be maintained under intense compression for the service life of the gasket. It must be impermeable to provide a barrier against the passage of gases or liquids contained in the assembly.

The gasket also needs to cover the flange surfaces and conform to the flange irregularities by filling any imperfections. This capability depends on factors such as the condition of the flange surfaces, face alignment, joint rigidity and gasket composition. Gaskets can respond in several ways to the sealed media. Interaction involving excessive swelling, shrinking or physical degradation can cause leakage and contamination of the sealed media. As a result, it is important to install a gasket that has not suffered excessive natural aging during storage.

CNA sheets are manufactured by the vulcanization of a composite under pressure. The composite can contain one or more rubbers, natural and/or synthetic fibers and different types of fillers. The rubber binders are used in CNA gasket manufacturing to provide sealability and resilience characteristics. Numerous CNA gaskets are on the market. Each type is designed to provide sealing for a specific application in which the environment may or may not be unique. For this reason, the raw materials used to develop and manufacture these gaskets are carefully chosen.

Rubber-Based Gaskets

The term "rubber" covers many natural and synthetic elastomers, each of which can be compounded into different varieties. Because of the great range of properties found in these materials, they are versatile for gasket applications. Some are capable of use over a wide temperature range. Complete contact between the flange and gasket can be easily achieved

with these gaskets. They will also seat with little flange pressure.

Different hardness levels and textures are available with rubber products. Where greater seating stresses are required, a harder material can be used. Because most rubber gaskets have high cold flow and compressibility characteristics, the lateral flow will increase when seating stresses are high. To improve the mechanical resistance, maintain stability and control extrusion, different fibers are composited with the rubber binder and calendered into sheets to fabricate CNA gasket material.

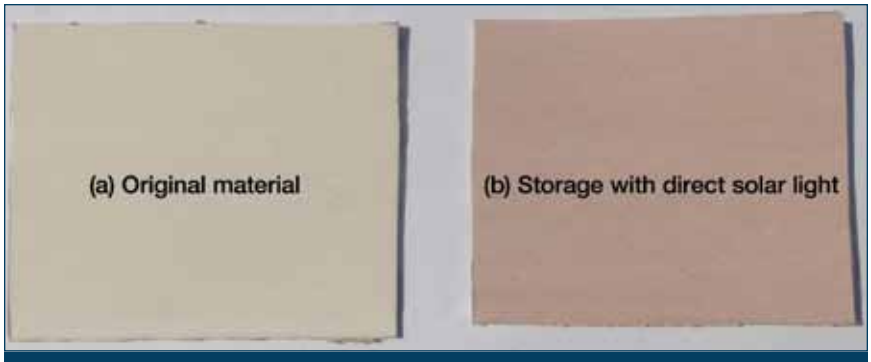

Figure 2. CNA color change

The Effects of Aging

Sheets and finished gaskets should not be stored for long periods of time. The elastomer used as a binder can age, causing the degradation of physical characteristics important to sealing performance. Aging at ambient temperatures over long periods will have a distinct effect on the properties of certain gasket materials. This occurs primarily because of the chemical degradation of the rubber binder that occurs over time. Figure 1 shows a typical curve of the decrease in CNA compressibility as a function of time at 25 C (77 F).

The aging effects are not limited to the degradation of mechanical properties—such as compressibility—that provide a positive seal between two stationary joints. Aging can also deteriorate the rubber binder to the extent that it causes extensive physical damage to the gasket material, which will result in leakage.

Aging Mechanism

The property changes that occur when CNA is stored for a long time are related to the post-cure of the binder. As the binder ages, all rubber-containing gaskets can undergo changes in physical properties, such as a reduction in compressibility and flexibility. These changes are difficult to control or prevent. This post-cure process is seen as natural aging in this type product and is accentuated by storage room temperature variations. Solar radiation can accelerate post-cure and consequent aging as shown in the color changes that occur with exposure to sunlight (see Figure 2). Exposure to chemical attack from aggressive fluids or humidity can cause similar deterioration and premature aging.

Gasket Storage

Because the mechanical properties of the gasket material play an important role in performance, controlling the conditions that can accelerate deterioration from aging is critical. The natural aging of a CNA gasket will depend on the material composition, degree of rubber cure and the manner in which the gasket was fabricated. The manufacturer's recommendations for storage and handling a CNA gasket must be followed to ensure the longest possible shelf life for the material. Good practices for CNA sheet and gasket storage include:

- Store them in a dry and cool place without direct sunlight.
- Avoid direct contact with water, oil and chemicals.

- Store sheets and gaskets flat, without folds or wrinkles.
- Do not hang the gaskets or roll the sheet material to prevent permanent deformations.
- Protect the stored product from exposure to high humidity; dust; and aggressive or corrosive vapors, steam and solvents (see "Sealing Sense," *Pumps & Systems*, May 2009).

Conclusion

Materials with elastomeric binders will inevitably deteriorate over time. They may even become unusable due to excessive hardening, cracking or other degradation. These changes may be the result of a single factor or a combination of factors—such as oxygen, ozone, light, heat, humidity, oils, water or solvents. As a result, CNA gaskets and sheets cannot be stored for too long without affecting performance.

Detrimental effects can be minimized by proper storage conditions. Overall, the recommendation is that, based on ideal storage conditions, the shelf life for CNA material is four years from the manufacture date. If the storage guidelines provided by the manufacturer have been correctly followed, premature aging problems can be avoided. A first-in-first-out (FIFO) inventory control system should always be implemented.

Next Month: *What are the important considerations for the proper torque of a valve packing gland?*

We invite your suggestions for article topics as well as questions on sealing issues so we can better respond to the needs of the industry. Please direct your suggestions and questions to sealingsensequestions@fluidsealing.com.

P&S

The following members of the Gasket division sponsored this "Sealing Sense" series:

American Falcon, Inc.
A.W. Chesterton Co.
Barrett Strip and Alloys
Daikin America, Inc.
Donit Tesnit d.d.
EGC Enterprises, Inc.
Empak Spirotallic Mexicana SA de CV
The Flexitallic Group
Garlock Sealing Technologies
Gasket Resources, Inc.
GFL Americas – Gujarat Fluorochemicals
GrafTech International Holdings, Inc.
John Crane
Lamons
Nippon Pillar Corp. of America
Sealing Corporation
SGL Technic Polycarbon Division
Slade, Inc.
Teadit International
Teijin Aramid USA, Inc.
Thermoseal Inc.
Triangle Fluid Controls, Ltd.
W.L. Gore & Associates, Inc.
Wolverine Advanced Materials
YMT/Inertech, Inc.