

# Sheet Rubber Failures: Causes, Mechanisms, and Prevention

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Sheet rubber products are engineered for flexibility, durability, and chemical resistance. Whether it is nitrile, EPDM, neoprene, or other elastomers, sheet rubber is used to produce gaskets, seals, pads and other protective barriers and built to withstand various applications. Despite this precision, failures can still occur when limits are exceeded, whether it be environmental, mechanical or manufacturing ceilings.

That is why it is key to understand common causes of failure. It helps when it comes to selecting materials, troubleshooting, and overall product performance. There are three major common causes of failure: Chemical or temperature incompatibility, mechanical overstress or environmental exposure, and manufacturing or material consistency issues.

## **Manufacturing or Material Consistency Issues**

Causes of failure may start as early as production. Factors that can create weak spots include improper compounding, inadequate bonding during manufacturing, inconsistent thickness during calendaring, and incorrect curing levels. To prevent this, organizations should strive to meet industry standards, like ASTM International, to ensure proper testing methods are being used to provide consistent products that soar in product expectations.

## **Mechanical Overstress or Environmental Exposure**

Even with proper production protocols and quality materials, outside variables during application can impact products causing wear-related failure. Applications involving movement or contact surfaces can cause friction, particulate contact, and repeated mechanical stress on products causing erosion, pitting, or tearing. For prevention, one must carefully select their products beforehand to minimize this.

Environmental exposure is another outdoor variable that can cause failure during application. Elements like ozone, sunlight, oxygen, and weather cycles in outdoor applications can impact and attack susceptible elastomers. This impact can cause surface cracking, chalking, and stiffness symptoms. Prevention can include

proper protections from prolonged exposure, and correct material selection, specifically choosing materials formulated for superior weather resistance.

## **Chemical or Temperature Incompatibility**

Chemical incompatibility is one of the most repeated causes of sheet rubber failure. This can include exposures to oils, fuels, solvents, or aggressive chemicals that can cause swelling, softening, or loss of strength. Prolonged chemical exposure can even be a cause accelerated fatigue failure, reducing sheet rubber's elasticity and tear strength.

Chemical incompatibility effects occur when fluids penetrate the polymer matrix, weakening internal bonds, and altering dimensions. This can be prevented by the correct selection of materials. Specific chemical environments require specific materials; it is essential to prevent premature degradation.

Temperature incompatibility is another recurring cause of failure. When an elastomer is not made for a specific temperature set, an elevated temperature can accelerate material oxidation and structural changes in rubber. This overexposure to heat can lead to embrittlement, cracking, or loss of elasticity over time. Prevention for this cause of failure starts in production through the proper formulation and curing to improve heat resistance. While choosing materials for applications, it is crucial to examine their temperature ratings. Continuous exposure beyond the material design limits eventually reduces performance.

## **Selection is Key to Prevention**

As seen from the most frequent failure causes, precise material selection is key to prevention of failure. While sheet rubber is engineered to be flexible, durable and chemical resistant, reviewing their specifications and standards they uphold is crucial to preventing failure and successful applications. Most importantly, selecting quality manufacturing and suppliers ensures quality materials and correct applications when carefully selecting materials to extend service life of products and maximize application performance.

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