LION ENGINEERING PLASTICS

Comparison of acetals: Acetal Copolymer vs. Acetal Homopolymer

Acetal is the general name for a family of thermoplastics with the chemical name "PolyOxyMethylene", or POM. Acetal is available in two common types of resins: Acetal copolymer (POM-C), and acetal homopolymer (POM-H). DuPont™ Delrin® is a popular acetal homopolymer (POM-H) brand name and the most commonly used acetal homopolymer. Each type of acetal has its own set of advantages and disadvantages.

Acetal Copolymer (POM-C)

The copolymer grade offers excellent performance at a slightly lower cost than Delrin®. Acetal copolymer offers consistent properties throughout the shape (being free of centerline porosity). Low stress levels and high strength assure flatness and dimensional stability up to a maximum continuous service temperature of 180°F (80°C). Copolymer acetal grades are FDA, USDA, NSF, and 3-A Dairy compliant. In addition, acetal copolymers are available in a wide variety of colors, including: natural, black, blue, red, yellow, green, brown, and grey. Other advantages over homopolymer acetal are:

- Better dimensional stability due to its lower level of crystallinity.
- Better resistance to hot water and strong caustics, or high pH (basic) solutions.
- Lower coefficient of friction and better impact and wear properties, especially in wet or moist environments.

Acetal Homopolymer (POM-H) *(DuPont™ Delrin® is most commonly used)

Acetal homopolymer offers slightly higher mechanical properties than acetal copolymer but may contain a low-density center (also known as "center line porosity") especially in large cross-sections. Acetal Homopolymer also gives slightly less chemical resistance than copolymer acetal. As an example, Delrin® is ideal for small diameter, thin-walled bushings that benefit from the additional strength and rigidity of homopolymer acetal. Delrin® is available in colors of natural and black. Other advantages over copolymer acetal are:

- Greater stiffness, with higher flexural modulus at room and elevated temperature applications.
- Slightly higher tensile and impact strength at room temperatures and lower.
- Slightly harder, thus giving the homopolymer acetals a lower coefficient of friction.

What it means

In most applications, POM-H and POM-C may be interchanged because many material properties are within approximately 10% of each other. Notably, the most significant difference between homopolymer and copolymer acetals relate to what is commonly known as centerline porosity – an inherent characteristic of POM-H. It is most prominent in thick slab and large diameter rod stock. Visually, it is clearly evident around the center portion of a rod, which extends down the entire length. In sheet, porosity appears as a line along the center of each cut edge. Excessive centerline porosity may be undesirable for the following reasons:

- Aesthetic - inconsistent color appearance in finished parts.
- May compromise structural integrity.
- Presents potential routes for leakage of gas and liquids.
- Provides areas where the bacteria can grow in food processing applications.

The cause of the porosity is shrinkage. During the extrusion process, the outside of the shape cools before the interior. As the interior material cools, there is a corresponding reduction of volume. Since the volume change of the shape is restricted due to the solidified skin, voids form to compensate for the loss of interior volume.

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