

The Right Gear Reducer For Your Washdown Application

Chuck Russell, Senior Principal Engineer for Dodge Gearing, Baldor



Finding a gear reducer that offers performance and withstands the harsh chemicals and high-pressure washdown required in a food or beverage plant can be a real challenge. No plant can afford to have processing lines shut down when inspectors find corrosion or other damage that can result from the cleaning process. But understanding the advanced features now available in wash-down capable gear reducers will help you select the most durable product.

Housing Materials

Most washdown gear products are offered with either a cast iron housing covered with an anti-corrosion coating, or stainless steel housing. Although aluminum is thought to be a non-corroding material, when sprayed with harsh chemicals, the aluminum will quickly corrode and fail. Overall, a coated cast iron housing is the most cost-effective housing option. The cast iron housing is typically the same as used in the standard product line so costs are low due to high volumes. However, the type of anti-corrosion coating, and how it is applied, makes a large difference in product performance at the customer's site.

It's critical you choose a washdown product from a manufacturer that uses a salt-fog chamber to run corrosion tests. The salt-fog chamber is the most consistent method available to compare the performance of different coatings under the same highly corrosive conditions. Trying new coatings at customer sites may lead to a coating that works well under some conditions, but not in others.

The highest performance coating system currently available consists of two coats of epoxy-based paint applied to the cast iron housing. Epoxy paint has superior

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adhesion, is highly durable, and offers very high corrosion protection to the base material. Although powder-coated products have an attractive high gloss, salt-fog testing has shown that powder coating does not provide the same level of corrosion protection as the two-part epoxy paint system. Some gear reducers include a clear third layer, but it primarily functions to add gloss for visual enhancement.

For optimal corrosion resistance, look for products that use electrodeposition to apply the first coat of epoxy paint to the bare housing. In the electrodeposition process, a multi-step cleaning process is used first to ensure that all foreign material is completely removed from the surfaces being coated. After cleaning, the part is submerged into a large container of epoxy paint. An electric charge is then applied, which attracts the paint particles into the smallest crevices of the part's surfaces. The part is then baked to quickly and fully cure the paint. The resulting paint film is very uniform in thickness, extremely durable, and is superior to a primer that is applied via a spray system.

After the gear reducer is assembled, it is then completely covered in another layer of two-part epoxy paint that increases the overall paint film thickness to improve the corrosion resistance. A cast iron housing that has been coated with two layers of epoxy paint, with the primer applied using the electrodeposition process, has a better chance of withstanding the harsh cleaning processes required in the food industry.

However, stainless steel housings provide the ultimate in water and chemical resistance. Since no coating is applied to the housing, the coating cannot be chipped off or inadvertently damaged through the use of very high-pressure water. The downside to the stainless housings is the high cost. Despite the cost, stainless housings should be selected when damage to the paint film cannot be tolerated in a particular food production process.

Venting

Whether the housing is cast iron with epoxy coatings or stainless steel, look for a pressure-relief type of vent if the reducer is vented. A standard open vent, even if equipped with chemicals to absorb moisture, will ultimately allow moisture to enter the reducer, resulting in premature failure. A gasket or O-ring should also be present between the gear reducer and motor to keep water and moisture out of the cavity between the two products.

Lubrication

To properly lubricate the gear reducer and avoid contaminating food product, lubricants should have NSF H1 (incidental contact) rating. Reducers using NSF H2 (no contact) lubricant offer no advantage and should not be considered an approved product for incidental food contact.

Sealing

One of the lowest cost components of a gear reducer, which nevertheless serves a

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critical function, is the shaft seal. Shaft seals in non-wash-down gear reducers seal the lubricant in the reducer and keep dirt and other solid contaminants out. In a wash-down application, the shaft seal must still keep the lubricant in the reducer, but it must also keep out water and chemicals being used to clean the exterior of the reducer. If the seal allows water into the reducer, the internal components will rust, and the lubricant will break down. Ultimately, the gear reducer will prematurely fail from a combination of these two conditions.

A standard lip seal used in a non-wash-down application typically has a rubber sealing lip that rides on the rotating shaft surface. There may also be a non-contacting dirt excluder lip that is used to keep large particles away from the sealing lip. The sealing lip is commonly held against the shaft with a small spring around the circumference of the lip. When exposed to high velocity, or high-pressure water and chemicals, the sealing lip will lift off the shaft and allow water and chemicals into the reducer. Even if multiple standard lip seals are stacked side by side, the sealing lips will lift off the shaft and allow water and chemicals to get inside the reducer.

To avoid these issues, look for enhanced shaft sealing systems that consist of specialty seals designed to keep the water and chemicals out.

A harsh duty seal consists of two parts, the normal outer case with sealing lip and a separate inner sleeve and flange. The inner sleeve has a rubber coating to seal tightly against the shaft, and an external flange to keep water from getting to the oil sealing lip. Between the flange OD and the oil sealing lip, there are multiple other lips designed to keep water and other contaminants away from the oil sealing lip. Some gear reducers come with a rubber v-ring combined with a standard lip seal to cut costs. This combined sealing system does not typically provide the same level of protection as a true harsh duty seal.

Working in combination with harsh duty seals are corrosion-resistant output shafts. Look for output shafts that are either stainless steel or carbon steel plated, with a high performance coating such as nickel plating. Both types perform well in wash-down applications. Sealing out water and chemicals is vital to the life of the gear reducer.

The type of housing, venting, lubrication, and shaft seal are all critical components of a wash-down capable gear reducer, and these features should be carefully evaluated before selecting a gear reducer for a food industry application.

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