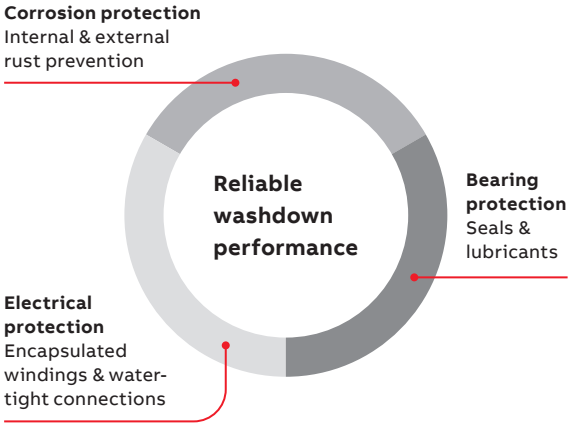
The evolution of Baldor-Reliance® washdown motors

By James Maynard
Product Specialist
for NEMA washdown motors

Creation of the washdown motor

The creation of the first washdown electric motor was a major turning point in increasing the life of electric motors used in wet and humid applications. This journey began in the 1980s. The decade of hair bands and neon spandex was also fraught with motor failure after motor failure due to water ingress. Customers with applications in wet environments were searching for a motor that could stand up to these harsh applications and keep their manufacturing facility running. It was then that the challenge of building a motor specifically designed for wet and humid applications was accepted.



A team of engineers and designers from what was then Baldor Electric Company got together and looked at the failure modes these motors were experiencing. There were failures from corrosion on the external and internal components of the motor and failures from the windings shorting out due to excessive water ingress. There were also several bearing failures from grease contamination due to water. The team took each failure mode and asked themselves what features could be changed and what components could be upgraded on the outside and inside of the motor to stop the failures and keep the motors running in the customers' applications.

Battling corrosion

The first failure mode the team addressed was corrosion. To stop corrosion on the external components of these motors, the team upgraded the external hardware and shaft extension to 300 series stainless steel, eliminating the risk of corrosion on these components. The team also upgraded the paint system to a white two-part epoxy that was five times more resistant to chipping than a standard paint system. To mitigate the risk of corrosion on the internal components of the motors, the team coated the rotor with a two-part epoxy primer. These value-added features ensured that the exterior and interior components of the motors were protected to provide a long corrosion-free life.

Windings and bearings

Protect the winding with seals and gaskets to keep water out

The team then turned their attention to protecting the motor windings from shorting out due to water ingress. They decided the best way to achieve this was to stop the water from getting into the motor in the first place. The two main areas of entry where water can get into a motor are through the conduit box/frame junction and where the shaft extension exits the endplate. The team started with the conduit box gaskets. They replaced the original paper or cork gaskets with gaskets made from neoprene to ensure a watertight seal. The team then focused on stopping water that might get into the motor between the motor shaft extension and the endplate. They enhanced this design by adding a contact lip seal and v-ring slinger to the shaft end of the motor. The case of the lip seal presses into the drive endplate, and the sealing edge of the lip seal rides on a machined surface on the shaft extension. The v-ring slinger rides on the shaft and rotates to sling water and contaminants away from the shaft opening. The lip seal and v-ring slinger work together to provide a watertight seal, mitigating the risk of water getting into the motor.

Bearing failures due to contamination

The last failure mode the team needed to address was bearing failures. The standard bearing in most general-purpose motors is an open design, which means there is nothing protecting the components of the bearing (grease, cage and balls) from external contaminates other than being housed inside of the motor endplates. In most general-purpose applications, this system is adequate and provides all the protection the bearing needs to operate effectively for the life of the motor. However, in a washdown application, the team decided to add an extra layer of protection by changing out the standard open bearings with double-sealed bearings. These bearings have an integral seal on each side of the bearing that protects the grease from contamination. This enhancement ensures that the bearings of the washdown motors are protected from water and contamination to ensure that the motor will be able to stay in operation without bearing failures, providing a long maintenance-free life.

Washdown motors

Baldor-Reliance White Washdown motor
After the team had addressed all the failure modes and the enhanced features had been added, the White Washdown motor was born. This motor entered the market in 1986, and since then it has become the go-to motor for any application in a wet or humid environment. However, that is not the end of the story. As the food and beverage industry has evolved over the past 35 years and rules and regulations have changed, the needs of the industry have also changed. At first, the focus was just on keeping the motor running in wet and humid applications, but now the focus is keeping the motors running while also keeping the food supply safe and free of bacteria or other contamination.

Baldor-Reliance paint-free motor
The next motor that was developed in the washdown motor line was the paint-free motor. The paint-free motor is the motor of choice when a harsh non-food contact application may compromise the finish of a painted motor. Its robust design boasts a 300 series stainless steel frame, motor base, shaft and hardware, while the endplates are ball-burnished aluminum. These motors are designed to resist corrosion and mitigate the risk of bacteria growth. Paint-free motors are also equipped with a rotating non-contact labyrinth seal on the shaft end to ensure the motor is watertight and will operate flawlessly in a non-food-contact application.

White Washdown

Paint free

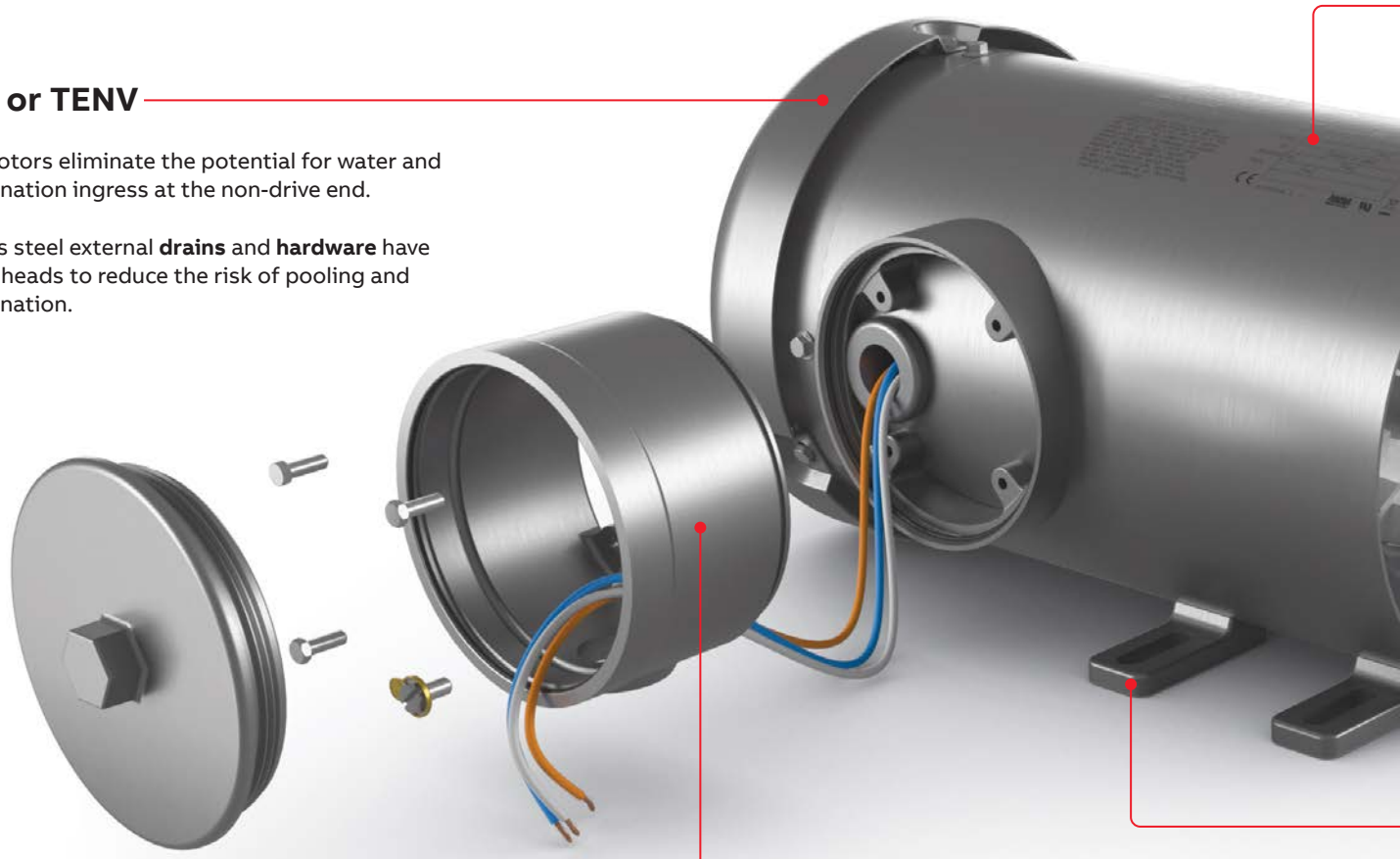
Washdown motors

Baldor-Reliance stainless steel motor
In the early 2000s, new improvements in motor design were introduced. With the issues of durability, corrosion and contaminant inhibition having been addressed, the focus again shifted; this time to making a motor that was easier to clean and sanitize. At this point, the engineering group started investigating stainless steel as the main material. The paint-free motor already had a stainless-steel frame, motor base, shaft, hardware and shaft extension, so the engineers started with that design as a base and developed stainless steel endplates, thus creating the first all-stainless motor in the washdown product family. The all stainless-steel construction is impervious to corrosion. A labyrinth seal is installed on both the drive end and opposite drive end of these motors for a watertight seal to protect the bearings and internal components of the motor from being compromised by water ingress. This motor is a perfect choice for an IP56* application in the food contact zone. (1)

TEFC or TENV

TENV motors eliminate the potential for water and contamination ingress at the non-drive end.

Stainless steel external **drains** and **hardware** have smooth heads to reduce the risk of pooling and contamination.



Rotatable, round conduit box

Our 3-piece rotatable conduit box for three phase motors offers flexibility and safety for lead connection orientation. Waterproof lead connections come standard with every motor. Being round allows for water and debris to easily shed from the motor.

Baldor-Reliance Food Safe motor

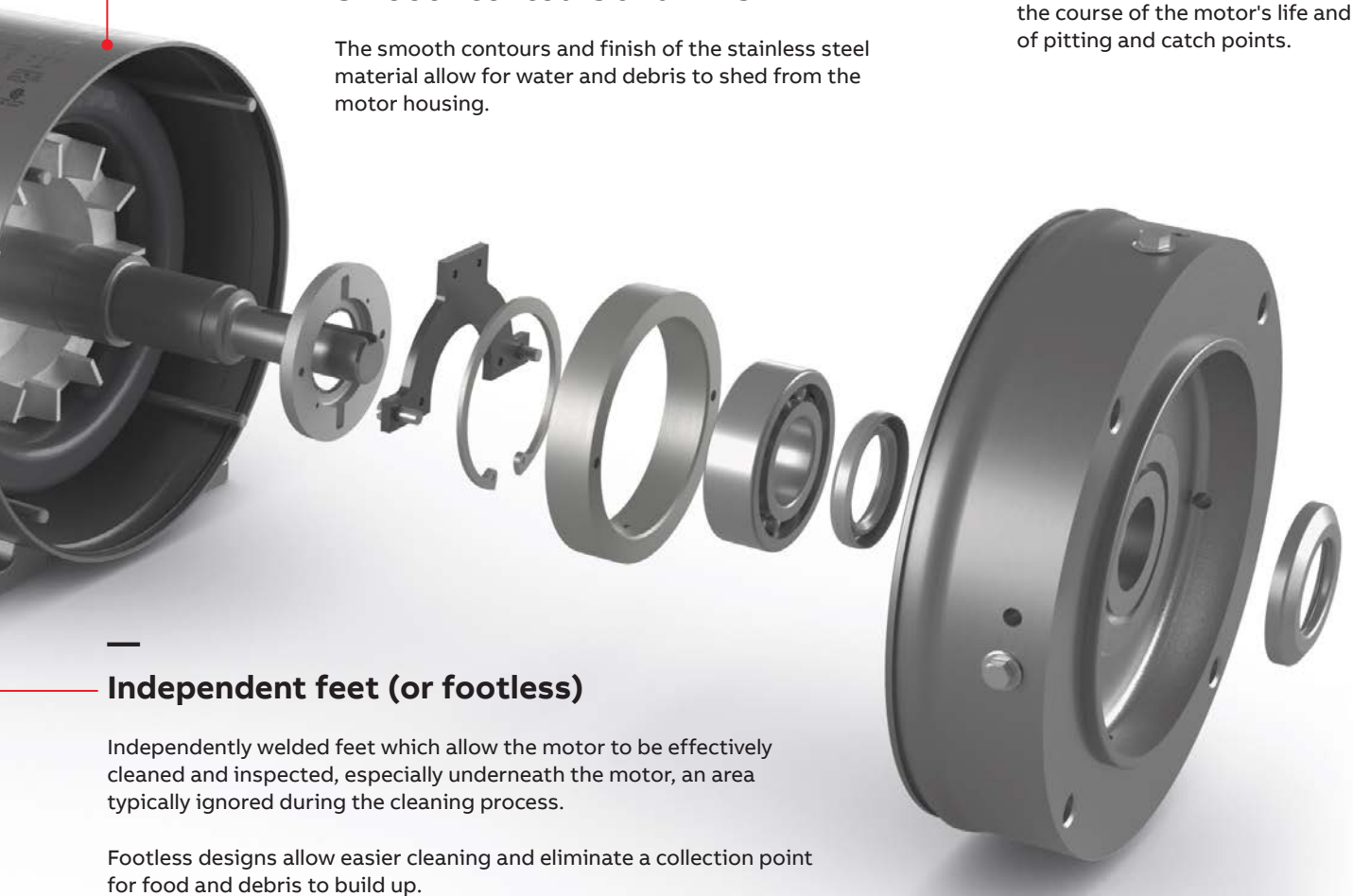
As requirements have changed over the years and clean-in-place systems have been developed to sanitize electric motors and equipment in food and beverage manufacturing facilities, the need for an IP69** rated motor has increased. This need led to the development of the Food Safe motor. These motors are the future of the food and beverage industry, designed for food processing applications where reliability is of utmost importance in an intense, caustic, cleaning environment. Stainless steel Food Safe motors are designed with a feature set consisting of a surface finish with smooth contours making them easy to clean and greatly reducing the risk of the motors harboring bacteria and other contaminants. The windings are totally encapsulated all the way into the conduit box to ensure they are protected from any condensation that may collect inside the motor. Advanced sealing utilizing an internal lip seal and an external axial face seal allow these motors to exceed the IP69 rating to maximize motor life in high-pressure, sanitary cleaning environments.

Laser marked nameplate

We've fine-tuned how to properly mark motor information to make it legible over the course of the motor's life and be free of pitting and catch points.

Smooth contours and finish

The smooth contours and finish of the stainless steel material allow for water and debris to shed from the motor housing.



Independent feet (or footless)

Independently welded feet which allow the motor to be effectively cleaned and inspected, especially underneath the motor, an area typically ignored during the cleaning process.

Footless designs allow easier cleaning and eliminate a collection point for food and debris to build up.

Expansion to the line

Since the creation of the White Washdown motor in the mid-1980s, the Baldor-Reliance line of motors has been on the cutting-edge for wet applications. This full line of motors provides a long, trouble-free life in the harshest washdown applications.

1980s

Stainless steel hardware and shaft extensions, coated rotor with two-part epoxy

1986

White Washdown motor
Double-sealed bearings

1995

Paint-free motor
Stainless steel frame, motor base, shaft and hardware, Ball-burnished aluminum endplates, Rotating non-contact labyrinth seal

2017

Food Safe motor
All stainless-steel construction, Totally encapsulated windings, Labyrinth seal on drive end and opposite drive end, Internal lip seal and an external axial face seal, Laser marked nameplate

2020

Cast-iron washdown motor
Rugged cast iron construction, Stainless steel shaft extension and hardware, White epoxy corrosion resistant finish

2022

Shaft grounding Food Safe motors provide increased reliability in variable speed performance

References

Visit ABB.com to see our full line of washdown motors.

* Protected from limited dust ingress. Protected from high-pressure water jets from any direction.
** Protected from total dust ingress. Protected from steam-jet cleaning.
(1) NEMA MG 1-2016, Motors and Generators, Section I, Part 5 - Page 1

ABB Motors and Mechanical Inc.
5711 R.S. Boreham, Jr. Street
Fort Smith, AR 72901
Ph: 1.479.646.4711

new.abb.com/motors-generators

BR485 03.2022