



Mechanical Seals In Mixing Processes

The manufacturing of chemical and pharmaceutical products puts considerable strain on the sealing technology. In addition to the process specific properties, the sealing systems must meet ever increasing requirements in terms of service life and reliability in a constantly growing and challenging market. With decades of experience in application engineering has made Sealmatic one of the leading manufacturer of sealing systems in the chemical and pharmaceutical industry, biotechnology, food industry, agrochemical industry, dispersion and micro-wet milling technology, flue gas desulphurization and many other processes.

Sealmatic can provide technical solutions for aggressive, corrosive, adhesive, viscous, toxic, explosive, dry, environmentally hazardous or exotic media. Process-optimised engineered solutions are employed by combining these with reliable seal supply systems. Sealmatic mechanical seals fulfil special requirements and directives conforming to SIP, CIP GMP, FDA and ATEX.

Mixing Process

Agitating, mixing and kneading are basic unit operations for combining of materials. The aim is to balance out differences in concentration and to achieve greater homogeneity.

In a closed agitator or vessel, the rotating agitator shaft must be sealed completely from the cover or bottom of the vessel. This type of arrangement is known as a top or bottom entry installation. There are also horizontally arranged shaft entries and side arrangements that are not horizontal. This creates very different requirements for the mechanical seals. To meet end users' expectations of longer service life, Sealmatic has developed families of seals that cover a wide range of applications and are based on many years of experience and development. These seal designs are standardised and thus provided the most cost-effective and reliable solutions for the required application. Engineered solutions are still needed for special equipments. The seal design depends on the type of installation and the process-specific load. The mechanical, process-specific, physical, chemical and safety requirements must all be taken into account in the design of the mechanical seal.

Cooling Flange

Mechanical seals may also have additional design features depending on the process requirements. These may include a Cooling flange for additional cooling of the seal for process temperatures in excess of 200 °C.

Leakage Drain

Leakages of media that could harm the product or environment can be drained into an external system.

Polymerisation Barrier

Prevents polymerisation of the product in the dynamic seal area by means of a liquid reservoir on the process side or by flushing. Prevents deposits in the dynamic seal area released by product resublimation by means of a liquid reservoir on the process side or by flushing.

Top Entry Installation

A top entry installation is generally used to seal the gas containing headspace. It should be noted that the dynamic and stationary sealing elements on the product side can come into contact with splasher and foam from the tank. There is also a risk of polymerisation in gaps or in the dynamic sealing area. The maximum speed, temperature and system pressure to be sealed in the reactor are important factors that affect the design. The mainly overhung agitator shafts are subject to bending stresses that cause the shaft to deflect in the seal plane. The mechanical forces that act on the shaft seal and bearing also have to be analysed carefully, as well as unwanted vibrations caused by internals that affect the flow or special cases, e.g. liquid bearing missing from the agitator. Shaft deflections in the seal area of 0.1 mm to 0.3 mm are tolerated as standard, depending on the size of the drive system and agitator. Up to 2 mm is possible in special cases. Sealmatic mechanical seal systems have proven successfully in many different applications.

Liquid-lubricated:

Sealmatic U184 Single or double seal with or without bearing for steel vessels.

Sealmatic U164 Single or double seal with or without bearing for glass-lined vessels. Can be equipped with cooling flange, leakage drain or polymerization barrier to meet the process requirements.

Dry Running, With Contact Of The Seal Faces:

Sealmatic MXS Single seal with or without bearing
Sealmatic MXS Double seal with or without bearing

Gas-lubricated Without Contact Of The Seal Faces:

Sealmatic GSAZ Double seal with or without bearing

Bottom Entry Installation

In contrast to top entry, it is the process medium itself which is sealed in a bottom entry installation. The rotating agitator shaft must be sealed completely from the bottom of the tank and is totally immersed in the medium. It is characteristic for this installation that deposits may form in the area of the dynamic and stationary sealing elements, depending on the process medium. These can then cease the seal. Additionally, the seal directly faces the temperature of the process medium. To cope with these tough operating conditions, mainly double seals with pressurised barrier medium are used. Other design features, such as flushing, may also be used. The materials must also be selected carefully. One decisive criterion in the choice of the barrier medium is its compatibility with the process medium. As with the top entry installation, the maximum speed and temperature, the sealed system pressure in the vessel, the chemical requirements, the bending stresses, the shaft deflection and the bearing must all be carefully analysed and evaluated. Sealmatic sealing systems from the liquid-lubricated UR, UR333 and BSHLU series and for the process-optimised gas-lubricated seals from the GSAZ series have proven successfully for bottom entry installations.

