

RELY ON EXCELLENCE

Smooth vaccine production

EagleBurgmann contributes to the reliable production of COVID-19 vaccines with gas-lubricated mechanical seals

The global vaccination campaign against COVID-19 is steadily progressing. In October 2021, more than 20 million people worldwide received a vaccination. The need for vaccination serums is accordingly high. To serve this demand even better in the future, the vaccine manufacturer BioNTech has expanded its strategic partnership with the German pharmaceutical and chemical company Merck. Merck is one of the leading manufacturers of lipids, which are urgently needed for the vaccine production. Product safety, trouble-free operation, and the resulting reliable and quick delivery of the important vaccine components are of key importance. To ensure this, Merck relies on a long-standing and reliable cooperation with EagleBurgmann and trusts in their gas-lubricated agitator seals from the AGSZ series.



Merck is a leading science and technology company headquartered in Darmstadt, Germany. In their business divisions Health Care, Life Science, and Electronics, they employ around 58,000 people in 66 countries. Merck is heavily invested in the efforts to contain COVID-19 since the beginning of the pandemic. Their Life Science division supports more than 50 vaccine projects worldwide with products and technologies.²

numerous excipients essential for the serum's effectiveness. Among these, lipids are especially important. The mRNA molecule is rather instable – it has to be shielded in a protective shell so that it does not become ineffective before arriving in the body cells. This shell is made up of lipids.

mRNA vaccines – there's no way around lipids

BioNTech/Pfizer's Comirnaty® (BNT162b2) was the first vaccine to receive global approval as a protective vaccination against COVID-19. It is a so-called mRNA vaccine (mRNA = messenger ribonucleic acid). The vaccination serum transports the mRNA into the body. It acts as a blueprint of a

special characteristic of the SARS-CoV-2-Virus (spike protein) and provides the cell machinery with the information it needs to produce the corresponding antigen. As a consequence, the immune system triggers an immune response.

But the vaccine consists of more than just its active ingredient. It is also made up of

Advantages of gas-lubricated seals from the AGSZ series

- Quick, simple installation and operating reliability through ready-to-fit cartridge unit
- Highest possible product purity due to contact surfaces running without friction and abrasion
- Minimum friction heat due to low start-up torque
- Process safety through use of an inert barrier gas (N₂)
- Longevity and cost-effectiveness through wear-free operation on the sliding surfaces

¹ OurWorldInData.org/coronavirus (https://ourworldindata.org/grapher/daily-covid-19-vaccination-doses?country=-OWID_WRL) / Stand 21.10.2021

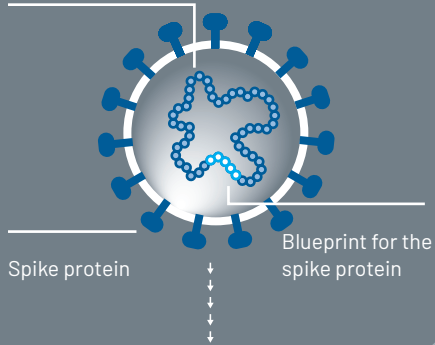
² <https://www.merckgroup.com/de/media-center/press-kits/corona-pandemic.html>

³ <https://www.zusammengegencorona.de/impfen/impfstoffe/impfstoffe-gegen-covid-19-comirnaty-r-von-biontech-pfizer/>

An mRNA vaccine's mode of action

SARS-CoV-2

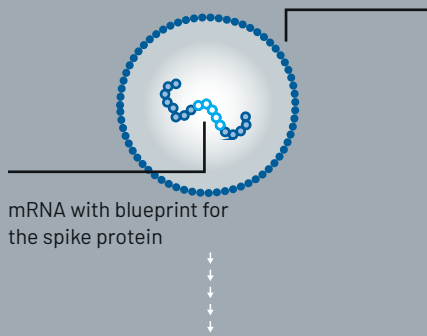
mRNA (genetic information)



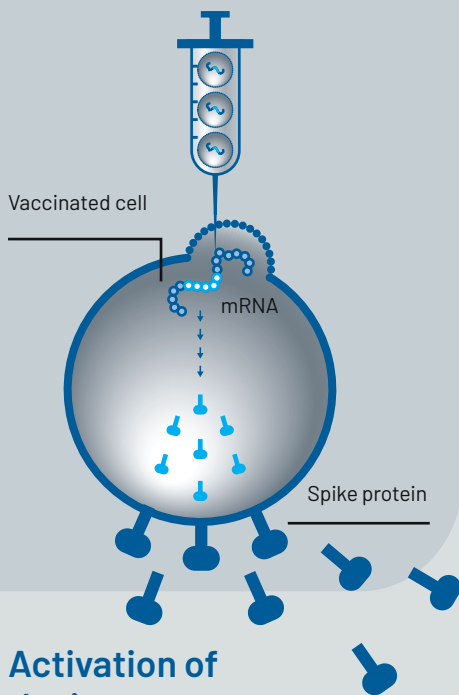
mRNA vaccines



Protective shell from lipids



Vaccination



Activation of the immune system

Lipid production at Merck

As a strategic partner of BioNTech, Merck is heavily involved in numerous process steps of the vaccine production. For example, they develop and produce the lipids urgently needed for production of the mRNA vaccines. BioNTech/Pfizer for instance uses four different lipids in its vaccine.

As one of only a few companies worldwide, Merck is able to produce the lipids in the required quantities while meeting the quality standards for mRNA vaccines. In the first quarter of 2021, Merck announced that they would expand the strategic partnership with BioNTech and increase their lipid production capacities in several locations around the world until the end of the year. This will significantly speed up the supply of lipids and increase their available quantities to keep up with the currently high demand.

Long-standing trust in agitator seals from EagleBurgmann

For the lipid production, Merck uses agitators with top entry drives, which had previously been used to process other products. When it comes to agitator seals, they have put their trust in EagleBurgmann's competence and quality for more than 30 years. This is why the choice was made for gas-lubricated agitator seals from the AGSZ series when they expanded their production capacities. "We were privileged to supply Merck with four glass-lined double-acting gas seals with bearings and rinsing flanges as well as the corresponding supply systems to be used in the lipid production in the converted agitators. The seals have a diameter of 100 millimeters and 80 millimeters respectively," explains Markus Schmidt, Product Manager Mechanical Seals for Agitators, Mixers & Kneaders at EagleBurgmann. "Especially in a case like this that requires highest product purity, our FDA- and ATEX-compliant gas-lubricated AGSZ seals offer a variety of advantages."

Constantly high product quality and trouble-free processes are essential to ensure quick and reliable lipid production. With gas-lubricated agitator seals from the AGSZ series, both prerequisites are met to the fullest extent.

Absolute product purity

The AGSZ seals run contact-free. Thanks to precisely machined gas grooves, the seal face and seat achieve static lift-off at differential pressures as low as 3 bar. This allows a stable gas film with high stiffness to be created even without dynamic movement. "The contact-free operation reliably prevents abrasion. As a result, there is basically no chance of product contamination," explains Schmidt.

In its new application in the converted agitators, the gas-lubricated mechanical seal offers another decisive advantage. "With the product change in the agitators, stricter purity requirements are needed," notes Schmidt. "This also means that the product cannot be contaminated with buffer fluid. Gas-lubricated seals are ideally suited for quality and purity specifications like these." At Merck, nitrogen (N₂) is used as barrier gas, which is supplied via suitable supply systems from EagleBurgmann. The process in the agitator vessel is not affected by the inert gas. Thus, high product purity and quality can be ensured at any time.

Trouble-free processes

Not only do the contact-free sliding-surfaces reliably avoid contamination of the product through abrasion. The wear-free operation also significantly increases the seals' longevity. Additional factors, which contribute to their long service life, are their hard/hard material combination as well as the seal faces' "diamond-like carbon" coating, which also lends them their outstanding emergency running properties. The special seal design with a reduced number of parts also benefits Merck in the form of lowers maintenance requirements. Schmidt summarizes: "All of these factors contribute to a reliable, trouble-free operation in the lipid production at our client. Operating reliability is always important. This is all the more true in the current pandemic situation, where vaccines are so urgently needed."

Swift order implementation

EagleBurgmann answered the urgency of the project with a short delivery time and to Merck's fullest satisfaction. The seals were supplied within a very short time and commissioned by trained personnel from Merck. "Our AGSZ seals are ready-to-fit cartridge units," explains Schmidt. "This sped up and simplified their installation and commissioning in the new production capacities at Merck. We are proud that this project allowed us to contribute to the progress of the global vaccination campaign."

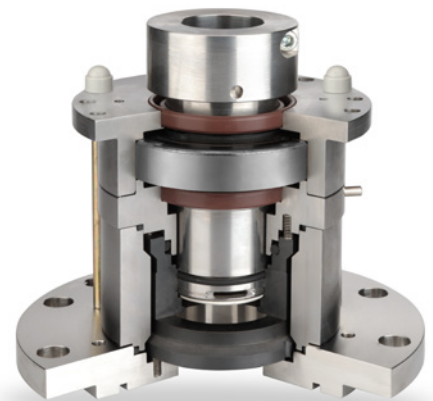
Diamond-like carbon: sliding surface technology with good emergency running properties

Diamond-like carbon (DLC) is a sliding ring coating made of carbon that possesses outstanding properties similar to those of diamond. Only a few micrometers thick, it combines extreme hardness, a minimal friction coefficient, outstanding corrosion resistance, and excellent wear protection. The biocompatibility and chemical resistance of DLC make it even more attractive. All reasons why DLC sliding rings by EagleBurgmann have proven their worth for years in demanding applications in the chemical, pharmaceutical, and food industry.

Operating conditions for AGSZ seals

- Shaft diameters: $d_1 = 40 \dots 220 \text{ mm}$
- Pressure: $p_1 = \text{vacuum} \dots 6 \text{ bar (87 PSI)}$, $\Delta p = \text{min. } 3 \text{ bar (44 PSI)}$, $p_3 = 9 \text{ bar (131 PSI)}$
- Temperature: $t_1 = -20 \text{ }^\circ\text{C} \dots +200 \text{ }^\circ\text{C}$ (+250 °C with cooling flange)
- Sliding velocity: $v_g = 0 \dots 5 \text{ m/s (0} \dots 16 \text{ ft/s)}$

AGSZ seals from EagleBurgmann are ideal for applications in the pharmaceutical, chemical, and food industry - where highest product purity is essential.



EagleBurgmann – at the leading edge of industrial sealing technology

Our products are used wherever safety and reliability count: in the industries of oil & gas, refineries, petrochemicals, chemicals, pharmaceuticals, food, power, water and many more. About 6,000 employees contribute their ideas, solutions and dedication every day to ensure that customers around the globe can rely on our seals. With our modular TotalSealCare Service, we emphasize our strong customer orientation and offer custom-tailored services for every need. **Rely on excellence.**

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