

## PROCESS INDUSTRY

### CEROBEAR Bearing Solutions for Cryogenic Applications

In cryogenic applications rolling bearings very often operate in the harshest environment, characterized by temperature far below 0°C and poor lubrication.

Small wonder then that conventional steel bearings provide short service life and are the main root cause not only for planned maintenance cycles but also premature equipment failures and unplanned machinery shutdowns.

In LNG pumps rolling bearings are designed directly into the flow path of the process media. The advantage of this design principle is, that the construction becomes less complex.

Rotary seals, which separate and protect the bearings from the process media, and which are typical wear parts, are no longer necessary. The trade-off is, that the bearings must be capable to cope with the various liquefied gases, which act as their only lubrication. Special advanced bearing materials are required to enable bearings for media lubrication by cryogenic liquids.

CEROBEAR's cryogenic bearing specification features races either made from AISI 440C or High-Nitrogen-Steel (e.g. Cronidur® 30, XD15NW). High-Nitrogen-Steel provides excellent resistance against wear, fatigue and corrosion, particularly in combination with silicon nitride ceramic (Si<sub>3</sub>N<sub>4</sub>) rolling elements. Si<sub>3</sub>N<sub>4</sub> rolling bodies, balls or rollers are available, prevent adhesive wear and significantly reduce abrasive wear and bearing friction. Thus CEROBEAR hybrid bearings are especially qualified for media lubrication operation.

While cages made from polyamide (PA) or virgin PEEK tend to get brittle at cryogenic temperatures, CEROBEAR's special range of bearings for the use in liquefied gas pumps feature retainers made from a reinforced perfluoro compound, which is filled with fibres and solid lubricants.

The compound material provides the perfect balance of strength and tenacity. Its high wear resistance, low friction and very good self lubrication at cryogenic temperature makes it the best material for retainers (cages) in submerged cryogenic bearing applications where typical oil or grease lubrication is not possible.

*CEROBEAR has a long tradition in supplying hybrid ceramic bearings to the LNG industry.*

CEROBEAR does not only pay careful attention to all bearing materials, but also adapts the inner and outer bearing geometry to the cryogenic environment. CEROBEAR's bearing engineers consider the different thermal properties of all materials, also of shaft and housing, during the design phase, so that our bearings provide an optimized radial play and contact angle as well as perfect fits to the mating parts at operating temperature. This leads to optimized load capacity and superior bearing life. CEROBEAR offers customized bearing dimensions and tolerances on request, even in small quantities.

CEROBEAR LNG pump bearings are designed to fulfil the requests of improving productivity and cutting maintenance costs. Skilled CEROBEAR bearing engineers are happy to consult customers to lift their LNG pumps to the next performance level.

