

Transforming Subsea Bearing Performance with Engineered Plastics

BACKGROUND

Offshore oil and gas operations demand materials that can withstand harsh subsea environments: high pressures, corrosive seawater, and continuous mechanical stress. The metal bearings traditionally used in subsea applications, aside from being incredibly heavy, are prone to corrosion and require frequent maintenance. Recognizing these challenges, a leading offshore drilling company approached Lehigh Valley Plastics seeking a reliable solution to extend the service life of subsea bearings while reducing maintenance demands and costs.

THE CHALLENGE

The drilling company's metal bearings were facing several critical issues:

- **Corrosion:** Continuous exposure to seawater was causing rapid degradation, requiring frequent replacements.
- **High Maintenance Costs:** Regular anti-corrosion treatments and part replacements were driving maintenance expenses up by 30% annually.
- **Friction and Wear:** High friction between metal components led to accelerated wear, causing unscheduled downtimes.
- **Weight and Handling:** The heavy weight of metal bearings complicated handling and installation processes.

These challenges underscored the need for a material that could resist corrosion, reduce maintenance, and perform reliably under subsea conditions.



LVP SOLUTION: ENGINEERING PLASTIC BEARINGS BY LEHIGH VALLEY PLASTICS

- **Material Selection:** Lehigh Valley Plastics proposed the use of Nylon and UHMW-PE (Ultra-High-Molecular-Weight Polyethylene) for fabricating subsea bearings. These materials were selected for their:
- **Exceptional Corrosion Resistance:** Inherent resistance to seawater and chemical attack.
- **Low Coefficient of Friction:** Minimized wear and extended service life without lubrication.
- **Lightweight Properties:** Eased handling and installation, reducing overall operational weight.
- **High Load Capacity:** Engineered to handle the substantial loads typical in offshore applications.

CUSTOM FABRICATION

The bearings were custom-machined to precise tolerances to ensure a seamless fit with existing equipment, eliminating the need for costly modifications. Lehigh Valley Plastics' in-house capabilities enabled rapid prototyping and testing, ensuring that the components met stringent offshore performance standards.

IMPLEMENTATION AND TESTING

The engineered plastic bearings were installed during a planned maintenance shutdown, replacing the existing metal bearings on the riser and guide systems. To validate performance, the bearings underwent a series of tests:

- **Saltwater Immersion Test:** Simulated continuous exposure to seawater for 12 months with zero signs of degradation.
- **Load Testing:** Demonstrated the ability to withstand high compressive loads without deformation.
- **Friction Analysis:** Showed a 40% reduction in friction compared to metal bearings, minimizing wear and energy loss.

RESULTS

- **Corrosion-Free Performance:** After 18 months of subsea operation, the plastic bearings exhibited no signs of corrosion with minimal wear, significantly enhancing equipment reliability.
- **Maintenance Cost Reduction:** Maintenance costs related to bearing replacement and anti-corrosion treatments dropped by 30%, providing a rapid return on investment.
- **Increased Service Life:** The engineered plastic bearings demonstrated an extended lifespan of over 40% compared to their metal counterparts, reducing the frequency of part replacements.
- **Improved Efficiency and Handling:** The lightweight nature of the plastic bearings simplified handling and installation, cutting downtime during maintenance by 20%.
- **Enhanced Operational Safety:** The reduction in maintenance interventions and the elimination of lubricants contributed to a safer working environment for offshore teams.

CONCLUSION

This case study illustrates how engineered plastics can outperform traditional materials in demanding offshore applications. By replacing metal bearings with custom-engineered plastic solutions, Lehigh Valley Plastics helped a major offshore operator achieve higher efficiency, lower costs, and enhanced safety.