

## **Bearings for Seawater Immersion Use**

By Jeff Spira

No longer is it necessary to just specify simple Nyliner bearings or use ball bearings packed in grease and hope corrosion doesn't lock up the bearings at a critical time when used in seawater spray or immersions environments. New technologies have brought more choices and options to designers and users of bearings in marine environments. New materials for plain bearings and bushings, plastic ball bearings that can operate entirely without lubrication, and type 316 stainless steel ball bearings bring new utility and performance to marine equipment.

For slow speeds and moderate loads marine equipment designers were restricted to such single polymer plain bearings as the Nylon "Nyliner" type bushings, or Acetel (Delrin) type bushings. While these work fine within their limited parameters, when speeds or loads increase, or bearing wear is of concern, the limitations of these bearings becomes apparent very quickly. Nylon bushings absorb water and their running torque increases greatly when swollen reducing the internal clearance necessary for a free turning joint. Nylon and Delrin also wear out quickly whenever dust, dirt or gritty particles, common in seawater are present.

The new polymeric alloys, combining the features of many polymers are proving themselves a boon for bushings for seawater use. Materials such as Polyphenylene Sulfide (PPS or Ryton) PTFE (Teflon) and Molybdenum Disulfide composites are offering greatly increased load carrying capabilities with substantially longer lives. Such bearings can be not only be used in bushings in the on-deck, salt spray environments, but also fully submerged in environments where traditional cutlass type bearings are used.

Many other modern polymeric alloys are now available to accommodate a wide variety of application parameters.

Where low torque anti-friction type bearings are needed, plastic ball bearings assemblies are now available. These are generally constructed of Acetal polymer rings and cages and use stainless steel balls. Originally developed for swimming pool cleaners and immersion in photo developing solutions, these bearings are finding favor in a wide range of marine, saltwater applications.

Self-steering gear for sailboats, for instance, relies on low torque rotation of shafts sensitive to minor variations in wind direction. A plastic raced ball bearing fits the bill perfectly, can operate entirely without lubricants, and may be employed in the salt spray zone or completely immersed in seawater<sup>4</sup> without ill effect. Other application includes wind directional sensing gear, rotating antennas (satellite, radar, etc.) and other places where a zero maintenance lightly loaded ball bearing is needed.

Where there are heavier loads and a need to operate without lubrication, type 316 ball bearings are now available on the market. These utilize stainless steel rings, stainless steel balls, and generally plastic cages. These ball bearings can also operate above or below the waterline, are able to withstand substantial loads without lubrication, and have been proven to be corrosion free for years.

Some marine applications type 316 bearings have found favor in, include watertight ship doors, fairlead pulleys, bow rollers, stabilizers, and a host of other high load, slow to moderate speed saltwater applications.

No longer does the marine designer or shipboard equipment engineer have to rely on constant maintenance, frequently packing all bearings with grease to keep everything rolling smoothly on ships and boats exposed to salt spray, saltwater immersion or other marine environments.

Jeff Spira is a mechanical engineering consultant and runs Spira Engineering at <http://www.spiraengineering.com> specializing not only in design and engineering, but also in tooling, design, process design and quality system consulting. One of his specialties is in the conversion of materials in product designs.