

FINNISH NAVY FINISHED WITH RUBBER BEARINGS

Water jets are generally used in most Finnish Navy light and fast patrol vessels bigger than open outboard motor boats. The first of their fast attack missile boats to use them were the *Rauma* class vessels. In the propulsion shaft line is a water lubricated line bearing, located inside the stator of the water jet's jet pipe.

The vessels are operated in the Finnish coastal waters and the Northern Baltic Sea. They have a shallow draft and can be operated within the archipelago, where this is always some risk of debris in the brackish (semi-salty) water. Originally, the *Rauma* vessel water jets were equipped with traditional rubber bearings.

"We had good experience with rubber," says Klaus Salkola, Head of Technical Inspection Unit, Finnish Navy Headquarters, "but for some reason these bearings failed due to manufacturing errors."

Soft rubber bearings presented two problems: they wore out fast, and their vulcanization loosened them from the bearing housing.

"Delivery time for new bearings was long," adds Salkola, "and the quality

didn't improve over time. So we decided to look for other solutions."

Unable to find another manufacturer of rubber bearings with the required dimensions, the Finnish Navy contacted Thordon Bearings in the early 1990's. They tried Thordon bearings in one water jet unit and have since switched to Thordon as an alternative to rubber bearings in several vessels.

They initially tried a Thordon grade that did not fix the problem—the bearings lasted longer—however there was heavy wear in the shaft. Because the jet's suction of sand and mud in low waters gathered into the cooling grooves, it created an abrasive environment when the shaft engaged. So, Thordon's Distributor in Finland, Marmex AB, offered for testing an alternative Thordon grade – GM2401 bonded to the existing bronze housing. Thordon's GM2401 is the bearing wear surface component of Thordon Composite which is a 2-component elastomeric bearing designed to operate in highly abrasive water. The Navy agreed to the testing.

Thordon GM2401 was tested head-to-head with rubber for use in the water jet propulsion systems. A new model of a harder version of the rubber bearing was installed on one side and Thordon

GM2401 on the other side. Compared with Thordon's GM2401 bearing, the newer, harder rubber bearing still wore out fast.

"The minimal installed diametric clearance for the GM2401 bearing was 0.61mm (0.024") and calculated running clearance in water was approximately 0.4mm (0.0157"). For the rubber bearing it was 0.3mm (0.0118")," reported



Rauma Class vessel "Naantalis"



Water jet nozzle equipped with water lubricated Thordon GM2401 line bearings

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Finnish Navy contact Jukka-Pekka Majanen.

After 2000 hrs. running time, a visual inspection was made; both bearings appeared to be in good condition on the surface, with slightly more wear and minor dents on the rubber bearing. The shaft, however, had “clearly more wear on the rubber bearing side,” wrote Majanen. “Clearances (dry) were 0.6mm (0.0236”) with the Thordon GM2401 bearing, and 1.2mm (0.047”) with the rubber bearing.”

Based on the test results, Majanen recommended that the Navy switch to Thordon GM2401 bearings in these applications, or at least widen the testing.

Based on a direct field comparison with similar working conditions, and after 2000 hrs of running time, the measured wear on the GM2401 bearing was significantly lower (by a factor of 2) in relation to that of the rubber bearing. Even when water absorption effects were discounted, the wear on the GM2401 bearing was negligible. Although the condition of the rubber bearing surface appeared acceptable, the fact that the clearances had increased from 0.3mm (0.0118”) to 1.2mm (0.047”) after the first period deemed the bearing unusable for the tight tolerances required for this propulsion system. **Nw**