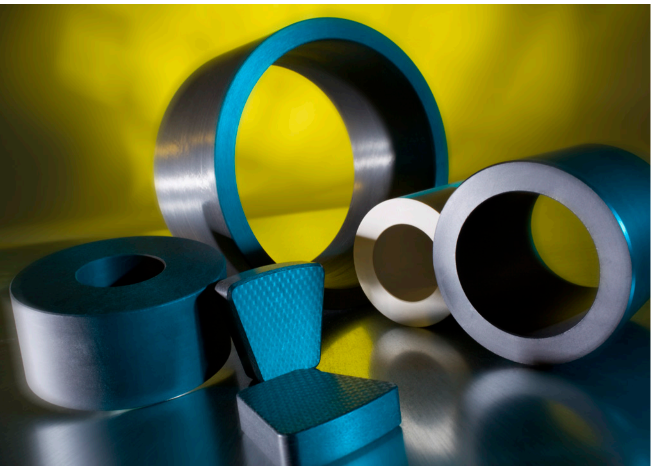
CASE STUDY

WR®525 Eliminates Failures in Feedwater Pumps

Non-Galling, Non-Seizing Material Saves Company $4–5 Million



Our customer, one of the largest utilities providers in the United States, came to us with a challenge involving one of their nuclear generating stations. Nuclear power plants work by harnessing the thermal energy released from the nucleus of an atom during nuclear fission. Heat is removed from the reactor core by a cooling system and used to generate steam, which drives a steam turbine connected to an electrical generator. Within this system, our customer was experiencing frequent and costly failures of their feedwater pumps. The role of feedwater pumps is to increase the pressure of water coming from the condensate

Challenge

- A major U.S. utilities provider struggled with frequent failures of its feedwater pumps at one of its nuclear power generating stations
- The failures were caused by temperature stratification, which would distort the pump case in relation to the shaft
- The breakdown bushing and shaft sleeve would then contact each other, causing galling, seizing, and ultimately failure system, forcing it into the steam generator or the reactor.

At the nuclear generating station in question, operations were routinely shut down to perform maintenance and refuel the reactors with uranium. Afterward, problems would be encountered trying to re-start the feedwater pumps. The cause of the issue was temperature stratification, which distorted the pump case in relation to the shaft and resulted in the loss of original running clearances. With running clearances no longer uniform, the breakdown bushing and shaft sleeve would contact each other and gall and seize.

In total, there were seven feedwater pumps at the nuclear generating station. Each time one failed, a team of five people would spend 7–10 days repairing the pump. During this time the plant would be running at reduced capacity, resulting in a significant loss of revenue per failure.

Application

- Product: WGID pumps
- Temperature: 375°F (190°C)
- Media: Treated hot water
- Pressure: 400 psi suction – 1,300 psi discharge

CASE STUDY

Solution

Greene Tweed recommended upgrading to WR® 525, a non-galling, non-seizing thermoplastic composite.

Based on the failure characteristics, Greene Tweed recommended switching to a new bushing material – WR® 525. A thermoplastic composite, WR® 525 consists of carbon fiber in a PEEK matrix. With non-galling, non-seizing properties, a low coefficient of thermal expansion, and exceptional thermal shock resistance, it could better withstand startup conditions than the 410SS used at the time.

In engineering new WR® 525 breakdown bushings, Greene Tweed was able to eliminate the original "toothed" design. Breakdown bushings reduce the differential pressure caused by variance in suction and discharge in a pump. In the original design, each labyrinth would act as a successive pressure barrier, with pressure dropping as media advanced from groove to groove. By upgrading to WR® 525, running clearances could be tighter due to the material's non-galling, non-seizing properties. These tighter clearances achieved the same pressure reduction intended by the hardened steel, labyrinth design.

Results

- New WR® 525 breakdown bushings were installed in April 2010, and none of the pumps has experienced a failure since then
- In addition, after 18 months of service, one pump was examined for bushing wear; it showed no wear
- The result is a recuperation of $4–5 million in power generation revenue which would have been lost in the past due to pump failures

The new WR® 525 breakdown bushings were installed in April 2010. Since then, none of the pumps have experienced an episode of galling, seizing, or failure.

Greene Tweed
1930 Rankin Road | Houston, TX 77073 USA | Phone: (+1) (281) 765-4500 | www.gtweed.com

05/20-GT CS-US-PP-026