



## How Nagarjuna Fertilizers Increased Their Pump Lifespan 8X

Greene Tweed's WR® 300 PEEK Composite Bushings and Wear Rings Reduced Pump Vibration and Improved Operational Efficiency

### Challenge

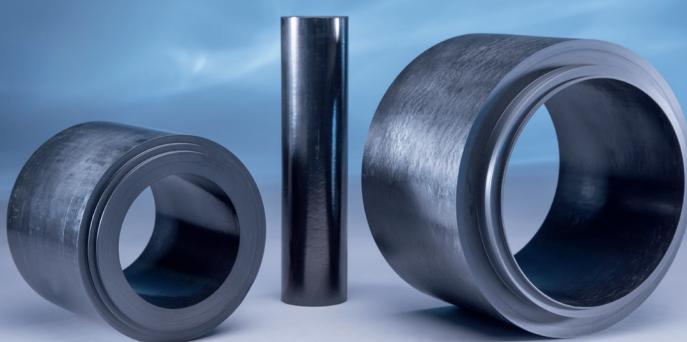
Nagarjuna Fertilizers and Chemicals Ltd. (NFCL), a leading Indian fertilizer manufacturer, operated two 900-tpd ammonia plants and two 1,500-tpd urea plants. After three months of operation, the lean carbamate solution circulation pumps in the stream-2 urea plant developed serious vibrational problems, measuring .750 inches/sec. (19mm). Similar vibration problems were present in the overhead condensate pumps in the CO<sub>2</sub> removal section of the ammonia plant in stream-2. The high vibrations in Pump A led to the shaft between the two impellers breaking.

**Greene Tweed WR® 300 PEEK composite bushings and wear rings increased MTBF (mean time between failure) on pumps from less than 3 months to more than 24 months.**

### Analysis

When NFCL engineers opened the pump, they observed that the inter-stage bushing, impeller wear rings, and throttle bushings experienced severe rubbing. These same conditions soon appeared in Pump B. Despite analysis and replacement of parts, both pumps experienced the same problem nearly a dozen times. Increasing the inter-stage bushing clearance from .012 inches (0.3 mm) to .020 inches (0.5 mm) was unsuccessful, and NFCL's in-house study determined that none of the following conditions were the cause of the problem:

- Coupling alignment
- Bearings
- Bolt looseness
- Pipe strains and support systems
- Rotor unbalance
- Process condition



### Why WR® 300

- Excellent chemical resistance
- Non-galling/non-seizing properties
- Low coefficient of friction
- Impact resistance
- Thermal shock resistance
- High strength-to-weight ratio

## Solution

Arai Pump Manufacturing Company, the original pump manufacturer, recommended that NFCL engineers make the following changes to prevent recurring failures and provide trouble-free pump operation:

- Replace SS316 inter-stage bushings with WR® 300 material, which is non-galling and non-seizing.
- Change the shaft material from SS316 to SS329, which provides higher-strength capabilities.
- Reduce the inner stage clearance from .012 inches (0.3 mm) to .006 inches (0.14 mm).



Some of the information provided in this case study appeared in an article entitled "High Vibrations in Lean Carbamate Solution Pumps in Urea Plant," Fertiliser News, June 2002

## The Result

To ensure uninterrupted pump-operations, NFCL engineers reached out to Greene Tweed to use WR® 300, Greene Tweed's carbon-fiber-reinforced PEEK composite, which is frequently selected by pump manufacturers and users for pump bushings and wear rings to enhance operational reliability. A new shaft, composed of SS329, was put into service, along with a new inter-stage bushing made of the API 610 compliant material for various wear applications. The pump continued to run smoothly and satisfactorily, with normal vibrations on both bearings at .250 inches (6 mm)/second. This success prompted Nagarjuna Engineering to make the same modifications in the other pump, where the original SS316 inter-stage bushing was replaced with WR® 300. Nagarjuna also replaced SS316 with WR® 300 in the overhead condensate pumps in the CO<sub>2</sub> removal section of the ammonia plant.

**After upgrading to Greene Tweed's WR®300, NFCL was able to increase its MTBF (Mean Time Between Failure) from less than 3 months to more than 24 months,** increasing their pump lifespan by eight times. WR® 300 enables the pump user to increase pump efficiency by running tighter wear ring clearances while decreasing potential pump damage when pumps are cavitated or experience radial bearing failures.