CASE STUDY

AR®1 Bearings

Improve Reliability in Circulating Water Pumps

Circulating water pump

Customer

The leading power companies are under more pressure than ever to produce low-cost electricity for their markets in order to stay competitive. To meet this demand, power plant managers are pushing for lower operating costs and extended MTBR (mean time between repair). Power companies cannot afford catastrophic failures to critical pump equipment as this can cause units within power plants to shut down. The resulting downtime can cost companies millions of dollars of lost revenue.

Customer Goals

- A top five U.S.-owned power plant wanted to increase the MTBR of their circulating water pump to 10+ years
- They wanted to find a bearing material that could help reduce pump vibration with better wear characteristics than cutlass rubber

Application

Pump provides cooling water to the condenser and pumps abrasive media such as sand and silt.

Technical Data	
Pump type:	Circulating water pump; mixed flow vertical; type IR 69 APMA
Capacity:	146,000 gallons/minute (39.824 Q m^3/h)
Diameter/Shaft	7.5” (191 mm)
Power:	1,200 hp
Media	Abrasive salt water
Temperature	Ambient to 110°F (43°C)
Pressure	10-15 psi (0.7-1 bar)
Former Product	Cutlass rubber bearings
New Product	AR®1 bearings
Size of Bearings	3 bearings: 9.631 (OD) x 7.514 (ID) x 11.25” length 245 mm (OD) x 191 mm (ID) x 286 mm length
	1 bearing: 9.631 (OD) x 7.514 (ID) x 15” length 245 mm (OD) x 191 mm (ID) x 381 mm length

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Challenge

Cutlass rubber line shaft bearings were wearing prematurely after 1.5 years leading to higher vibration levels and shorter MTBR. The rubber bearings were also scoring the shaft sleeves in the abrasive media.

Solution

The customer decided to replace the cutlass rubber bearing material with AR® 1 bearings. The bearing holders were sent to Greene Tweed's Houston manufacturing facility where the cutlass rubber was taken out of the holders, the ID was remachined, and AR® 1 was inserted and secured. After the change to AR® 1 the vibration levels were reduced to levels lower than any of the customer's mixed flow vertical pumps.

Clearance:
Cutlass rubber: .025" (.635 mm)
AR®1: .015" (.381 mm)

Vibration:
Cutlass rubber: in excess of 46 mils
AR®1: less than 10 mils

The AR®1 bearings have doubled the lifetime of the pump vs. the previous material.

AR® 1 Bearings

Results

- The AR®1 bearings have doubled the lifetime of the pump vs. the previous material.
- This success has led the company to standardize the use of AR® bearing materials for all vertical pump abrasive applications for both repairs and new pumps.

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Benefits

- **Increased reliability** - Because of the dramatically lower vibration levels on the mixed flow vertical pumps with the AR® 1 bearings, the company feels it should be able to increase its MTBR to ten years or longer.
- **Intermittent dry-run protection** - Under frequent start and stop conditions AR® 1 bearings show less wear due to better dry run capabilities (lower coefficient of friction).
- **Excellent abrasive resistance** - AR® materials exhibit superior wear characteristics over traditional bearing materials in abrasive media.
- **Vibration dampening characteristics** - AR® 1 allows the pump to run with very low vibration levels.
- **Low hydrolysis/swell** - AR® 1 maintains its physical properties in water pump applications since the material has no moisture absorption and does not swell.
- **Easy to machine/install** - It can be precisely machined to exact finished dimensions, reducing pump repair turnaround times.

Customer Commentary

"Our plants are realizing the benefits of AR® 1 and AR® HT bearings. These bearings have significantly reduced shaft vibration in our circulating water pumps and are able to withstand momentary dry run occurrences (e.g., startups and shutdowns). We chose the AR® bearings for increased pump reliability, increased durability, ease in machining, and exceptional lead times."

Reliability Manager, Top U.S. Power Company

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05/20-GT CS-US-FH-029