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Consider composite materials in centrifugal pumps

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Fluid processing industries have embraced the use of current- generation composite materials in centrifugal pumps to increase efficiency, improve mean-time- between- repair (MTBR), and reduce repair costs. One such material used successfully by major refineries is Dupont Vespel CR-6100, which is a PFA, carbon fiber composite.

CR-6100 has replaced traditional metal and previous-generation composite materials in pump wear rings; line shaft bearings; and throat, interstage and pressure-reducing bushings (Fig. 1). The properties of CR-6100 eliminate pump seizures and allow internal rotating-to-stationary part clearances to be reduced by 50% or more. Composite wear materials are included in *API 610, 9th Edition,* the latest centrifugal pump standard from the American Petroleum Institute.

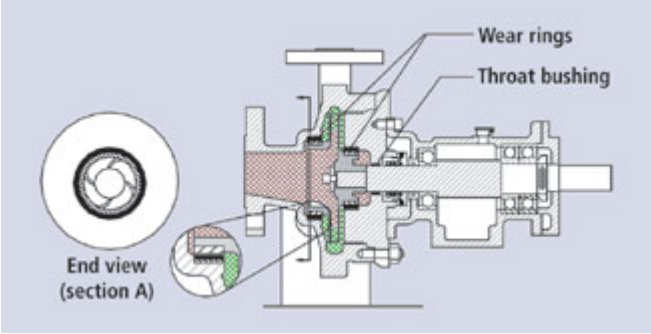

Fig. 1 CR-6100 has replaced traditional metal and composite materials in centrifugal pumps.

CR-6100 has proven to eliminate pump seizures, provide dry-running capability and mitigate damage from wear ring contact. Users do not experience pump seizures during temporary periods of suction loss, off-design operation, slow-rolling or startup conditions. When the upset condition has been corrected, the pump continues operation with no damage or loss of performance.

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Conversely, when metal wear components contact during operation, they generate heat, the materials gall (friction weld) and the pump seizes. This creates high-energy dangerous failure modes, which can

result in extensive equipment damage and potential release of process fluid to atmosphere. CR-6100 wear components do not gall or seize, eliminating damage to expensive parts, reducing repair costs, and mitigating safety and environmental incidents.

Reducing wear ring clearance by 50% increases pump performance and reliability through increased efficiency, and reduced vibration and *NPSHR*. Efficiency gain for a typical process pump is 4 – 5% when clearance is reduced by 50%.[1] Minimized wear ring clearance also increases rotor hydraulic damping, reducing vibration and shaft deflection during off-design operation. The lower vibration and reduced shaft deflection increase seal and bearing life, and help users achieve reliable emissions compliance. This reduction in clearance also lowers *NPSHR* on the order of 2 – 3 ft, which can eliminate cavitation in marginal installations.[2]

Users have had great success installing CR-6100 to achieve all of these benefits. One refinery installed CR-6100 wear rings and line shaft bearings to eliminate frequent seizures in 180°F condensate return service. The condensate return pumps have subsequently been in service for six years without failure.

Another user improved efficiency and reliability of two gasoline shipping pumps by installing CR-6100 wear rings and interstage and throat bushings. The shipping pumps have been in service for four years without failure or loss of performance. Hundreds of other applications have benefited from composite wear components. These include light hydrocarbons, boiler feed water, ammonia, sour water and sulfuric acid. For an update and technical guidance, contact www.industryuptime.com. **HP**

Literature cited

[1] Bloch, H. P. and F. K. Geitner, *Major Process Equipment Maintenance and Repair,* Gulf Publishing, 1985, p. 32.

[2] Lobanoff, V. S. and R. R. Ross, *Centrifugal Pumps, Design and Application, Second Edition,* Gulf Publishing, 1992, p. 96.

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