



Metal Matrix Composite - MMC Aids Replenishment Operations

Each navy replenishment ship, shown in the background above, carries numerous winches each with high horsepower / continuous slip air clutches that limit transfer wire rope tension effectively, regardless of the relative movements of the receiving ship. The clutches apply force to aluminum bronze friction drums through brake linings. After these linings were converted to non-asbestos brake material, excessive wear and erratic friction behavior became evident on the friction drum. The condition also created a safety hazard during cargo transfer. Frequent costly friction drum replacement was necessary.

At the time, Wisconsin Centrifugal engaged in the search for a suitable titanium carbide material and pioneered the development of centrifugal cast Metal Matrix Composite technology to treat the problem. The results are truly remarkable with the prospect for considerable savings to the navy and a return to a safe operating mode.

WC produced centrifugal cast MMC friction drums using a proprietary mixture of aluminum bronze and titanium carbide. Under carefully controlled conditions, the natural process of centrifugal casting concentrated the highly abrasion resistant titanium carbide particles at the working surface of the friction drum. On the navy's test rig, the MMCs evidenced zero wear in 100 hours of continuous testing while the non-MMC material wore over .200" per side. Then the MMC drums were put on the USNS KILAUEA in 1996 and after 700 hours of operation, they show no wear or excessive corrosion. Reports also indicate that the operation of the winches was rendered very smoothly and safely by the new friction drums.

With the TiC/Bronze centrifugal cast friction drum, operating cost per hour is reduced from \$253 to \$18. Total savings are outstanding. If operated only 50 hours per year per winch, the savings in five years will amount to \$4,000,000.



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