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AquaMaKKs Clutches and Brakes Are Winning the Corrosion Battle



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An Altra Industrial Motion Company

AquaMaKKs Clutches and Brakes Are Winning the Corrosion Battle

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On a marine deck in the oil and gas industry, the battle is always the same. Cast iron vs. salt. Salt wins every time. So the trick is to keep the saltwater away from the iron.

When Wichita Clutch, an Altra Industrial Motion company, heard this request from an offshore platform customer – “Can we use seawater to cool our tensioning brakes?” – the answer was, “Well, no...wait... let us work on that”.

With technology borrowed from the aerospace industry, Wichita spent a year in development to create the prototype composite water jackets that are now revolutionizing the marine-duty water cooled clutches and brakes used for tensioning on offshore oil and gas platforms and in other heavy-duty applications in mining, logging and forestry operations, metal processing and metal forming, and water/wastewater treatment.

Passing the Test

In an offshore platform tensioning brake, alternating friction discs and water jackets are used to transmit torque by applying axial force from the pneumatic, hydraulic or spring set actuator. The water jackets provide the required high heat dissipation.

Previous to the development of the new AquaMaKKs composite water jackets, the industry standard had been to use cast iron water jackets, alternated with copper wear plates, to dissipate the high heat generated in heavy-duty tensioning applications. In marine environments, however, salt corrosion created maintenance issues that required too-frequent repair or replacement of the cast iron water jackets.

The composite material in the new water jackets was developed by Wichita engineers working with a partner firm who tested several polymer combinations before selecting the high-tech blend that satisfied the design requirement which was to be as strong as the original iron parts' typical design stresses. In fact, structural testing couldn't cause a failure in the AquaMaKKs 36-inch diameter composite water jacket even when the part was stressed to more than four times the maximum design load.

Ongoing longevity cycle testing in Wichita's engineering test lab has been running for two years and has proven the composite water jackets are at least as long-lived as the cast iron jackets, while also providing superior corrosion-resistance in off-shore applications. Salt water is not the only problem, however, as any water source with a high PH value (some water in Texas has a very high 4.4 PH acidic value) can cause corrosion.

Significant Weight Savings

The composite water jackets offer an additional benefit of weight reduction, with some units weighing at least 50+% less than the iron jackets. For example, the 36-inch AquaMaKKs cast iron water jacket weighs 375 lbs. while the composite water jacket weighs only 90-96 lbs. This is significant in the multi-plate (friction disc) design in which each of the copper friction discs requires two water jackets – one on each side of the disc. Depending on the braking/holding requirement of



New engineered composite water jackets developed by Wichita Clutch will not corrode, allowing AquaMaKKs clutches and brakes to be cooled with salt water or water with high acidic PH levels.



A new 36" composite water jacket (left) weighs approx. 95 lbs. A comparable 36" cast iron jacket (right) weighs approx. 375 lbs. The reduced weight is a significant maintenance benefit, especially when units are installed in weight restricted applications such as mobile yarders in the forestry industry.

the application, some units may have up to four discs and eight water jackets.

On the large 36-inch diameter units, the copper plates themselves may be 3/8-inch thick and weigh 114 lbs. Thus, on a unit with four discs and eight water jackets, the total weight of discs and cast iron jackets can reach nearly 3,500 lbs. With composite water jackets, discs and jackets on the same unit weighs less than 1,200 lbs.

The weight savings is a particularly important factor in forestry applications such as mobile yarders where the units are mounted to a semi flatbed trailer. It's also important in metal processing, metal forming and oil and gas industries. Because of its light weight, the units require no lifting device, depending on size, which is an advantage during installation and maintenance procedures.

Water Flow Design

Other than material selection, the most difficult technical challenge in redesigning the AquaMaKKs was to design the water porting in and out of the composite water jacket. Initially, because composite materials can be molded into threads, it was thought the water porting could be built into the base material; however, this configuration failed to offer the robustness required in the industry. So Wichita engineers achieved the necessary robustness by designing metal threads (male and female) that are molded into the composite material.

While patents are pending for the use of the composite materials, patents have already been issued for the water flow configuration which is the performance heart of the Wichita Clutch water jacket. "The patented water jacket flow design provides a balanced water flow in the water jacket to efficiently remove heat being generated by the friction materials running against the copper alloy," said Mark Stuebe, VP & General Manager, Altra Heavy

Duty Clutch Brake Group. "The balanced flow is designed to match the heat being generated on a swept area in a multi-plate. What this means to a user is that a Wichita water-cooled unit can absorb more heat than a comparable competitive unit when it's supplied with sufficient cooling water."

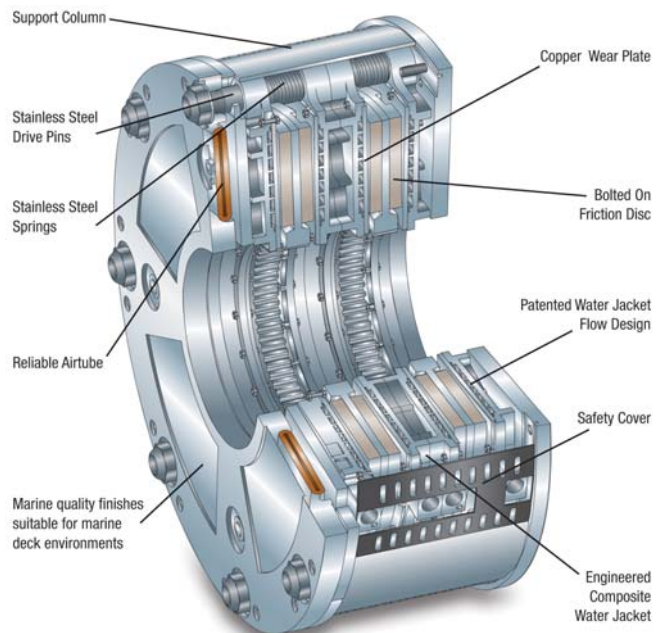
Also, since the composite material is a thermal insulator, the cooling water moving through the composite water jacket picks up more of the frictional heat compared to an iron water jacket. Thus, the surrounding parts in a unit remain at cooler temperatures which contributes to longer life.

Field Tested

Offered in three diameter sizes – 19-inch, 25-inch and 36-inch (friction lining O.D.) – AquaMaKKs provides up to 3400HP heat absorption which is 35% higher than the most robust units previously constructed for heavy-duty applications. AquaMaKKs units with new composite water jackets have been supplied in 25 and 36-inch sizes to Oil States Industries (Skagit-Smatco) and National Oilwell Varco's Amclyde Division for off-shore mooring and positioning applications. They have also been installed in oil and gas drawworks applications.

"Results have been good in the field," said Stuebe. "We've seen only positive performance differences. The advantage will show in a few years when the iron water jackets would typically need to be refurbished or replaced due to corrosion. The composite water jackets won't have any corrosion and most likely will remain in service unless the copper wear plates would need resurfacing or replacement due to wear."

(Continued on back)



Replacement and Retrofits Available

Designed with fewer parts for simple installation and maintenance, and a shim design that makes it easy to maintain and adjust for wear, AquaMaKKs is a perfect solution for field retrofits and rebuilds. The composite water jackets can be easily retrofit into older AquaMaKKs units with iron water jackets. A unique mounting pattern enables direct replacement to Wichita or competitors' units. Wichita can also provide new replacement composite water jackets, dimensionally identical to cast iron jackets, with case/integrated perimeter gear teeth to support its large customer base with older Kopper Kool models.

In addition, a new E-Fit™ option is available with a mounting bolt pattern and tooth profile designed to match Eaton models for easy interchangeability with no design changes.

Wichita standard and HICO friction materials are available. The optional HICO friction material provides up to 50% higher torque. Provisions are also available for electronic wear monitoring.



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