Wichita ensures clutches and brakes don't get hot under the collar

"Effective heat dissipation in clutches and brakes ensures reliability and a longer wear life, whilst allowing cost reductions from optimised sizing."

There are many deciding factors to consider when choosing a brake or clutch; heat dissipation being one of the most critical. In this article, Tony Griggs of Wichita Clutch offers some major pointers to guide you through the decision making process.

When specifying any brake or clutch, one of the most important considerations is how to deal with the inevitable heat energy generated during normal operation. With the variety of different and very demanding operating environments into which clutches and brakes can be installed, it can be very difficult to keep units cool and, therefore, operating efficiently.

Clutches and brakes require cooling when the heat generated during engagement exceeds the convection capacity of the unit to dissipate it. In addition to helping to maintain reliability of the unit and extend its operating life, the major benefit of cooling is to help match the clutch or brake unit more closely to the speed, load, and inertia requirements of the application. It does not need to be sized larger 'just to be on the safe side', in terms of heat dissipation, and this can result in cost savings for the user and a more compact assembly than would otherwise be the case.

Other factors that need to be considered include the duty cycle of the clutch or brake – how often is it engaged or disengaged? Also the inertia and speed going into the engagement; high inertia and high speed plus regular engagement can result in high levels of generated heat.

Then there is the consideration of heat transfer from primary movers or equipment such as cupolas in steel making. Will the transferred heat push the operating temperature of the brake/clutch over its limit? Finally, there is the question of the ambient environment; there is a lot of difference in a clutch/brake operating in Saudi Arabia as opposed to Siberia, where winter temperatures routinely drop to -40^0C.

This consideration has implications both for the type of material used in the clutch/brake (Wichita uses cast iron in Siberia) and for the method of cooling, especially if it is water-based. If not properly specified and protected, a water cooling system could, theoretically, boil in the extreme heat of the Arabian Desert, resulting in possible failure of the driven equipment.

At the other end of the scale, freezing is a potential problem in environments like that of Siberia, where, paradoxically, the summers can also be very hot. If a water cooling system is employed in this type of doubly aggressive environment, then anti-freeze would have to be used. However, this reduces the efficiency of the water to dissipate heat. In these type of applications manufacturer involvement is vital at an early stage to avoid problems, which can be extremely difficult to solve thereafter, bearing in mind the remoteness of the application site.

Basically there are three cooling options available: **air cooled/passive** as used in Wichita SV (standard ventilated) and LI (low inertia) clutches; **air cooled/dynamic** with fans, as employed on Wichita Mistral and Modevo tension brakes in the mid power range; and for the highest heat dissipation, **water/copper cooling,** combining higher heat dissipation through water cooling with the incorporation of copper alloy friction surfaces for continuous slipping duties. This type of cooling is standard on high energy brakes (Wichita KK/SS - Kopper Kool /Spring Set units) used in demanding forestry, marine, mining, oil and gas and mineral extraction applications.

At the cooler end of the scale are passive air -cooled SV and Low Inertia LI units that rely on unassisted methods of cooling. Applications for these include Mining and Steel Processing, and though the operating environment temperatures can vary wildly, these clutches are well ventilated and have large metal mass to help dissipate the heat. On average they units generate around 3- kilowatts (kW) of heat.

Mid- range are dynamic air-cooled tension brakes such as the Wichita Mistral and Modevo units. Commonly used in tensioning applications, these brakes usually have a dedicated fan to assist with cooling, as the operating speeds mean greater levels of heat energy are involved: up to a maximum of 15kW.

At the top end of the heat capacity range are the water/copper cooled units like the KK and Wichita's new AquaMaKKs. These use a patented Water Jacket design, coupled with copper wear plates, to provide precise stopping power with very high heat dissipation characteristics. On average these units generate up to 1500kW of heat.

About Wichita Clutches and Brakes

Wichita Clutches and Brakes are designed with a number of different methods of heat dissipation in mind. They are well proven as standard fitment in many demanding application sectors, including Paper, Steel, Metal Forming, Mining, Marine, Forestry, Oil and Gas, Dynamometry and many more. Although Wichita's published torque ranges are from 0.25 – 2,000,000 Nm, this is by no means exclusive. It is quite common for units to be manufactured to customer specifications well in excess of those in the catalogue. Wichita's considerable experience and expertise in system design, including heat dissipation calculations for customers, combined with its in-house test lab and commitment to customer service, means that the company can always provide the best engineered solution to any customer requirement.

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