Information Note
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Crane frictional component exchanges

During recent Committee discussions it was agreed that IMCA's Lifting and Rigging Management Committee (LRMC) should develop an information note on caution to be taken when renewing brake frictional components (i.e. brake/clutch pad/discs) that are integral to the safe functioning of a crane.

This information note can be used for knowledge sharing and serves as a warning to select and test brakes before their application.
Brakes are a critical safety feature of lifting equipment. In typical operation, they hold the load without any power drive. In the case of power failure, the brake must apply, stop, and hold the load. To hold the load, a static holding torque is required. To stop a moving load, a dynamic braking torque is needed.

During dynamic braking, for example, during the lowering of a load and in case of power failure, heat is generated, resulting in less frictional holding capacity. There must be sufficient brake holding capacity to decelerate the moving load before the brake catastrophically overheats; where the frictional ability of the brake reduces to the point to which it cannot effectively stop the load. The available dynamic brake torque depends on the duration of the brake action and the heat generated. Clutches based on friction in the power transmission of lifting equipment are similarly just as critical as brakes. Sometimes, they are even more critical because transmitted torques may need to be within minimum and maximum values. In general, they are more challenging to inspect.

Current situation

- Static holding torques mentioned in the documentation of a brake manufacturer are often not achieved in a test. Even the minimum friction values mentioned in codes are usually not achieved in test conditions.
- Dynamic braking torques are often not tested by brake manufacturers due to the low inertia (energy) applied in the test. While the friction typically reduces at higher temperatures.
- Brakes are delivered to clients without testing the torques of each delivered brake.
- Brake lining materials have been modified by the supplier without notification or updated documentation. Significantly, dynamic brake performance has dramatically decreased (30%) compared to similarly specified brake linings in the past.
- Brakes are delivered directly to clients with no bedding in. This results in much lower holding torque values when compared to the manufacturer's documentation.
- Classification Societies approve and certify brakes that have not been tested due to the limited capacity of the supplier test bench.

Brake selection and pre-testing advice

- Determine the 'maximum allowed design-stop-time' for the application in case of power failure.
- Note that friction depends on many factors, like geometry, surface pressure, temperature, wear and contamination.
- Check the maximum allowed application speed of the brake.

- Consider the wear of the brake lining.
- Consider the number of static activations for lifetime evaluation.
- Consider the reaction time of the brake for maximum actuation speed.
- Take the allowable heat dissipation of the brake into account (multiple stops per hour can be required).
- Test the brake in 'normal operating conditions' to determine the minimum expected brake torque values for the acceptance tests.
- Test the brake in the worst-case conditions (e.g. contamination, wear, low and high temperature) to determine the 'minimum-guaranteed-torque' and the number or size of the required brakes in the drive train.

Brake acceptance test advice

- Bedding in of brakes and measuring of the actual performance is always required before final application.
- Test the static holding torque of every brake and compare the results with the minimum expected braking torque conditions multiple times, for example, with a jack on the drum until the brake slips.
- The 'average dynamic brake torque' shall be concluded based on the measured stop time during a brake test.
- Typically, two dynamic load cases are to be tested:
  1) brake working at maximum load at nominal actuation speed
  2) brake working at reduced load (e.g. 50%) at maximum actuation speed.
- The braking time of the test must be equal to or greater than the 'maximum allowed design-stop-time' such that the 'average dynamic brake torque' is measured at the maximum temperature of the friction material.
- Check the airgap increase afterwards to check the wear rate.

Brakes and clutch maintenance and inspection advice

- Check air gap/wear.
- Check if holding torque is sufficient.
- Check if slipping torque is sufficient.

For more information, please get in touch with mark.ford@imca-int.com.

Related Guidance

IMCA LR002 – *Crane Specification Document*
IMCA LR006 – *Guidelines for Lifting Operations*