

Load Brake Got You Down?

The purpose of this bulletin is to help purchasers and operators of overhead material handling equipment make informed decisions regarding the use of mechanical load brakes in hoisting applications as well as to explore more modern, safer and more cost effective alternatives.

R&M Materials Handling, Inc. has over 70 years of experience in manufacturing hoists and crane components. In 2001, R&M halted the production of its traditional load brake equipped hoists and introduced the most technologically advanced wire rope hoist line in the industry, the Spacemaster® SX.

Background & Functional Description

The primary function of a mechanical load brake is to provide a “control braking means” to control the lowering speed of the hoist load; the load brake should also be able to hold the load independently of the hoist holding brake. Normally housed in the hoisting gear case in the first stage of reduction, the basic principle of the mechanical load brake is the mechanical conversion into heat, through friction, of the kinetic energy produced by the descent of the load. This heat is dissipated from the friction surfaces to the oil in the gear case and then to the atmosphere. A mechanical load brake will normally require power from the hoist motor to lower a load (as it is working against friction).



During the first half of the twentieth century, the vast majority of AC motors used on hoisting equipment were “wound rotor motors”. Without a control braking means, a load being lowered would continue to accelerate under the force of gravity with little resistance; unlike a squirrel cage motor, a wound rotor motor does not inherently generate a retarding torque that controls the rate of acceleration of a descending load. Modern hoisting equipment utilize squirrel cage motors (a.k.a. synchronous or induction motors); these motors are inherently capable of regenerative control braking (i.e. generate a retarding torque when overhauled).

According to the Crane Manufacturers Association of America (CMAA) specification no. 70, electric wire rope hoists require a control braking means to control the lowering speed: These means shall be mechanical, hydraulic, pneumatic or electric power (such as eddy current, dynamic or regenerative or counter torque). The inherent regenerative controlled braking means of a squirrel cage motor is an acceptable means of controlled braking.

Today, the vast majority of hoists sold around the world are not equipped with a mechanical load brake; this type of hoist design has now become the industry standard in North America. Furthermore, due to mechanical limitations, mechanical load brake hoists were usually not used on high capacity, high horsepower or heavy process applications or applications requiring a permanently attached “below the hook device” such as a magnet, grab or clamp.



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Operating Costs, Reliability and Application

The lifetime costs of operating load brake hoists are much greater than the lifetime costs for comparable non-load brake hoists.

Mechanical load brakes require periodic maintenance and inspection. The friction material in the load brake continually wears requiring periodic inspection and “adjustment”. If the “gap” becomes too wide, the load brake does not function. Unfortunately, due to the location of the load brake, inspection and maintenance requires the draining and opening of the hoist gear case.

Without periodic inspection or a load test with the holding brake disengaged, it is virtually impossible to know that the load brake is out of adjustment and/or not operating. This can give the operator a false sense of security. Furthermore, a properly functioning load brake provides no additional safety mechanism when failure occurs beyond the location of the load brake.

The heat generated by the load brake and the wear particle contamination of the gear case oil will detrimentally affect the life of the gear train. In addition, the constant mechanical action of the load brake further imposes shock loads on the gear train.

Below the hook devices should not be suspended from load brake hoists for extended periods of time. This can cause the load brake to “lock-up”. To “unlock”, the load must be taken off the hoist by other means, causing lost production time and additional expenses.

A load brake will hamper the performance of Variable Frequency Drives (VFD's) used in hoisting speed control; speed accuracy is reduced and low creep speeds are normally not possible (some of the main reasons for having VFD controls in the first place).

A Better Alternative

In general, the most cost effective and reliable hoist design both in initial capital investment and lifetime operating costs is a “non-load brake” hoist. Normally, non-load brake hoists also have standard two-speed hoisting for increased positioning accuracy and safety instead of the standard single speed hoisting on traditional load brake hoists. Non-load brake, two-speed hoists are the proven industry standard in the western world. For stepless speed control and increased positioning accuracy a variable frequency drive equipped, non-load brake hoist is the modern preferred alternative.

If increased safety is required or demanded, a second holding brake, externally mounted on the gear case, is the best option. The second brake will provide redundancy in the event of a motor brake failure or motor coupling failure. Being externally mounted, the brake can be easily maintained and inspected. Without a load brake, the gear train runs quieter, cooler and free of contamination resulting in extended life and increased reliability.

In critical applications, a brake mounted directly on the drum is available. This brake provides redundancy to the holding brake and can also be fitted with over-speed detection. This type of brake is designed to hold a load in the event of a failure anywhere in the drive train. Naturally, this option requires a higher initial investment.



Please consult your R&M Master DistributorSM for assistance in selecting the proper Spacemaster[®] SX Wire Rope Hoist for your application. For further information visit us on the web at www.rmhoist.com.