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FAN APPLICATION GUIDE – SERIES 1300 -- POWER ABSORPTION FANS

INTRODUCTION

Power Absorption Fans are used as brakes on various types of hoist mechanisms, the following discussion will describe some of the aspects of these fans as they apply to hydro electric installations.

GENERAL

Frequently hydro electric installations use gates to regulate the flow of water over dams. These gates (large heavy structures) are allowed to fall by gravity. In order to slow their descent, the vertical motion is translated in to rotary motion (by rack and pinion, drum and cable or other mechanism) of the fan shaft. The rotary motion of the fan shaft is converted to work done on the air. The power absorbed by the fan is proportional to the cube of the rotational speed of the fan and this explains the popularity of fans for this application.

The rate of fall of the gate is dictated by the energy absorbed by the fan, this is usually controlled by varying the position of the outlet damper on the fan. Usually, the fan is sized to absorb all the required energy absorption with the damper set 50-60% open, this gives a reasonable safety factor for this type of application.

FEATURES

In addition to the outlet damper mentioned above, large box-type inlet screens are required to ensure that flying debris such as plastic sheet, paper, etc. do not block off the air flow through the fan. Air flow blockage has the potentially disastrous effect of significantly reducing the power absorbed in the fan and lead to the gate falling and fan rotational speeds above safe operating limits. Sheldons Engineering will not supply brake fans without proper inlet and outlet screens.

The smallest most inefficient fan is required for these applications, Sheldons Type F forward curved wheels absorb a large amount of horsepower compared with their size. Since these fans operate at high speeds and absorb high power levels, heavier than standard construction is used for all brake fans.



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APPLICATION FOR SLUICE AND HEAD GATES

1. Generally, most head gates and sluice gates are equipped with individual hoisting mechanisms, which consist of double or single drum rope hoists, driven by electric motors.
2. Hoisting speed is comparatively small, and varies from 1- 6 feet/min.; however the loads are quite considerable, and consequently the ratio of motor to drum speed is quite high. The speed reduction is achieved by multi-stage spur, helical or herringbone gears.
3. One of the usual requirements is to have gate lowering speed approx. 150%-200% of the hoisting speed, particularly for head gates, when emergency (quick) closing is required.
4. Holding of the gate in any particular position is accomplished by solenoid release, spring set, electromagnetic brake mounted on the motor shaft extension. This brake is normally provided with hand release, so the gate can be lowered in case of power failure, and is for the installation remotely controlled. It is a common practice to have a DC solenoid for the brake operated from independent power source.
5. Brake fans offer a reliable, simple and inexpensive means to absorb energy from a lowering gate. The best configuration is to mount the fan wheel on the motor pinion shaft extension. No clutch or coupling is required, this avoids the cost and potential safety concerns. When hoisting, the fan absorbs very little power since the speed is low and the wheel is backward curved in this direction. When the gate is lowering, the exhaust damper is adjusted to obtain the desired speed. Once the damper has been set, no other maintenance is required, unlike other brakes, which rely on friction. Electric brakes are quite expensive by comparison to fan brakes and there is potential for overwind problems that completely mechanical solutions avoid.