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AUXILIARY BRAKING SYSTEMS (RETARDERS)

Auxiliary braking systems, or retarders, provide a means of slowing down a vehicle without using the service brakes. This contributes to vehicle safety by allowing the service brakes to remain cool and available in an emergency. Retarders also create the potential for reduced operating costs through less frequent brake maintenance and reduced tire wear.

The retarding systems available today can be grouped into four main categories: **exhaust, engine, hydraulic,** and **electromagnetic.**

An exhaust brake is basically a gate or butterfly valve in the exhaust system which is operated by the driver. When the valve is closed it restricts the flow of exhaust gases and creates back pressure in the engine. The amount of retarding horsepower available depends on engine size and the amount of back pressure (this can range from 12 to 70 psi) allowed by the engine manufacturer.

Engine brakes retard by optimizing the engine's compression braking ability. When a cylinder is on the compression stroke, the exhaust valves are opened and the compressed air is released. This allows compression work to be done by the engine and ensures that no expansion work is done to the engine. As with exhaust brakes, retarding horsepower is dependent on engine size. Engine retarders are available for most large displacement engines in use today and are easily retrofitted.

Hydraulic retarders operate like a hydrodynamic coupling except that while the rotor spins, the stator is stationary. When a fluid, either engine or transmission oil, is introduced between the rotor and the stator, resistance is created as they try to shear the oil. This generates a large amount of heat which is absorbed by the oil. The oil is passed through a heat exchanger and cooled by engine coolant. The retarding power is controlled by varying the oil flow between the rotor and stator. It is limited by the capacity of the engine cooling system, (which is usually sized to suit engine power ratings) and the speed at which the rotor turns. Hydraulic retarders can be positioned between the engine and transmission and driven at engine speed. Classed as input retarders, these require that engine speed be maintained to maximize braking. They can also be positioned after the transmission and operated at driveline speed. These are termed output retarders and their power output is dependent on drive-axle gear ratio.

Electromagnetic retarders work by using a series of electromagnets to create a magnetic field within which steel flywheels are rotated. This creates eddy currents or magnetic resistance in the flywheels which convert the truck's kinetic energy to heat. The heat is dissipated to the atmosphere through the flywheels, which have vanes that increase surface area and promote air flow. The strength of the magnetic field, and thus the braking force, is variable and controlled by a lever in the cab.

The retarder can be positioned in the driveline or it can replace an entire trailer axle. The driveline models operate at drive-shaft speeds whereas the axle flywheels are driven at 5.5 times road speed through a set of planetary gears located in the wheel hub. The advantages of the axle over the driveline models is that they place the braking power at the rear of the trailer, thus preventing jackknifing. They are also self-contained units, isolated from the rest of the power train and designed to take the power they develop. The driveline retarders may also create problems as they are applying reverse torque through the drive shaft and rear end.

The retarding systems discussed in this Field Note all provide a means of slowing down a vehicle while keeping the service brakes in reserve. These systems may also be factors in reducing operating costs and increasing revenues. Most important of all, they increase vehicle safety and should be of interest to all log haulers.

INFORMATION

The information contained in this report is based on limited field operation and is only published to disseminate information to FERIC member companies. More information may be obtained from:

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