JOULE SPEED CONTROL SYSTEMS FOR MARSHALLING YARDS
During the passage of wagons through marshalling yards accurate speed control is essential for high throughput and zero damage to rolling stock and freight. Speed control is the only means by which optimum operation can be achieved.

With this in mind New Joules Engineering North America Inc. has over the past decade, designed, developed and implemented a variety of products to achieve the efficiency needed to cope with modern day demands of high-speed marshalling yards. The result of which is the JOULE RETARDER.
Application

The speed control offered by the JOULE RETARDER in marshalling yards allows railroad organizations to hump all types of freight inclusive of automobiles, petrochemicals, livestock and hazardous materials, at the same time virtually eliminating freight and car damage. Speeds offered, ranges from 0mph through 8mph. Typical coupling speeds of 4mph is used in most yards.

Principle of Operation

The JOULE PISTON RETARDER is a self contained hydraulically operated device, that requires no external power source.

The unit is calibrated on a hydraulic test bench to pre-determined flows and pressures, as calculated on a Retarder Simulator, to ensure accuracy. All calibration is done under strict quality control. The simulator ensures that the efficiency of all setting parameters are maintained at all times during the final assembly and calibration of the retarder.

The distribution and density of retarders is determined by a variety of factors such as, gradient, rolling resistance, curves, space for installation, etc. All of which is used by our engineers during the design stage.

Speed control is achieved by the principle of extracting energy from the railcar as it rolls over the retarders, hence the name JOULE, which is a Metric unit of measure for Energy.

The Joules retarder also has low noise emissions. Typical noise values of 55 dB makes it very suitable for use close to residential areas. (It has a much smaller noise footprint compared to clasp type retarders.) Yards built in residential areas are Balmer Seattle WA, Lincoln NE, Sacramento CA.

As with all piston type retarders, energy extraction is speed related. Thus, higher railcar speed equals higher energy extraction. When a retarder setting is given as, for example, 4mph – 1180J, this means that at 4mph this retarder will extract 1180 Joules of energy from the railcar. As energy cannot be destroyed, but transferred from one form to another, and from one body to another, the extracted energy is transformed into different energy forms, such as heat, sound, vibration, etc.
The retarder has a speed sensitive valve, which is activated at predetermined speeds only. Thus when the railcar travels at speeds lower than the set speed, the valve will not activate, and the retarder “idles”. During idling no significant energy is exchanged, and energy of below 40 Joules is expected. This is extremely important for light cars traveling through.

In the event of the rail car traveling at a speed higher than the set speed the valve will activate and resultanty the retarder will extract energy from the car.

**Design**

Yard design relies on a variety of parameters such as gradients, rolling resistance, car weight, etc. as well as the capabilities of the retarder. Therefore close contact exist between engineers from both, the client, and New Joules Engineering North America Inc. in order to strike the perfect balance for each yard.

New Joules Engineering North America also provides yard design and consultancy services.

The Joule Retarder is designed and manufactured completely by New Joules Engineering North America Inc.

**Manufacturing**

Value engineering during the design phase coupled with in house production to specified quality standards and prints has resulted in a rugged high quality product.

The company’s manufacturing facilities are equipped with carefully selected machine tools to permit consistent production to the exacting standards required by high performance hydraulic equipment.

The manufacturing facility is based in Kansas City, MO and the retarders are completely manufactured and serviced from this location.
New Joules Engineering North America’s product range consists of our **Standard Piston Retarder**, and a variant thereof known as the **Joule Controllable Retarder**. These retarders were designed and developed for the US market and are manufactured and serviced from our Kansas City facility.

**Standard Piston Retarder**

As a proven design these retarders are used throughout the US and available in speed settings ranging from 0 mph to 9 mph.

These units can be used all the way from the crest to the bowl tracks, providing speed control from humping operations at the crest, to “soft” coupling in the bowl tracks.

The retarder is sealed to prevent unnecessary water and debris to enter the housing. It is also beneficial to have a sealed unit in areas of high spillage and where icing is a problem.

These units are designed for ease of installation and maintenance. Operating in ambient temperatures ranging from –40 to 150 F, including rain, snow and ice.

**Joule Controllable Retarder**

The **JOULE CONTROLLABLE RETARDER** offers an affordable solution to increase throughput in modern day marshalling yards without sacrificing speed control.

This system enhances the function of the crest gradient by letting the empty railcars run through with no resistance and ultimately gain enough momentum to carry them to their destinations without premature stalling.

The system also speeds up trimming operations as higher pullout speeds can be accommodated without unnecessary capsule damage.

All this is achieved by retracting the retarder to a position where activation of the internal mechanisms, which are responsible for energy extraction, cannot be activated. In this operational mode the retarder is doing no work and the life expectancy is increased dramatically.
The hold down is achieved via a vacuum system that creates a suction on the retarder capsule hence causing it not to return to the normal extended (up) position. The vacuum is generated by either an air driven vacuum pump system or by an electrical motor driven vacuum pump.

**Controllable Retarder - Principle of Operation**

In order for the retarder to extract energy, a series of valves needs to be activated. The valve of interest is the speed valve which shuts off at predetermined oil flow settings, hence the speed setting of the retarder.

Oil flow is generated by the stroking movement of the capsule. When the desired oil flow is reached the speed valve will activate. The series of events following the activation of the speed valve will cause the retarder to extract energy causing the railcar to slow down.

By shortening the stroke length of the capsule, the ability to generate sufficient oil flow to shut the speed valve is eliminated and the retarder cannot extract energy as the internal dynamics needed for energy extraction cannot be activated.

The reduction in stroke is achieved by partially holding down the capsule, effectively reducing stroke length. This is achieved by applying a vacuum to the retarder housing causing an opposing downward force on the capsule. The downward force counteracts the force exerted by the nitrogen gas inside the capsule that exerts a force pushing the capsule upward to its normal extended (up) position.
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