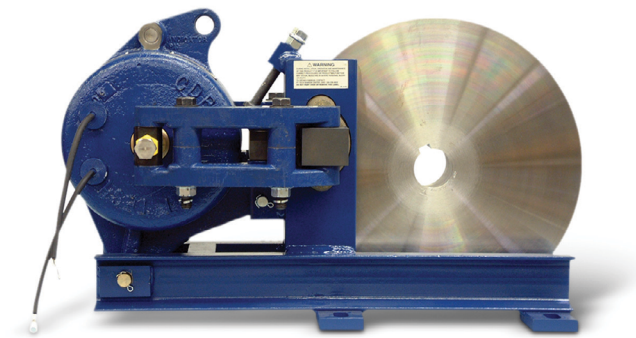




Specialized Clutches & Brakes

Powering Innovation

PT Tech has the stability of a large corporation and the flexibility of a small company.



Response

PT Tech appreciates its customer's needs for its technical information. Our customer service department includes three engineers and a designer. They can do more than just answer your technical questions. They know the products well enough to understand what modifications can be made to suit a customer's unique needs.

Rebuild Capability

PT Tech's rebuild development lead time is two weeks when returned parts are available. With advance notice, lead time can be dramatically reduced.

Inventory

PT Tech strives to maintain service parts for its special designs as well as its standard product line. We stay in close touch with our customers so that we may anticipate service parts and requirements.

Engineering Support

PT Tech's employees are leading professionals in their fields. We have graduate engineers on staff with over 150+ years of experience designing industrial clutches and brakes. We have invested heavily in the latest research and design tools, including finite element analysis software, 3-D CAD software and multiple product test stands.

Extending Customer Communications

We know our customer's need for information and help is not limited to standard business hours. Customer service is available from 7am to 5pm. Company wide e-mail allows communication after hours. Our website contains product data sheets that include dimensional and performance information. In a service crisis, we offer a 24-hour Service Hotline: (330) 414-3172.

Professional Participation

PT Tech is active in supporting the technical societies that are associated with major markets. PT Tech has had active members on both the Electrical Committee and the Mechanical Committee of the AIST (Association of Iron and Steel Technology). We have co-chaired the Electrical Working Group that revised Technical Report #11 to include caliper and disc brakes. Also, PT Tech is an active member of SAE and ASM.



PT Tech is committed to...

- Solving our customers' problems with innovative designs
- Growth through continuous product development
- Keeping our focus on our core technology
- Providing our customer with exceptional service.



Employee Ownership and Commitment

In 1991 we became ESOP company and became 100% employee owned in 2008. This minimizes any problems associated with succession and assures long-term stability. Also, employee ownership allows the people you work with day-to-day to have the authority to make wide-ranging decisions, offering customers faster response times when critical actions are required.

Since 1978 PT Tech has served heavy industries' need for specialty clutches and brakes.

The 1980's:

In 1980, PT Tech developed the first TLC Torque Limiter for cutterhead used in underground mining machines. Today it's the mining industry's standard for protecting drive systems. During the mid-Eighties, PT Tech created a line of special hydraulic clutches for the cutter drives on tunnel boring machines. They were critical to the successful boring of many tunnels including the tunnel under the English Channel.

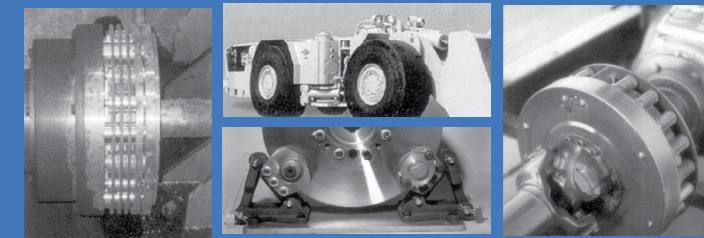
By 1986, the FMD multiple disc torque limiter series was introduced to work in high horsepower, high energy applications. Today, it is used on a wide variety of equipment around the world.

In 1994, PT Tech installed its first CDB caliper disc brake. It directly replaces archaic drum brakes on overhead cranes in steel mills. PT Tech introduced the HCDB hydraulic caliper disc brakes in 1996 to replace existing drum brakes on bridge drives on overhead cranes.

PT Tech's disc brake concept or direct interchangeability with existing drum brakes help set the AIST (Association of Iron and Steel Technology) brake standard. At the end of the decade, after 5 years of development, PT Tech introduces the HPTO (Hydraulic Power Take Off) line of diesel power clutches. This product has gone on to become the market leader in the Grinding and Rock Crushing markets and has been growing ever since into other diesel applications.

The 2000's:

The turn of the century meant continued growth in PT Tech's product mix. Early in the new century, a line of fully "dry" HPTOs were developed, enabling applications onto lower HP engines. Along with this development was further advancement in the computer controls of the dry and wet clutches. This has led to the evolution of direct communication between the engine and the clutch, allowing for unprecedented reliability.



PT Tech produced its first totally enclosed, wet hydraulic brake in 1987. It provides improved performance within the same dimensional envelope than the brake it replaced. At the end of the decade, PT Tech developed the CMD for applications involving high torque in a radially limited package. A typical application is a leveler in steel strip processing equipment.

The 1990's:

Beginning the decade, PT Tech evolved the UJT series torque limiters to work in diesel driven equipment. PT Tech launched the SLQ series in 1992. The SLQ is widely used in recycling, metal processing, mining and equipment. These units have become the gold standard for accurate torque control.

For more information on torque limiters, hydraulic brakes, caliper disc brakes applications, case histories... contact PT Tech.

By serving these diverse markets with key niche products, PT Tech has grown into a strong, stable company with a solid track record of success. Through continuing product development, our business has maintained a minimum 15% per year growth.

What this means to our customer is that we're here to stay.

the coal market, a need was identified for an integrated brake/gearbox for underground scoops. The PTT-477 was born to meet this need, allowing for greater reliability and easier service.

Nearing the end of the first decade, PT Tech launched the Flex and VG models of the HPTO14 and HPTO15. These designs multiply the number of available pump pads, allowing for greater flexibility for OEMs.

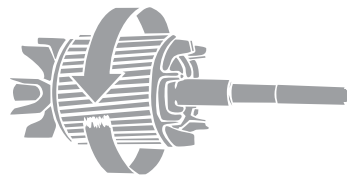
Each week brings a new product or innovation to PT Tech's product mix. Whether it is adapting our existing products in new ways or doing clean sheet designs, PT Tech is in constant advancement for the future of your equipment.

Torque Limiters

Diesel Engine Flywheel Effect



Electric Motor



Preventing Damaging Shockloads

Electric motors and engines act like large flywheels. Typically, they represent 80-90% of the drive system's total kinetic energy. This flywheel effect can produce inertia shockloads far above the rated torque when the driven equipment is abruptly stopped. Increasing productivity often mandates your equipment to be protected from shockloads without the loss of production caused by shear pin devices or releasable torque limiters.

A continuously engaged torque limiter, when properly applied, will provide excellent system protection. It sustains its torque setting through momentary shockloads thus avoiding nuisance releases. This is a major advantage in applications subject to frequent shockloads or when difficulty of resetting can disrupt production.

PT Tech has been manufacturing sophisticated continuously engaged torque limiters for heavy industry since 1980. The torque setting of a PT Tech torque limiter is controlled by patented spring assemblies. The quantity and strength of the assemblies determine the torque setting. This prevents unauthorized personnel from changing the torque setting. PT Tech torque limiters do not require adjustments or lubrication throughout their life.

The following application stories highlight PT Tech's products, technology, and problem solving capabilities in:

- Mining
- Road Working
- Tunnel Boring
- Diesel Engine
- Shredding
- Steel Mills
- Cranes
- Equipment Cranes

Roadworking Equipment



Performance Chart

Engine.....CAT3406
Horsepower.....405 HP
Peak Engine Torque...1,295 lb-ft
Torque Setting.....4,200 lb-ft
Torque Limiter.....UJT335-500 Series

• Situation

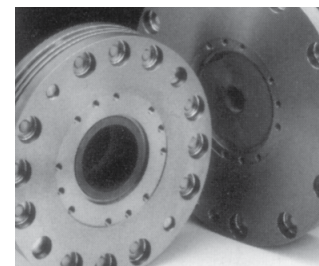
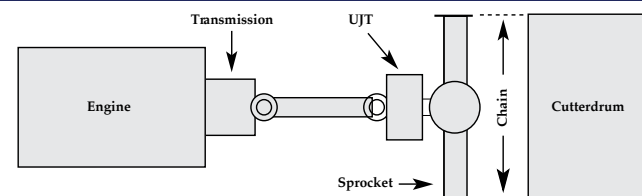
While grinding through pavement, a reclaimer's cutter drum frequently encounters objects that cause torque shockloads great enough to break shear pins.

• Problem

Frequent nuisance shear pin breakages lead to lost production that is costly to contractors.

• Solution

A UJT series torque limiter was positioned behind the transmission to absorb the torque shockloads. The torque setting was based on the transmission's lowest gear ratio. When the cutterhead encountered an object that could cause a torque shockload, it slipped at a safe torque setting thus preventing damage and increasing production.



Continuous Miner



Performance Chart

Horsepower.....250 HP
Peak Engine Torque...1,500 lb-ft
Torque Setting.....2,300 lb-ft
Torque Limiter.....SL228 Series

• Situation

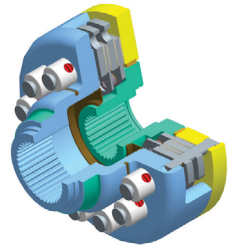
When the cutterhead on a continuous miner comes to a sudden stop or encounters a momentary jam that abruptly causes a loss of cutter speed then quite often the cutterhead gearbox is damaged. The torque shockload occurs because the motor's rotor acts like a flywheel. Its mechanical kinetic energy winds-up the drive system until something breaks.

• Problem

Many different devices and drive system designs had been tried to prevent this damaging shock load. Torque shafts designed to break to prevent gearbox damage caused significant downtime. Also, over time the torque shaft will fatigue, thus lowering the torque at which it will break. Even the fastest current overload device did not work because they sense the increase in current draw after the shockload has occurred. Rubber couplings did not work because they could not provide enough wind-up to accommodate the shockload.

• Solution

The TLC torque limiter was designed to eliminate the shockload by absorbing the rotor's kinetic energy and still maintain its torque setting throughout the slippage. Its patented design made the torque setting tamper resistant and eliminated problems due to worker misadjustment.



Tunnel Boring Machine

Performance Chart

Horsepower.....300 HP
Peak Engine Torque...2,700 lb-ft
Torque Setting.....3,750 lb-ft
Torque Limiter.....RTS Series



• Situation

While tunneling in poor ground conditions, the TBM can become buried and jammed. Manually digging it free is costly and dangerous.

• Problem

Previous TBM clutches were ineffective at breaking the cutterhead loose and often burned-up in trying.

• Solution

PT Tech designed a hydraulically applied torque limiting clutch that can be disengaged to allow the motors to come up to speed without a load. The unit's output inertia is very low and it has significant thermal capacity. This allows it to momentarily produce 300-500% of motor torque without shockload to free buried cutterhead.

Torque Limiters (cont.)

Tub Grinder



Performance Chart

Engine.....CAT3406
Horsepower.....402 HP
Peak Engine Torque...1,289 lb-ft
Torque Setting.....2,712 lb-ft
Torque Limiter.....UJT35 Series

- Single, double, and triple discs with torque to 9,066 lb-ft

Machined to accept SAE flanged drive-shafts. Wing bearing connections, also available.

• Situation

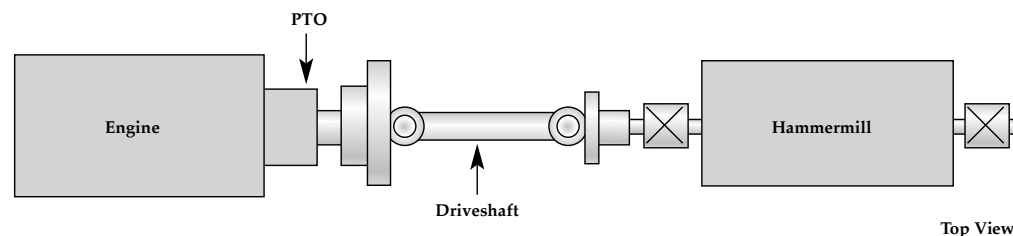
A tub grinder's diesel engine turns a hammermill at engine speed to pulverize material. Designed to reduce wood, yard, and demolition waste, the equipment is subject to significant shockloads when foreign material is dropped into the tub.

• Problem

The shockload can break universal joint causing it to fail. This can potentially cause costly damage to the equipment.

• Solution

A UJT Series Torque Limiter is mounted between the universal joint and the hammermill. The torque setting is placed at 200% of the engine's peak torque. This setting is below the mechanical clutch's torque setting and well below the universal joint's ultimate strength thus protecting both from the shockload.



• Situation

A slow speed tire shredder is particularly prone to inertia shockloads due to the high reduction ratio in its gearbox.

• Problem

The cutting drums in a shredder rotate towards each other. If metal falls into the shredder, it can be wedged between the drum causing a sudden stop. The motor and pulleys equivalent inertia at the cutting drums increases by the square of the gearbox ratio. This means even a small motor can have a devastating effect on the shredder.

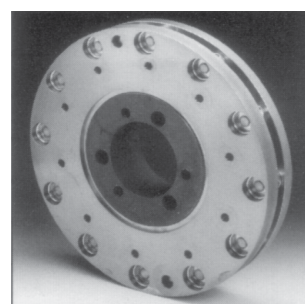
• Solution

The driven pulley is mounted onto the SLQ and the SLQ is mounted on the input of the gearbox. This isolates the motor/pulley inertia thus protecting the shredder during a jam.

Tire Shredder

SLQ Series

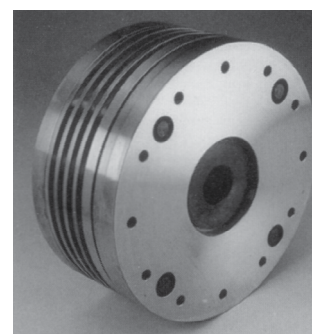
- Single disc with torque to 3,828 lb-ft
- Accepts Renold Hi-Tec rubber coupling for shaft to shaft installations
- Accepts sprockets or pulleys for parallel installations
- Shaft mounted using QD bushings



Performance Chart

Horsepower.....300 HP
Peak Engine Torque...2,700 lb-ft
Torque Setting.....3,750 lb-ft
Torque Limiter.....RTS Series

Rolling Mill Main Drive



Performance Chart

Horsepower.....3,000 HP
RPM.....600
Rotor Inertia.....28,800 lb-ft²
Peak Motor Torque...76,600 lb-ft
Torque Setting.....150,000 lb-ft
Shockload.....1,870,130 lb-ft

- Multiple disc with torque up to 190,000 lb-ft
- High Energy
- Accepts elastomeric, gear or universal joint couplings
- Bores up to 10 inches

• Situation

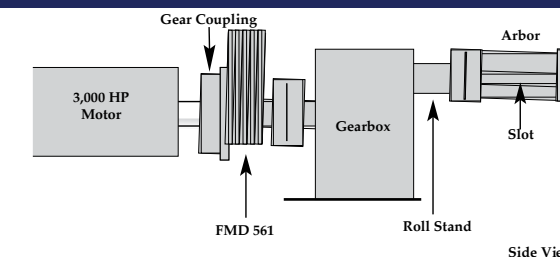
Electronic controls synchronize the recoiler's arbor to the leading edge of the steel strip. The arbor must accelerate at a rate that allows the strip to be caught in the arbor's slot but fast enough so that the strip does not deadhead in the slot.

• Problem

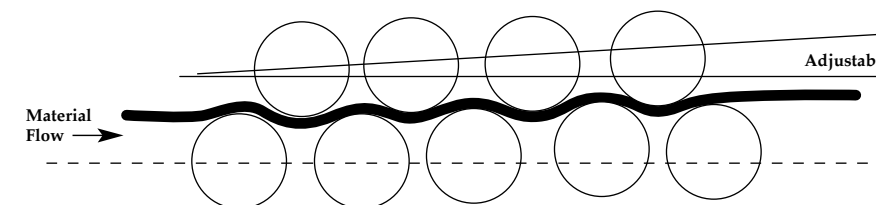
If the steel strip deadheads in the arbor's slot, the arbor will be subject to a sudden acceleration and the uncoiler will be subject to a like deceleration. This can cause inertial shockloads on the respective drive systems. The electronic controls cannot protect the drive system from inertial shockload because by the time they detect the problem, the inertial shockload has already caused drive system damage.

• Solution

Place a FMD 561 Friction Limiter between the motor and spindle. When the impact occurs, the FMD 561 slips just long enough to absorb the shockload yet continues to transfer torque equal to the torque setting. Once the shockload passes, the FMD 561 stops slipping and the recoiler continues to do its job.



Metal Strip Leveling



- Designs from 820 to 9,000 lb-ft torque
- 2 3/4 to 11 inch diameters
- Mounts either on gearbox output shaft or in between spindle's u-joints
- **Situation**
Coiled metal strip must be leveled prior to slitting or shearing. A leveler gearbox has a single motor input and many outputs. All of the outputs are mechanically tied together inside the gearbox.

• Problem

If operating conditions cause one roll to experience a greater resistance than its opposing roll, it will draw a disproportionate amount of torque. This can cause gearbox and spindle breakage.

• Solution

CMD torque limiters are placed on the output shafts of the gearbox. Their setting is below the ultimate strength of the spindles or the gearbox. When an uneven load is applied the CMD will slip allowing even power sharing among all the rolls.



Performance Chart

Motor.....AC Motor
Horsepower.....875 HP
Peak Engine Torque.....14,135 lb-ft
Gearbox Ratio.....3.92-1
Number of Gearbox Outputs.....19
Spindle Continuous Rating...4,170 lb-ft
Torque Setting.....4,085 lb-ft
Torque Limiter.....CMD Series

CDB Brakes

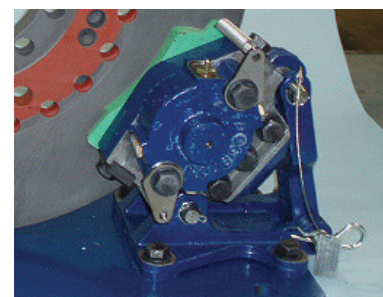
Ventilated Disc

When disc speed is more than 500 rpm, ventilated discs have significantly greater heat dissipation capability than solid discs. This can be critical in bridge brake applications. The entire kinetic energy of the crane must be handled by the brake if the operator does not plug (reverse) the motor. When operating at motor speed on an AC powered crane, the ventilated disc can have up to 300% more thermal dissipation capability than a solid disc.



HCDB Series

The HCDB brake is a hydraulically applied bridge brake that directly replaces 10, 14, and 18" drum brakes. Installation requires no modification. Its compact design allows it to fit into the existing space. The HCDB is designed to operate with the existing pedal/master cylinder. It reduces maintenance because it compensates for friction material wear. The HCDB's unique caliper accommodates misalignment and axial motor movement. Replacing the friction pucks is quick and easy. The caliper folds down exposing the pucks. The entire procedure takes 5 minutes.



CDB Brakes are designed to upgrade overhead cranes to the higher performance and ease of maintenance of a caliper disc brake. They conform to AIST Brakes Technical Report #11 (released August 1997). They operate either in series with DC motors or in a shunt circuit. Available in sizes to replace 8 to 23 inch drum brakes.

Hoist and Trolley Brakes

● Situation

Drum brakes have been the mainstay of the steel industry. They are susceptible to a number of problems including drum surface cracking due to thermal shock, fade due to heat, frequent adjustments due to drift and drag problems (expansion and contraction of the brake wheel), lengthy downtime due to brake pad replacement and expense involved in getting heavy brake shoes up onto the crane.

● Problem

At the AIST Crane Symposium each year, crane brakes were consistently recognized as one of the biggest maintenance problems.

● Solution

PT Tech's CDB Caliper disc brakes meet the AIST brake standard published in 1997. They directly replace existing drum brakes. They have the same mounting hole pattern and the centerline of the disc matches the centerline of the drum so no modifications to the mounting holes are required. They can operate in series with DC motors or in DC shunt circuits. Discs are not susceptible to checking due to thermal shock. They also eliminate drift and drag problems. Their friction pucks are lightweight and replacement only takes five minutes. Most importantly, they were designed with maintenance people in mind. Adjusting for wear takes 15 seconds. CDB brakes are used on hoists and trolleys.

Bridge Brakes

● Situation

The drive is designed to slow the bridge by first using motor plugging and then using a hydraulic brake as the sole means of stopping the bridge. Also, operators have a tendency to use the brake pedal as a foot rest. This causes the brake to drag and dramatically heat the drum. In other cases, the duty cycle of the crane has changed over time. Its new rate of cycling is much higher than when originally designed. This means the brake must contend with a higher than expected amount of energy.

● Problem

Bridge brakes are often abused for many different reasons. This leads to frequent and costly repairs.

● Solution

Replace the drum brake with the largest ventilated HCDB disc brake that will fit into the existing installation. The ventilated disc increases the disc's energy dissipation through convection by increasing its air flow volume.

HPTO Diesel Engine Clutches

Horizontal Grinder

● Situation

A horizontal grinder's engine drives a hammer mill through a set of belts. This harsh application applies a large load to the clutch output shaft while it reduces the size of waste materials.

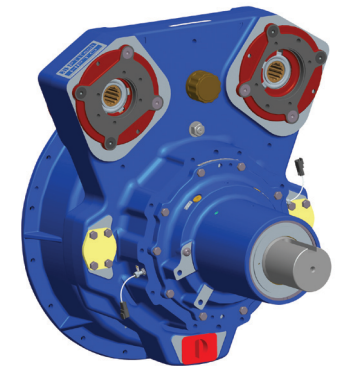
● Problem

Large overhung loads and shockloads can damage clutches, belts and even engines.

● Solution

An HPTO, a Hydraulic Power Take-Off, provides a reliable solution to all the concerns. This microprocessor controlled, hydraulically applied wet clutch isolates these damaging loads from harming the engine and machine.

HPTO15FX

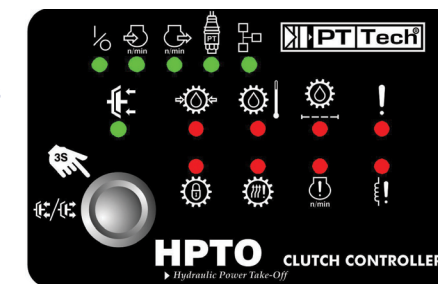


Models rated up to 1,600 HP
High belt-load capacity
Auxiliary pump drives

The Brains of the System

...is a rugged computer control for the clutch operation. This interface quickly tells the operator what is going on in the clutch and allows for quick troubleshooting. The built-in safety features can prevent unsafe operations.

Advanced 3 - Wet Clutch Controller
Basic 2 - Dry Clutch Controller



- SAE J1939 CAN Compatible
- Self Diagnostic
- Prevents operator abuse of machine and clutch
- Robust design for Off-highway applications

Rock Crusher

● Situation

Rock crushers use a high inertia impactor, cone or jaw crusher to crush rock. Getting these crushers engaged to the engine requires skilled operators.

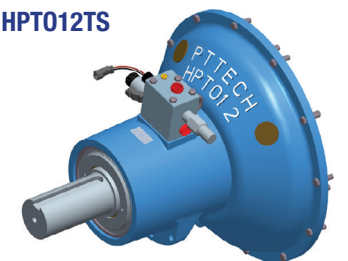
● Problem

Inexperienced operators can damage manual clutches while starting machine. The small pilot bearings have a short service life and transfer belt-load into the engine crankshaft.

● Solution

The microprocessor controller monitors the engine during engagement to properly synchronize the engine and crusher thus automating the process. The design of the HPTO12 eliminates the problem pilot bearing and replaces it with a self-supported, oil lubricated bearing. The combination provides an unparalleled solution for this punishing application.

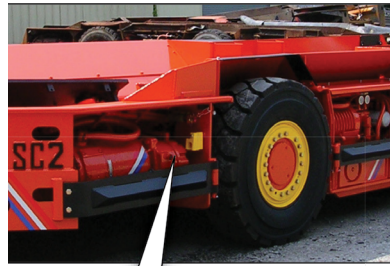
HPTO12TS



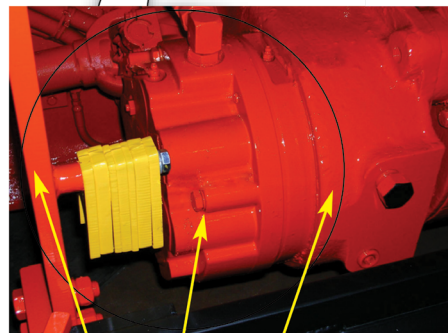
Up to 460 HP rating
Self-adjusting
Oil-Lubricated

Hydraulic Brakes

Shuttle Cars



A shuttle car is used to haul coal in underground mines.



Gearbox Brake Motor

Improving brake performance on underground

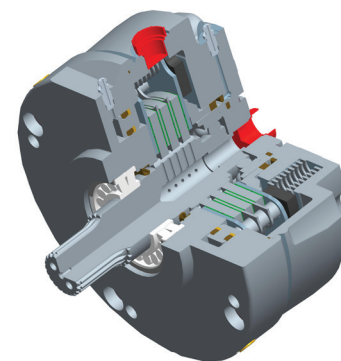
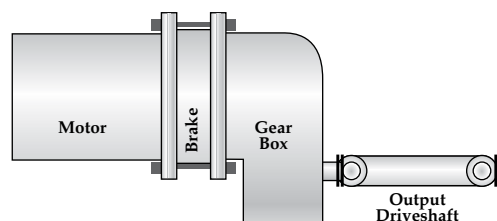
Over time, the concern for safety motivated underground vehicle builders to eliminate simple caliper disc brakes in favor of totally enclosed wet brakes. Totally enclosed brakes offer three distinct advantages to caliper disc brakes. First, the friction surface and operating mechanisms are not exposed to the environment. This reduces the maintenance problems that plague caliper disc brakes on underground vehicles. Second, they can provide significant braking force in a small package. Third, when the oil bath is circulated through a heat exchanger, a totally enclosed wet brake can have greater thermal capacity.

PT Tech has been manufacturing totally enclosed wet brakes since 1984. In most cases the equipment builder has a unique requirement that existing brakes cannot meet. The following application stories describe PT Tech's solution to a number of equipment builder's unique requirements:

- Shuttle Cars
- Continuous Miners
- Shield Haulers

Performance Chart

Torque.....	6,720 lb-in
Parking Brake Release Pressure.....	100 PSI
Service Brake Pressure.....	580 PSI



PT Tech's brake is flange-mounted between the electric motor and the shuttle car's gearbox.

Situation

Shuttle car downtime was considerable due to brake problems.

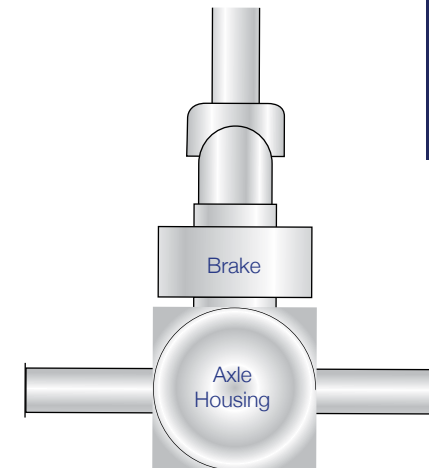
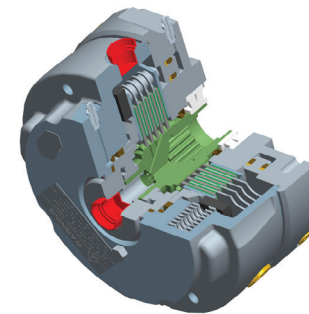
Problem

Caliper disc brakes were subject to frequent, maintenance problems due to contamination in coal mines.

Solution

Replace the dry caliper disc brake with a totally enclosed wet multiple disc brake. It is flange-mounted between an electric motor and a gearbox. The motor's splined shaft mounts into the brake and the brake's output shaft has a spline that fits into the gearbox. The brake is both a foot actuated service brake and a spring-applied parking emergency brake. It has greater thermal capacity and is far less susceptible to contamination problems than the dry caliper disc brake. Also, the brakes place the vehicle in compliance with International Mining regulations. Finally, a unique friction material wear indicator provides maintenance people with a means of knowing when service is required without having to rely on the operator's complaints.

Continuous Miner Brakes



Situation

A domestic coal equipment builder had to replace its existing caliper disc brake with a totally enclosed wet brake in order to sell into several off-shore markets.

Problem

Many overseas markets are governed by guidelines that did not allow the use of dry caliper disc brakes on vehicles.

Solution

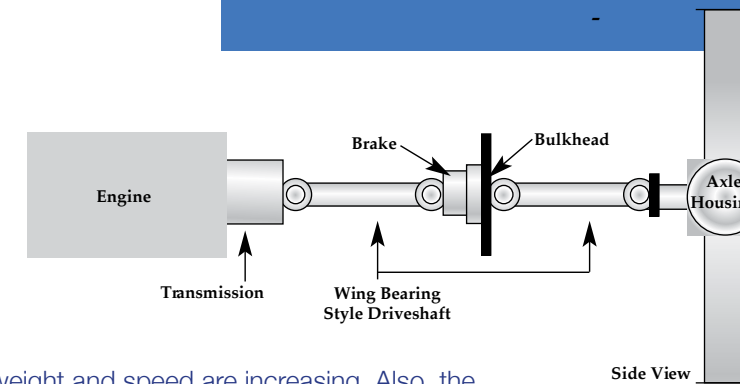
The existing axle fitting yoke is removed. A totally enclosed wet brake is mounted to the axle around the pinion shaft. There are different pinion shaft lengths. Three different adapter plates are available that bolt to the brake's input hub. These adapter plates accept 8.5C, 9C, and 1810 drive shafts.

Performance Chart

Torque.....	6,250 lb-ft
Min. Release Pressure.....	800 PSI
Normal Release Pressure.....	1,100 PSI
Max Release Pressure.....	3,000 PSI
Max Speed.....	3,000 RPM

Shuttle Cars

Shield Hauler Brakes



Situation

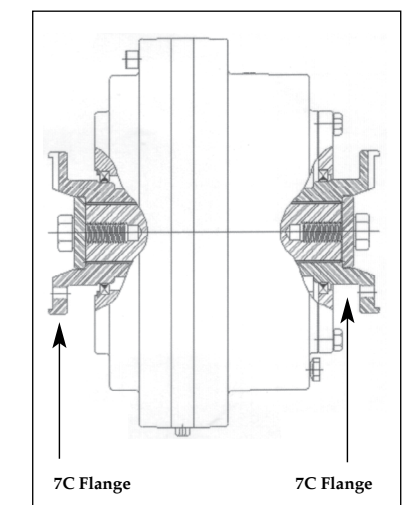
The vehicle's weight and speed are increasing. Also, the slope on which it will operate is increasing. In order to be compliant with mine safety requirements for stopping distance, additional braking torque is needed. The existing brake's torque capability cannot be increased. Also, there is a need on existing vehicles that brakes must be retrofittable.

Problem

The existing brake is incorporated into the transmission. It does not have enough torque to properly stop the vehicle. The transmission cannot be modified to accept a larger brake.

Solution

A totally enclosed, spring applied, hydraulically released wet brake that mounts to a bulkhead was installed for additional braking capacity. It has wing bearing style fitting yokes on both the input and output to accept 7C driveshafts.



Performance Chart

Torque.....	30,000 lb-ft
Release Pressure.....	300 PSI
Max Pressure.....	500 PSI
Vehicle WT.....	140,000 lbs
Driveshaft Speed.....	2,200 RPM



Professional Service



Product Testing

PT Tech has approximately 2,000 square feet of plant space and a full-time graduate engineer and technicians dedicated solely to testing the products we manufacture.



Rebuild Center

PT Tech provides rebuild services for all of its products. Whenever possible, wear parts are refurbished to minimize costs. All re-build units are covered by PT Tech's one-year warranty.



Field Service

PT Tech has field service technicians frequently used to assist in initial installations. Also, we conduct maintenance seminars at our customer's location and an in-house HPTO Training School for OEM's.

Application Assistance

PT Tech has been analyzing and solving problems for heavy industry since 1980. Our application engineers regularly visit customer job sites to better appreciate the problems that plant engineers and maintenance people face when trying to solve drive system problems. In addition, PT Tech's application engineers have two unique tools to assist you. First, our test stands can simulate the inertia shockload up to that of a 2000 HP motor. This allows us to better predict how a torque limiter will perform in your application. Second, using thousands of test results, PT Tech has developed a computerized selection program that quickly determines the best solution to your shockload problem.



Customer Service

PT Tech's customer service department is standing by to assist you with all your powertrain needs.

We pride ourselves in exceptional service.

Our facility is located 30 minutes south of Cleveland in Sharon Center, OH

PT Tech, Inc.

1441 Wolf Creek Trail, PO Box 305

Sharon Center, OH 44274

Phone: (330) 239-4933

Website: www.pttech.com

Powering Innovation