

Brakes and Clutches for Integration into OEM Applications

Flexible solutions from Force Control, Miki Pulley, and Ringfeder

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Brakes and clutches play a crucial role in various applications, and their importance lies in their ability to control motion and transmit power with precision and accuracy and enhance the safety and protection of personnel and equipment. They also optimize energy consumption and reduce downtime. The ability to integrate these components into OEM applications is essential. Below we focus on the brake and clutch solutions provided by Force Control, Miki Pulley, and Ringfeder.

As these manufacturers demonstrate, brakes and clutches offer versatility and adaptability to different operating conditions. They can be customized to specific requirements, allowing for compatibility with a wide range of machinery, systems, and applications. This flexibility enables manufacturers to optimize performance and meet diverse operational needs. These essential components provide control, safety, efficiency, reliability, and adaptability. Their proper selection and integration contribute to improved productivity, reduced costs, and enhanced overall performance of machinery and equipment.

Force Control Helps Wysong Improve Accuracy and Cuts Costs

Wysong USA is a manufacturer of industrial press brakes, hydraulic shears, and mechanical shears for sheet metal and plastics that have been around for nearly 120 years. Like many companies, their motto was “If it ain’t broke, don’t fix it,” so their product remained essentially the same for quite a while. But during a customer visit that motto clashed with another company saying, “The customer is always right.” This customer had changed out the dry clutch brake for an oil shear clutch brake that was more accurate. Well, “the customer is always right” won out, so Wysong updated their product line and not only increased accuracy but also reduced costs, making it a win all around.



Wysong Shears cut sheet metal and sheet plastic for companies making large automotive components, tractor hoods, and lawnmower hoods, among others. Often the presses run 24/7, so accuracy, repeatability, and durability are key factors. As the business has shifted from sheet metal to plastic sheets, customers have been looking for increased accuracy.

Their shears are used to cut plastic from 60-in. wide to 10-ft. wide, in thicknesses from 30-thousandths of an inch to five-eighths inch, like those used for lawn tractors. They typically operate from 60 strokes a minute to upwards of 200 strokes a minute.

During a routine customer visit with Primex Plastics, Wysong production engineer Linton Summers noticed that the clutch brake originally installed had been replaced with a Force Control clutch brake. Summers was impressed with the increased accuracy and repeatability as he watched the machine shear section after section of sheet plastic. While the Primex results were impressive, Summers knew they'd have to make some changes to the set-up for OEM scale productions. For instance, removing a gearbox and replacing it with couplers and turning shafts is fine for a one-off project, but a keyed shaft was required for production volume.

Originally the shear was designed to run even if the mechanism is slightly out of position. "When you told it to go if it skipped a tooth, it would still go," said Summers. This breakdown caused a wrong-sized part and wasted material—both undesirable outcomes.

Out with the Old

Wysong formerly used a clutch brake in their shears. These shears are designed to run at 60 strokes a minute and include a flywheel to overcome inertia and an encoder on the chain drive cam switch. Depending on the speed, the flywheels could get rather large, up to 40-in. tall in some cases. Because there is inherent fluctuation with a chain drive, the accuracy of the encoder was not optimal. The encoder certainly helped, but slight inaccuracies over time meant manual adjustments were typically required, either by an operator or by maintenance personnel. The old-style designs also needed maintenance every year, to the tune of about \$4,700 for the parts, plus two to three hours to change out the parts. Once reassembled, the shear had to be manually finessed to ensure it was running properly before production could resume.

The new Force Control clutch brakes are very different and require far fewer auxiliary components to operate. There are no flywheels, and one Force Control Posidyne model 3 clutch brake replaces a pair of clutch brakes, so the cost savings add up quickly. The old-style design required a D-style motor with high slip to allow the motor to accelerate the flywheel up to speed. Eliminating the flywheel allowed Wysong to utilize a much more common (and less expensive) B-style motor.

"We use just one Force Control, and we connect to a worm drive gear which we mount to the side frame," said Summers. "Then we have a motor sitting on top. It's all caged in. We've designed it to mount to a plate that we can easily remove."



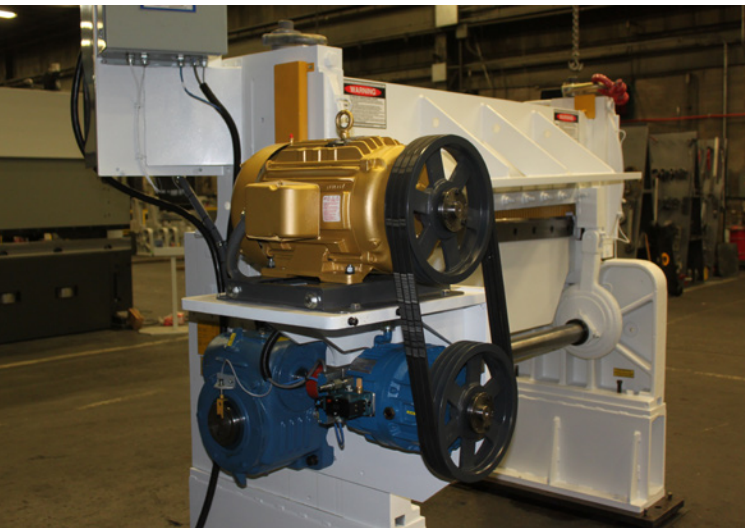
Old design with original clutch brake.

By replacing the dry clutch brakes with Force Control brakes, the shears achieve much greater accuracy and repeatability and are far more cost-effective in terms of manufacturing and maintenance. "The repeatability standpoint is a night and day difference. On the old version, you've got the brake and then you've got the clutch that's on a flywheel. It's all one set of air," says Summers, "so there is only so much adjustment available. With the Force Control, we have the manifold with the air adjustment for the brake and the clutch. You can run more air on the brake and less on the clutch. It's separate, whereas on the original it's all one. With the Model LC, the Force Control corrects itself automatically."

The Force Control Model LC is a form of closed-loop positioning control. It reads the machine position on each stop and adjusts, in real-time, where to signal the stop for the next part/cycle. This compensates for any frictional, wear, or thermal changes that occur over time, and greatly improves accuracy. Adding the Model LC eliminated the cam switch and chain drive from the old design, simplifying assembly while improving accuracy.

Designed with low inertia cycling components makes the Posidyne clutch brake more efficient, requiring less motor horsepower to accelerate the load, and less torque to stop the load. Their totally enclosed design is impervious to dust, chips, chemicals, coolants, caustic washdown, weather, and more, making them ideal for hostile environments.

Their multiple-disc design produces high torque from a small package. Recirculating the fluid dissipates the heat of the engagement, which is a common cause of downtime with other clutch/brake assemblies.



Posidyne retrofit with worm gearbox.

A simple actuation system allows torque in the clutch and brake to be precisely controlled. Adjustment for rapid or soft starts and stops is easily accomplished. Manifold-mounted control valves reduce response times by eliminating hoses and fittings and are recommended for high-cycle applications. By reducing the high starting inrush currents and the associated power factor imbalance in the motor these unique clutch/brakes can also reduce energy costs.

The Posidyne clutch brake can be actuated by air or hydraulic pressure for use in a plant or outside remote applications. The hydraulic actuation package includes a hydraulic pump, solenoid valve, regulators, and a filter. A heat exchanger can be added for additional cooling. It's also inherently explosion-proof with the addition of an explosion-proof actuation valve or locating the valve in an explosion-proof cabinet. Multiple sizes are available to suit particular applications from one-half to 350 hp (99 lb. in. to 79,000 lb. in.) with cooling options, control logic, and mounting arrangements to simplify and speed installation.

Oil shear technology is the reason that clutch brakes by Force Control last up to 10 times longer than standard dry friction clutch brakes and do not need maintenance, adjustment, or disc replacement. Oil Shear Technology is the function of a boundary layer of transmission fluid in shear between the friction discs and drive plates. As the parts come together, the fluid in shear will transmit torque between the two parts, as well as absorb heat. This eliminates direct contact of the friction discs and drive plates during high-speed slip. Heat from the friction surface is dissipated as the fluid circulates to the housing.

Heat dissipation is a major component when selecting a clutch brake. The Posidyne clutch brake basic unit dissipates heat through a unique internal design pumping system which causes the transmission fluid to be drawn into the center of the hub, flow through the friction stack, and by centrifugal force is pulled out of the stack to the housing. Cooling occurs as the fluid flows down the housing walls. Additional heat can be dissipated by adding internal water-cooling or pulling the fluid out to external-oil-to-water or oil-to-air heat



exchangers. This also allows for the use of an oil filter extending the life of the fluid. These cooling options allow the same compact size Posidyne clutch brake to be used on high inertia loads, or in extremely high or low temperatures.

The Force Control brake also saves money, both in manufacturing costs and ongoing maintenance costs, so it's a winning proposition not only for Wysong but also for the customers who will be using them. The company has also designed modular retrofit kits so that older-style flywheel models can be upgraded to enhance accuracy and reduce maintenance costs.

forcecontrol.com

Miki Pulley BXR Spring Applied Brakes Ideal Safety Brake for Robotic Arms

Miki Pulley is introducing their BXR Spring Applied Brakes for direct sale to OEMs in North America. The BXR safety



BXR Brake's low-profile design is two-thirds the thickness of most other brake models. Lightweight and energy-saving, this fast-response brake is ideal for servomotor applications.

brake may serve as an emergency brake, as well as a holding brake. Its low-profile design is two-thirds the thickness of other brakes in their lineup. In addition to saving space, weight is also dramatically reduced.

The BXR is an ideal safety brake for robotic arms. In these applications, when a catastrophic power failure occurs, robotic arm movement must be halted immediately to prevent mechanical system collapse and equipment damage. In the event of power failure using the BXR safety brake, compression springs engage and capture the brake's rotor hub immediately stopping arm movement. Designed with a very thin profile, the BXR saves space in articulating joints. Idling wear is also reduced significantly because of its lightweight construction. The BXR brake may also be installed on the output face of a servomotor, serving as a power-off holding brake. This can be an advantage when the overall assembly size must be contained in a small envelope.

Additional design benefits include a single friction plate, which provides fast response in high-cycle applications. Armature engagement is smooth, quiet, and operates with no chatter.



Sleek, extra thin-designed Miki Pulley BXR Brake blends perfectly into this compact articulating robotic arm joint application.

Successful in articulating joint applications where a cantilevered load must be minimized, the extra thin BXR brake operates in this way: to open the brake and allow free rotation, voltage flows to the coil. When power is disengaged from the coil, internal compression springs push the armature plate toward the rotor disc, halting it against the top plate. The square/splined rotor hub affixed to the input shaft interfaces with the rotor disc holding rotational movement.

The Miki Pulley BXR brake is also a space and weight-saving option for servomotor applications. Operating specifications are:

- Brake torque: 3.688 ft. lb. ~ 40.566 ft. lb.: (5N · m ~ 55N · m)
- Brake outer diameter: 3.287 in. ~ 7.280 in.; (83.5mm ~ 185mm)
- Ambient Temperature: 14°F ~ 104°F; (-10°C ~ 40°C)

Miki Pulley also makes available even smaller sizes with the designation BXR-LE, (low energy) for miniature applications 0.06 Nm to 3.20 Nm.

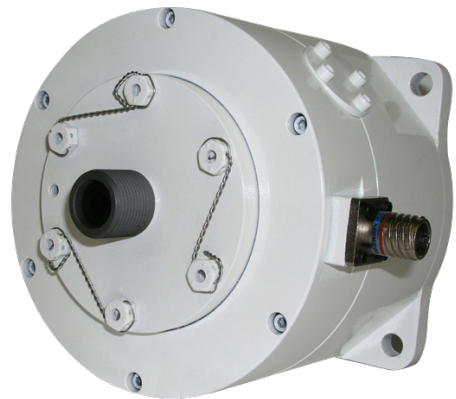
mikipulley-us.com

Ringfeder's Customizable Solutions for Precise Power Transmission Requirements

The MTL Bidirectional, One-Way Clutch

A clutch that is both bidirectional and one-way might sound like a contradiction. But in fact, Ringfeder offers just such a clutch. As a bidirectional clutch, the MTL can transmit torque from input to output shaft in either rotational direction. And its one-way functionality prevents output shaft loads from backdriving into your other power transmission components. These capabilities make the MTL bidirectional one-way clutch excellent at sustaining torque overloads and shock loading.

Choose from three standard models with torques ranging from 15 to 120 ft. lbs. and bore sizes ranging from seven-eighths to 1 7/8 in. The clutch's driving end achieves smooth rotation regardless of the direction of the load, and it is self-locking—made possible by a friction disc and ball ramp design.



The MTL bidirectional one-way clutch can sustain substantial torque overload and shock loading while preventing the output shaft from backdriving the input shaft in either direction.

You can easily integrate the MTL bidirectional one-way clutch with other Carlyle Johnson clutches, brakes, and torque limiters, creating lighter and more compact designs depending on the component combination. For example, pair the MTL clutch with a Carlyle Johnson spring-applied clutch for braking, torque limiting, and manual driving functionalities—all without having to worry about backdriving.

We can even include a torque limiter as part of the MTL bidirectional one-way clutch. If you place it on the input side, it will limit the driving torque. If you place it on the output side, it will allow slipping in the stationary



The FEA clutch is ideal for heavy-duty applications and provides a long service life. Its powerful electromagnetic disengagement force ensures a low-drag neutral.

component if there is an excess load, protecting either upstream or downstream components. Both the internal torque limiter and spring-applied clutch are available customization options. Another option is the ability to set a firm slipping point.

Our experienced engineers can customize the MTL bidirectional one-way clutch to meet your design and application requirements. We can also alter any of our standard products or design an entirely new clutch.

The FEA Fail-Safe Spring Set Electromagnetic Clutch

When developing fail-safe systems for precise, delicate, or heavy-duty machine applications, components that deliver extreme reliability and high performance are invaluable. The FEA Fail-Safe Spring Set Electromagnetic Clutch features a durable design with high-strength components to provide high torque in a compact, easy-to-install, completely assembled package.

Our FEA unit is a spring-applied, positive-acting electric clutch with high repeatability. A powerful electromagnetic force disengages the discs to provide a low-drag neutral, and the radial magnetic flux path provides maximum torque throughout the clutch's lifespan. To extend the clutch's lifespan even further, a unique, adjustable end-plate design facilitates easy wear compensation.

The FEA's coil is sealed within a stationary housing—enabling operation in both wet and dry environments—that is supported by ball bearings. For additional protection, internal compressive forces are contained within the clutch and not transmitted through the bearings. With a focus on dependability, the FEA's design contains no levers, cams, or other highly stressed parts.

Because there are few moving parts and no slip rings, brushes, or complex wiring that make repair difficult, this clutch can be rebuilt without requiring any special tools. Like all their electromagnetic clutches, the FEA is precision-engineered and undergoes thorough testing to ensure proven, dependable performance across a diverse range of applications.

Custom Solutions

Ringfeder dedicates a significant portion of its production efforts to designing and manufacturing special clutches, brakes, and integrated systems that are custom-tailored to exact user specifications. If you need a custom electromagnetic clutch solution, Ringfeder has the experience and skills to meet your toughest power transmission challenges. Some common modifications include increased torque or adding electronic controls to achieve different actuation and release speeds as well as acceleration and deceleration control.

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