

Custom-Collaboration

SETS BIG ASS FAN IN MOTION

Anyone who has ever strained a neck muscle checking out the ceiling in a warehouse—or any large, indoor space—notices there are some pretty big fans required to circulate the air. Embracing this concept with its name, the Big Ass Fans Company, of Lexington, KY, produces six- to 24-foot-diameter ceiling fans that use their immense size, not speed, to move massive amounts of air over large spaces. The Powerfoil X, the company's latest brainchild, rolled off the production line in February and features a custom gearbox created in close collaboration with Stöber Drives.

"We wanted to develop the absolute best industrial fan ever built, and it all started with designing the NitroSeal Drive for an incredibly long fan life," says Katie Cecil, marketing communications specialist for Big Ass Fans.

The NitroSeal Drive is a maintenance-free, lubed-for-life, two-stage reduction gearbox featuring Stöber's HeliCamber gearing. The method of cutting this style of gear involves cambering the tooth profile and crowning the lead of the tooth to give the highest possible number of teeth in contact. The gear technology provides minimum wear, low backlash and low noise.

"All the gearing was designed specifically for that gearbox application," says Mike Mitchell, product manager for Stöber. "An air moving device is not just like a general conveyor application where you mount the reducer and it sits there, and it just sees the torque loads of the conveyor belt. You have to have many things come into play."

"There are three gear passes and they're all optimized for that air moving device," Mitchell explains. "The tooth profile, everything was done to optimize for the shocks and torsional effects associated with an air moving device."



The Powerfoil X fan features the NitroSeal gear drive built by Stöber Drives in collaboration with the Big Ass Fans Company (courtesy Big Ass Fans).

Long life, reliability and efficiency were the main concerns in the gear selection. Mitchell cites environmental concerns as part of these design considerations. "We live in a new market, a new evolution, where we want to be green," he says. "The helical gearing that was used for this is very, very efficient; therefore, the reducer runs cooler, it consumes less energy, so all that's good in our environment that's trying

to go green."

Mitchell says Stöber always has environmental issues in mind. "We don't even market some of the high energy consuming gears anymore. We have migrated from that into helical gearing—for that reason."

A 2.56" stationary output hollow drive shaft runs through the gearbox. The hollow shaft is 275 percent stronger than a standard solid output shaft,

according to Big Ass Fans, and it allows for stationary piping for integrating electrical functions, such as lighting, cameras, sensors or smoke detectors. This type of shaft is a feature of one other Big Ass Fan model, the Element. "We expect to see this feature in more models in the future, but retrofitting it to older ones is problematic because of the physical configuration of the gearboxes on the older fans," says Rick Oleson, engineering manager for Big Ass Fans.

SKF tapered roller bearings were used throughout the gearbox to support the axial load and at the bottom end of the hollow shaft. The bearings hold 100 percent of the axial load and are approximately 15 percent stronger than traditional ball bearings in this application due to the increased surface area the tapered bearings allow for.

A hub wheel assembly is responsible for attaching the NitroSeal Drive's output shaft to the hub mounting flange. The mounting flange is bolted to the gearbox shaft on one side, and the hub is mounted to the other side of the flange. The hub wheel assembly was included in lieu of a friction coupling, which relies on one piece to expand and hold all the suspended weight.

"The friction couplings have proven to offer excellent performance in many thousands of installations, and we continue to use them in a number of models," Oleson says. "In the models with a hollow output shaft, however, the much larger diameter of the shaft lends itself better to the bolted flange interface that we have chosen for the Element and Powerfoil X fans."

The last few steps in production of the NitroSeal Drive include Mobil SHC 630 synthetic gear oil to protect the gears from corrosion and filling the gearbox with nitrogen, prior to hermetically sealing it using Simrit seals. "The final detail was to fill the gearbox with nitrogen before it was sealed, ensuring a perfectly pure internal environment in which corrosion cannot occur," Oleson says.



The hollow output shaft creates a stationary platform for integrating electrical functions, like lights, cameras, motion sensors and smoke detectors.

As this was a custom design, don't expect to find the NitroSeal Drive anywhere but inside a Big Ass Fan. However, Stöber Drives will likely continue to co-develop products for Big Ass Fans judging by the degree of amicable cooperation achieved in this

project. "It was multifunctional teams," Mitchell says. "You had your application engineering, product management, your quality people were involved, your design engineering—of course your materials people—and that was from

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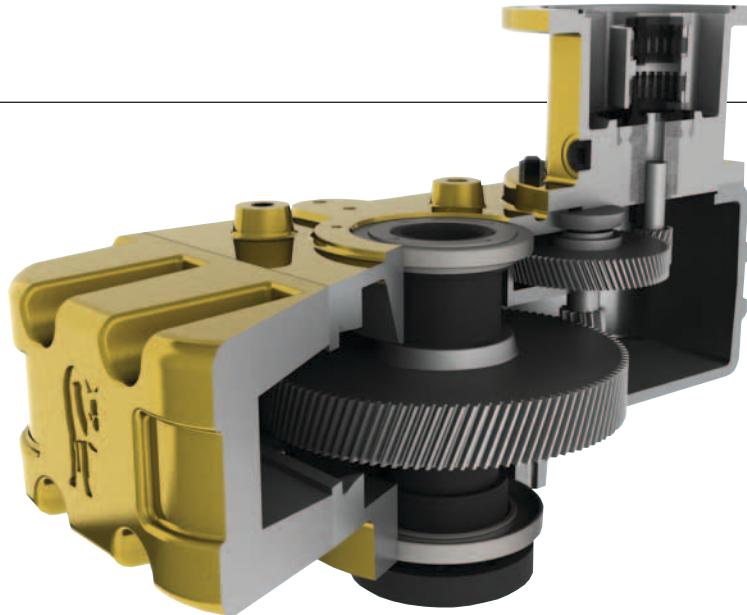


The hub wheel assembly relies on one piece to expand and hold all the assembly weight instead of using friction couplings.

both companies. So we had interactions at all those levels to make sure we packaged a reliable product."

Mitchell and Oleson both commented positively on the collaboration. "It was great," Mitchell says. "We got to hear their requirements; we got to be involved in analyzing, and that way we could properly affect the internal components of the gearbox to meet the aggressive guidelines they were putting out to solve all of their concerns from their customers in the past."

Oleson says, "This is the first time that we have worked with Stöber to develop an entirely new, custom gearbox for our application. We look at this as part of a continuing, ongoing relationship, which will result in more innovations in the future."



The NitroSeal drive features Helicamber gearing, which provides low friction between gear teeth. The drive is filled with nitrogen and hermetically sealed for life, making it maintenance free.

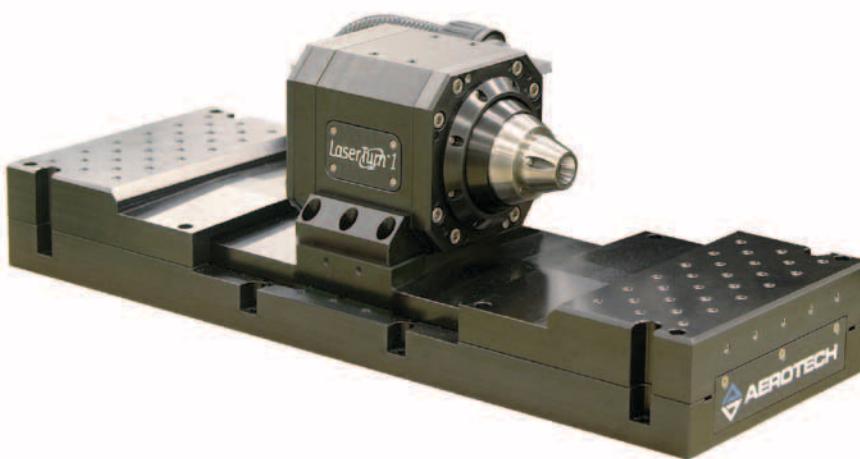
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Linear/Rotary Platform

COMBINES MATERIAL HANDLING
WITH DIRECT DRIVE, ROTARY MOTION



The LaserTurn 1 is a linear/rotary motion subsystem that integrates automated material handling with direct-drive linear and rotary motors to pro-

duce a cylindrical laser processing system that features a high throughput and accuracy. The design targets manufacturing cardiovascular and neural stents.

The system uses a pneumatically actuated type D collet closer with an aperture for product feed-through. The closer holds tubing with diameters from 0.1 mm to 7.9 mm in dry cutting applications and up to 3 mm for wet cutting applications. The closer is "designed to minimize axial tube motion during clamping operations by keeping the collet stationary and moving the tapered mating surface during collet open/close operation," says Byron Fruit, application engineer for Aerotech, Inc. "This minimization of tube motion eliminates the need for some operator intervention during processing, so as to provide a more automated and streamlined process."

The LaserTurn 1 has front and rear tooling platforms with M4 mounting features. They are bolted to the linear stage base to allow a stiff, common inertial frame of reference. This permits fixtures to be attached easily. The LaserTurn 1 is protected from fluids in

wet cutting processing by a sloped, hard cover design.

Both the linear and rotary axes use a direct drive motor and encoder technology. Linear and rotary encoders are coupled directly to the load for high accuracy and repeatability.

The motion subsystem uses Aerotech's A3200 control system, which is completely digital and features FireWire networked drives. The digital construction optimizes current, velocity and position servo loops for performance. "The A3200 controller comes with a powerful software suite, which includes advanced diagnostic and tuning capabilities that allow the user to easily optimize the servo loop gains and view system response through a simple GUI," Fruit says.

The control system is capable of advanced trajectory generation capabilities like multi-block look-ahead, which reduces geometry errors that can occur in tight profiles by regulating cutting speed. The position-synchronized laser firing output feature adjusts laser pulse frequency to match the cutting speed, so optimal laser power coupling is maintained.

With the LaserTurn 1, "Aerotech's goal was to provide a motion subsystem tailored specifically to cardiovascular and neural stent manufacturing in order to provide the highest throughput and performance possible in a compact form factor," Fruit says. "This combination yields the lowest cost of ownership in the industry."

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Automation Series Conveyors

FEATURE DRIVES THAT ROTATE TO MOST POSITIONS

The Automation Series AS40 and AS65 low-profile belt conveyors from QC Industries provide high speeds with a single-piece extruded aluminum frame and feature tool-less belt changes, rotate-to-replace drive bearings and the Pivot rotatable drives, which can quickly be rotated to almost any position as application requirements change. The Pivot drives can also

be positioned to avoid products on the conveyor belt or obstructions integrated machines cause.

"The drive adds flexibility to the conveyor application," says Chris Round, marketing manager for QC Industries. "In the past, from conveyor manufacturers, we used to have to ask customers, 'do you want it on the left or right? And do you want it top or bottom?' So it would have to be top left, bottom left, top right, bottom right. And you had to ask them, 'OK, are the parts coming towards you?' and you had to really figure all this out. Now you can just say left and right. They can put it at the top, they can put it at the bottom, they can put it straight out."

"One of the additional advantages is they can actually tuck it back up underneath the conveyor. Where in the past, there would be a bunch of drive components hanging outward past the conveyor that would have to be considered as you draw different automation components around this. Those drive parts a lot of times get in the way."

The drive rotates to a new position by loosening two set screws, rotating the drive and retightening the screws. The drive locks into place with a knurled collar. Torque is transferred from the motor to the conveyor's drive pulley by a timing belt inside the guard. The Pivot drives are available on any AS40 end drive conveyor and are compatible with any standard QC Industries AC or DC gearmotor, side rails and guides with both flat and v-guided belts. They are capable of belt speeds up to 400 feet per minute.

The AS65 center drive conveyors fit well with integrated machinery using the below-belt drive that can be positioned at any point along the length of the conveyor.

Belt tension is released by a button release mechanism, so belt changes are made without tools, and under-belt cleaning is simple. Sealed, deep-groove ball bearings are used, which can be replaced easily by rotating and pulling them out.

The single-piece aluminum frame has tee slots for mounting a stand or accessories quickly. The conveyors are 18" wide and up and have a multi-piece aluminum and steel frame. Drive packages have DC and AC motors in both standard- and heavy-duty models with various mounting options. The conveyors are efficient and do not require much torque beyond the initial load at startup, according to the company's news release.

Appropriate belt tracking is ensured by a crowned pulley. V-guide belts are available without changing any of the components. Over 50 belt styles are offered, from multi-purpose and accumulation belts to anti-static and color contrasting specialty belts.





The Automation Series conveyors handle speeds up to 400 feet per minute and loads up to 120 pounds. They come in widths from 2 to 24", lengths from 18" to 13 feet for single-piece frames and 14 to 25 feet for multi-piece frames. The conveyor can extend or shorten as requirements change due to a modular design, and they feature a five-year warranty.

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PMDC Speed Control

MOUNTS TO MOTOR



The TightDrive speed control from Bison Gear was designed for convenience by mounting directly to permanent magnet DC motors up to 1/6 hp (124 W), as opposed to being wired to the motor through an independent cable system. The TightDrive provides a 20:1 speed range and maximum output of 90 V.

The aluminum extrusion housing protects to NEMA 1 (IP 30) and has high heat dissipation. The on/off switch is combined with a speed potentiometer for speed control. Three adjustable potentiometers supply settings for minimum rpm, maximum rpm and current limiting. SCR control architecture allows for tighter speed regulation than alternative controls, according to a Bison press release.

Designed for 115 V 50/60 Hz operation, the TightDrive motor-mounted speed control includes a three-foot power cord and NEMA 5-15P plug. The control can mount to the motor in 90-degree increments for best positioning of the cord exit and motor leads.

"Simple solutions are often the best," says Matt Hanson, Bison Gear vice president of portfolio management. "The new TightDrive enables machine builders to put the control, the power and the gearmotor more conveniently at the point of use, while saving installation time and reducing costs. As a bonus, users can maximize energy savings by easily changing speeds as requirements change."

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Economical Slide

FITS INTO TIGHT SPACES



Techno Inc.'s ZF1 belt drive slide is a lightweight model driven by a 9 mm-wide HTD belt available in travel ranges from 153 mm through 2,853 mm. The low cost belt slide is 30 mm wide with an accompanying carriage 72 mm wide, so it can be placed in tight spaces.

The ZF1 belt drive slides have a maximum speed of 1.5 m/sec, and can be ordered with 200 W (2:1 ratio) or 100 W (2:1 ratio) servomotors; 50 N·cm, 160 N·cm stepper motors; or a 2:1 ratio assembly without a motor. The belt's drive pulley is 19.1 mm in diameter and has a specific mass of 0.0225 kg/m.

"The ZF1 belt drive slide is our most economical option. Customers will receive a slide that is compact, but powerful," says Joe Griffin, linear motion sales manager. "The carriage rides on two precision ground steel shafts that are supported the entire length of travel to minimize deflection, while the HTD belt profile helps to eliminate backlash."

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Arched Tooth Profile

IMPROVES DRIVE BELT SYSTEM

The Excel-A-Belt miniature drive belt system from NBK features an arched tooth profile with zero backlash, so the system runs longer, cleaner and quieter. The upgraded tooth profile allows for high accuracy positioning and precise rotation transmission by providing a rolling action between the belt and the drive sprocket. The belt tooth enters and leaves the sprocket in a rocking motion, so contamination from belt or sprocket tooth abrasion and wear is reduced.

The drive sprockets have bore sizes from 3–25 mm and PD's of 17–54 mm, and they come standard for shaft clamping. Four belt widths are available



in 3, 4, 6 and 9 mm. The drive system is suited for operation with motors of 10–1,000 W.

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Polymer Ball Bearings

WITHSTAND HARSH ENVIRONMENTS

The lubrication-free polymer Xiros ball bearings from igus were developed to perform where conventional metal ball bearings are limited by factors like temperature, chemical or moisture exposure. They are technically optimized, available from stock and feature a predictable service life. The ball bearings were developed in response to customer demand.

"We were hearing that while metal ball bearings are suitable for most applications, they sometimes fail in severe environments," says Tom Miller, igus bearings unit manager. "In applications with high temperatures, chemicals or

washdowns, metal bearings can corrode and cause contamination leading to costly maintenance and downtime. In washdown applications, the grease and oil used to keep these bearings lubricated can drip onto the machine or anything it is handling. Corrosion is also a problem for metal anytime water or chemicals are present."

The dry running polymer ball bearings don't compare with permanently-lubricated metal roller bearings when considering service life, speed or permissible loads; however, in many applications—such as medical engineering, chemical, food, pharmaceutical, biotechnology and plant engineering—low friction values and minimal driving forces are the basic requirements.

"By combining our extensive knowledge of bearings and tribologically optimized polymers, we are able to offer a ball bearing for the harshest applications," Miller says. "The races and cage



of Xiros ball bearings are available in two material blends, including igus' high-temperature iglide A500, which has good chemical resistance and can operate in temperatures reaching 302 degrees Fahrenheit, and a more economical material for less severe applications. The corrosion-free balls are made from stainless steel, and glass balls are also available for maximum corrosion resistance."

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Adjustable Speed Applications

BENEFIT FROM MOTOR, CONTROL'S BRUSHLESS TECHNOLOGY



Baldor Electric Company introduces the BSM25C and BSM33C brushless motors that provide designers with brushless motor benefits like higher torque, more power in smaller packages, reduced maintenance and quieter operation. The motors are available from stock with standard NEMA face/foot mount and ranging from 1/4 to 3 HP (0.18–2.2 Kw).

When combined, the BSM motor and BMC control can be adjusted to cover a speed range up to 7,000 rpm, adjustable acceleration time from 0.1–30 seconds, and it comes in a fully

protected package that includes motor overload, short circuit and electronic inrush protection. Adjustable speed applications include mixers, blowers, indexers, feeders and conveyors.

For more information:

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CD Shaft Couplings

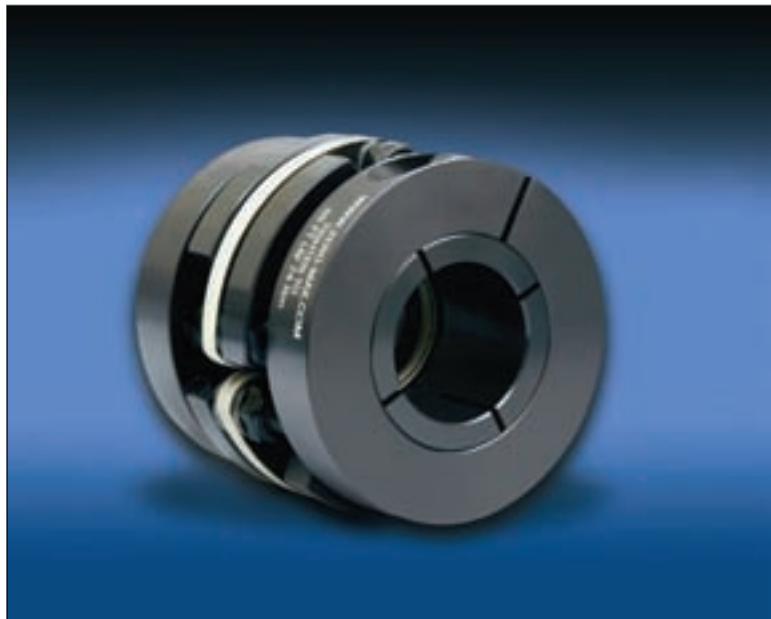
HANDLE HIGH STRESS APPLICATIONS

Zero-Max's CD couplings combine high dynamic load capacity and high torsional stiffness for reliable system operations. They are suitable for fixed displacement hydraulic pumps driven by servomotors.

The working part is made of a composite material. The couplings feature a composite disc design that withstands the stress of a servomotor. They are available in single and double flex aluminum hub models with or without keyways. Single flex models have a torque capacity range from 40 Nm to 1,436 Nm and more with speed ratings from 4,400 rpm to 17,000 rpm.

"This new pump drive technology has become increasingly popular because of dramatic improvements in their energy efficiency and noise reduction," says Robert Mainz, Zero-Max

sales manager. "These pump systems utilize the power and precision that only a servomotor can provide. The system pressure is controlled by modulating the output volume of a fixed displacement pump. This is made possible utilizing a high performance control system and the high performance qualities of a CD shaft coupling."



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Sterilizable Drives

SUIT HIGH-SPEED MEDICAL APPLICATIONS



Maxon Motor launched two sterilizable drives, EC size 5 and EC 13, for use with or without planetary gearheads in medical applications up to 90,000 rpm. The drives exhibit high nominal speed, low noise and low vibration operation, marginal thermal emission and small size.

The two drives are identical and have equal performance data and characteristics. The motor and gearhead of the size 5 version has an outside diameter of 0.5" and a shaft of 0.125". The motor features a servo mount type of motor fixation. The EC13/GP13 version is conveyed in metrics, with an outside diameter of 13 mm, a 3 mm shaft and a flange with three face side threads.

The drives have "personalized outer

wrapping," according to the company's press release, but they are depicted by their similarities. They are both ideal for medical design applications, they have a compact design with high nominal speed, quiet running, minimal thermal emission and sterilizability of typically 500 autoclave cycles. They are equipped with either Hall sensors or sensorless and with three different windings. The gearheads come in versions with one, two or three stages and with or without output end shaft sealing.

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