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ISSN: 1091-370X

TOP DEAD CENTER

THE TIGHTROPE

From the mid-1990s until recently, if you were involved with diesel engines, either in engine development or designing diesels into machines, your product development path was pretty clearly defined.

When the Clean Air Act absorbed diesels under its regulatory umbrella, the emissions levels required and the deadlines to meet those levels were very specifically spelled out.

So engine manufacturers, and eventually equipment manufacturers, had an exacting timeline with very little flexibility. The plan was right in front of them. Win or go home. Not that equipment engineers weren't in for some surprises. "Um, I have to put all that into a skid-steer loader?"

Which is not to say it was easy. We talked to plenty of engine engineers, many of whom stared out into space and said things like, "we've got to get NOx down to what? By when? Do they know reducing NOx and PM is a paradox?"

But for management it was a slighter easier decision, assuming they wanted to stay in business.

And, for the most part, it got done. Thousands of engineers were hired, huge investments were made in machining, software and test cells, and a few billion dollars later, those that wanted to survive, survived. The mandated emissions deadlines were met. Something, cheating scandals aside, I still think is a tremendous and underappreciated engineering accomplishment. Sadly, it will mostly go unrecognized.

But in today's alternatives & electrification *et al* world, the choices and the decision-making process is a lot harder.

That electrification is going to be part of our collective future is a given. When? In what markets? In what volumes? In which specific applications? How much do we need to invest? What and when do we need to invest it in?

Emissions was almost economically agnostic. The choices around electrification and the other emerging forms of propulsion technology are not that easy.

Walking the tightrope between the needs of new mobility technology yet satisfying the financial considerations of a company and its associated constituents, in uncertain times, will prove the mettle of the C-suite denizens at many companies and indeed for an entire industry.

Mike Osenga
mike.osenga@khl.com

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SCANIA

What a year, 2019. In this issue, the Newsmaker of the Year is revealed along with a selection of Notable New Products.

DIESEL PROGRESS®
(ISSN 1091-370X) Volume 85
No. 12 – Published monthly by KHL Group Americas LLC, East Ember Glow Way, Phoenix, AZ 85050, USA. Subscription rates are $95.00 per year/$10.00 per issue. Periodicals postage paid at Waukesha, WI 53186-1873 and at additional mailing offices.

Canadian Publication Mail Agreement # 40035419. Return Undeliverable Canadian Addresses to: P.O. Box 456, Niagara Falls, ON L2E 6V2, Canada.
Email: subscriptions@khl.com.
POSTMASTER: Send address changes to: Diesel Progress, 20855 Watertown Road, Suite 220, Waukesha, WI 53186-1873.
PRINTED IN THE USA.
Reprints of all articles published in Diesel Progress are available. Please address inquiries to: may.hyde@khl.com
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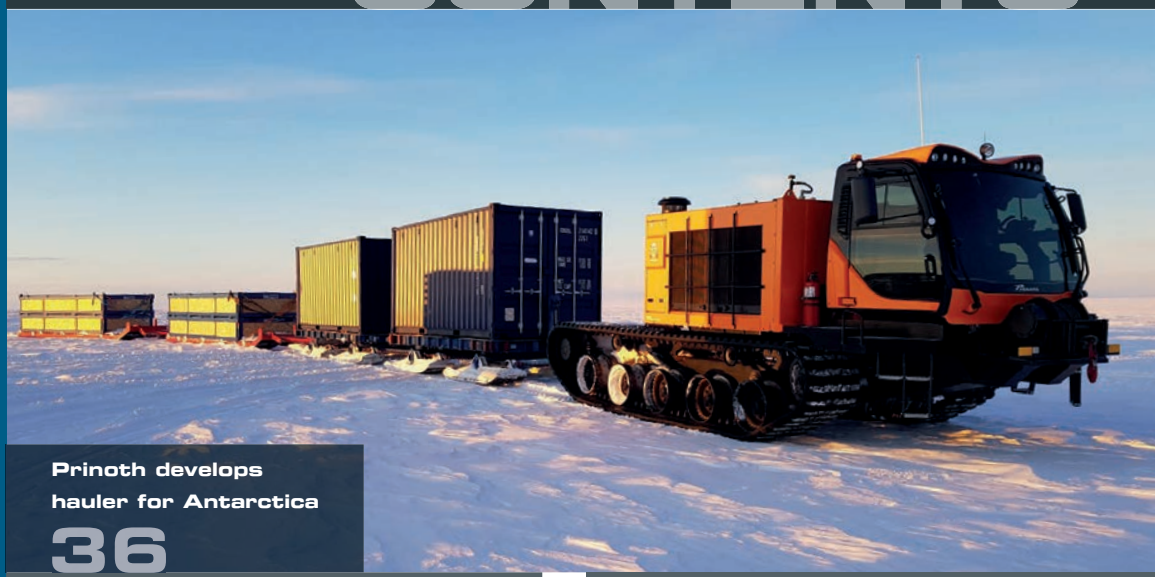

INDUSTRY NEWS

PRODUCT NEWS

INNOVATIVE USES OF HORSEPOWER

COLUMNS & BULLETINS

BUSINESS

OLD WORLD INDUSTRIES (OWI), of Northbrook, Ill. which manufactures and distributes heavy-duty fluids and is the maker of Peak and BlueDEF products, has acquired thje diesel exhaust fluid (DEF) and urea global business and assets from DASCO Inc. of Monument, Colo.

DASCO began selling DEF in 2013. OWI will service DASCO's DEF customers and working with its DEF and urea suppliers.

BENDIX SPICER FOUNDATION BRAKE LLC has broken ground on a 130,000 sq.ft. expansion of its wheel-end manufacturing facility in Bowling Green, Ky. The addition will increase disc brake capacity.

The business is a joint venture between Knorr-Bremse subsidiary Bendix Commercial Vehicle Systems LLC and Dana Commercial Vehicle Products, LLC.

"The trend toward greater traffic safety is leading to an increasing substitution of drum brakes by the even more safety-oriented air disc brakes in the North American market," said Dr. Peter Laier, member of the executive board of Knorr-Bremse AG and responsible for the Commercial Vehicle Systems division."

SCANIA, NAVISTAR TO STUDY SUPPLYING VEHICLES, SERVICES TO CANADIAN MINING SECTOR

Scania and Navistar International Corp. said they intend to study a relationship to cooperate in providing vehicles and services for mining operations in the Canadian market. The parties plan to bring a limited number of Scania heavy-duty off-road trucks for trials by selected operators in late 2020.

The cooperation reportedly entails using Scania's knowledge of mining vehicles, consulting services and lean operational support in combination with Navistar´s dealer network, aftersales and service capability. The aim, said Scania, is to provide customer support to global customers in the mining sector and trucks for heavy haul, general goods transport, fuel delivery, water delivery and personnel transportation.

More than 10,000 Scania heavy-duty trucks are in service in mining operations, for instance in South America and Asia.

"Our trucks and services together with Navistar's well-established international truck sales and service network have the potential to also make our cooperation a win-win for Canadian mining operators," said Alexander Vlaskamp, senior vice president and head of Trucks at Scania in Södertälje, Sweden.

More than 10,000 Scania heavy-duty trucks are in service in mining operations, for instance in South America and Asia. The company will work with Navistar to investigate the Canadian mining market.

Both parties will seek regulatory approval through the appropriate agencies in Canada to deliver the Scania trucks.

"Demand from the mining market is changing," said Persio Lisboa, executive vice president and chief operating officer at Navistar.

"Companies are exploring more sustainable solutions that improve worksite flexibility, increase uptime and reduce total operating costs. Working with Scania as a partner will help us rapidly achieve scale in addressing this unique market segment with comprehensive and powerful solutions."

The cooperation builds on the existing fruitful strategic alliance between Traton SE, Scania's parent company, and Navistar, which was initiated in 2016 and has been developed since then.

Following two runs at Elvington Airfield in York, England, a modified JCB Fastrac 8000 has broken the world record for a tractor, with a peak speed of 153.771 mph and an average of 135.191 mph. Its 7.2 L JCB DieselMax diesel engine is rated 1016 hp.

With the previous record of 103.6 mph having been set by JCB's Fastrac One in June 2019, the project team embarked on a plan to break the record again with Fastrac Two – which was 10% lighter and even more streamlined than its predecessor.

GKN Wheels & Structures worked on the wheels. After making a number of prototypes, the final specification was a specially designed 12x28-in. wheel.

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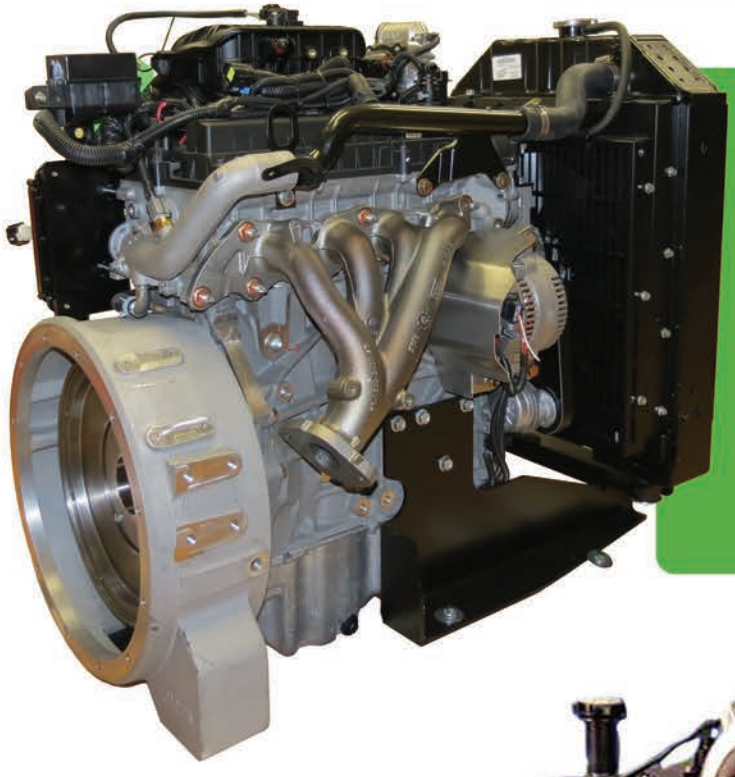

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DIESEL HR

PERKINS ENGINES CO. LTD., a subsidiary of Caterpillar Inc, announced that **DAVID NICOLL** has joined the Industrial Large Engine department as product manager. He will lead global strategy, product introductions, and lifecycle management for Industrial 9.3 to 18 L engines at the Mossville, Ill. operations. Nicoll's move was effective Nov. 1.

Succeeding Nicoll will be **JASON KERN** (pictured), as marketing and channel development director, also effective Nov. 1. In this role, Jason will be responsible for execution of global marketing and rental strategies and leading the Perkins distributor excellence program. Kern will be based at the Seguin, Texas, facility.

In his time with Caterpillar, Kern has held multiple titles of increasing importance including marketing supervisor in Aurora, Ill., commercial manager in Grenoble, France, Americas regional product manager, and most recently, large excavators global growth manager. Kern began his Caterpillar career in the marketing training program.

French hydraulic and powertrain manufacturer **POCLAIN GROUP** has named **FREDERIC MICHELLAND** to the position of chief executive officer.

He began his career in 1989 in the banking sector in France and abroad.

Over the last two years, Michelland held the position of vice-president of business development for Europe at the American aeronautical supplier Spirit Aerosystems.

BOOK YOUR PLACE AT THE OFF-HIGHWAY GLOBAL BRIEFING

Tickets are now available for the Off-Highway Global Briefing, which will take place on the Wednesday, March 11, of ConExpo-Con/Agg 2020 in Las Vegas, Nev.

Speakers at the breakfast briefing on Wednesday will include Chris Sleight, managing director of Off Highway Research, who will present the latest regional and global trends for the industry. He will be joined by Scott Hazelton, managing director of construction consulting at IHS Markit, who will discuss the underlying drivers for the equipment industry worldwide, and Alex Woodrow, managing director of Knibb Gormezano Partners, who will discuss technical and regulatory changes for the industry.

The briefing is designed to give attendees a detailed overview of the state of the global construction equipment market, the factors which drive it and the key issues for the industry. Off-Highway Research said it will be an essential event for managers and executives at equipment OEMs, component suppliers, aftermarket participants and other stakeholders in the global industry.

The event will be held at the Las Vegas Convention Center ahead of ConExpo's official opening time on the Wednesday of the exhibition. This will allow exhibitors at the show to attend without missing valuable time on their stands.

Due to capacity restrictions, places are strictly limited to 100 attendees. Details are available at www.offhighwaybriefing.com ■

ANOTHER MANUFACTURING EXPANSION FOR BOBCAT

Doosan Bobcat announced its third manufacturing plant expansion in less than a month. The company said it plans a $26 million expansion of its Litchfield, Minn., manufacturing facility. In October, Doosan Bobcat announced plans for a $17 million investment to expand its Gwinner, N.D., manufacturing operations. Earlier an $11 million investment was announced for its Statesville, N.C., facility.

The Litchfield announcement coincides with the official opening of Doosan Bobcat's nearly $2 million investment in a new Global Collaboration Center in downtown Minneapolis. The center is expected to serve as an easily accessible, centralized location where some elements of the company's global functions work, host global meetings and accelerate innovation.

Located approximately 65 miles west of Minneapolis, Doosan Bobcat's investment in Litchfield will modernize the existing production facility by adding new paint lines, a climate-controlled environment, assembly line upgrades and more. When completed, the project will more than triple the size of the current footprint and expand the facility to nearly 200,000 sq. ft. Once fully operational, the expanded facility is also expected to triple its workforce to an anticipated 300 full-time employees.

Construction at Litchfield is underway, with completion expected by September 2020. Gwinner is expected to be finished in July. The Litchfield facility has been a part of Doosan Bobcat since 2004, and today manufactures attachments for the firm's loaders and excavators (shown) for North America.

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Sept. 15-17

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Informa Markets
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Sept. 15-17

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Sept. 28-30

MINEXPO 2020 INTERNATIONAL

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Las Vegas Convention Center
Las Vegas, Nev.
National Mining Assocation
www.minexpo.com

✔ Indicates shows in which Diesel Progress will participate

A monthly column devoted to the on-highway truck market.

By **Steve Sturgess**

EMERGING TECHNOLOGY TALK FROM NACV

It was hardly surprising that electric trucks and buses were the main theme at the North American Commercial Vehicle Show in Atlanta. But the big surprise was the exciting news from Hyundai and Cummins about electrics featuring hydrogen fuel cell electric powertrains. And the same concept is being developed by Kenworth using Toyota fuel cells.

Nikola may be on the right track, after all.

But while most electrics are in prototype or customer trials to verify performance, reliability, cost of operation and all the other ducks the OEMs are trying to get in a straight line, the Hyundai HDC-6 Neptune is a full Class 8 and Hyundai is providing 1600 FCEV heavy-duty trucks -- fuel cell versions of its Xcient model -- to the Swiss commercial vehicle market, beginning this year and through to 2023.

While Hyundai is well known in North America for high-series, gasoline-engine cars at affordable prices, it manufactures and sells a complete range of commercial vehicles in 130 countries around the world. By far most are diesel powered, but Hyundai is also experienced in hydrogen fuel cell powered cars with two models available here: the still in development Tucson Fuel Cell which was available on a limited-lease basis and an all-new Nero with 354-mile range. Access to hydrogen fuel restricts the area of operation and the Nero will only be available in California. However, if Nikola's Trevor Milton manages to roll out his hydrogen fuel infrastructure, thing could change rather quickly.

HYUNDAI IN NORTH AMERICA

There was little technical detail in Atlanta about Hyundai's class 8 cabover Neptune in Atlanta, though the company did say it will be looking to the United States as a market for its trucks.

"Today at this show, by showing HDC-6 Neptune, the first hydrogen-only concept for Hyundai Motor Company's commercial vehicles, we will start exploring opportunities in the United States commercial vehicle market," said Edward Lee, head of Hyundai's Commercial Vehicle Business Division. "Furthermore, we are willing to work with other partners to pave the way to establish a hydrogen ecosystem for CV."

Cummins surprised a lot of us in 2017 when the company rolled out its battery electric AEOS. At NACV, Cummins announced it is pushing forward with a fuel cell version of its electric powertrain. But instead of the AEOS two-axle class 7 based on what looked like an International medium chassis, Cummins showed an unbadged Freightliner Cascadia to showcase the new technology. The badges for the truck had been scraped off, but the switch to a different OEM underscores that Cummins is remaining in the powertrain business and will rely on the OEMs to package its powertrain solution whether a customer is looking for a diesel or electric truck, Or bus. Or excavator. Or . . .

"Developing this hydrogen fuel cell truck as a technology demonstrator is an important step in gaining valuable insights that are critical to continue developing the right solutions for the market and preparing for the next 100 years," said Thad Ewald, vice president, corporate strategy at Cummins and leader of the company's Electrified Power business. ■

ABOUT THE AUTHOR

STEVE STURGESS is an independent trucking writer and consultant based in Corona, California. His blog is at www.stevesturgess.com

CUMMINS FUEL CELL

Designed and built by Cummins engineers, the display tractor featured a 90 kW, proton exchange membrane (PEM) fuel cell. It is designed for a wide variety of trucking operations, having alternative 40 hp (30kW) to 240 hp (180 kW) fuel cell stacks to generate range-extending electrical power and 100kWh lithium ion battery that powers the motors.

Cummins says this scalability would give the concept Cascadia a range of 150 to 250 miles.

The AEOS powertrain was promised for 2019 at its launch two years ago. This new system, is still in the development phase and is now promised to launch in the second half of 2022. According to Cummins, it will simplify the installation for OEMs, reduce weight and volume by a third and improve efficiency by 10% compared to direct-drive battery systems.

TransPower of San Diego is also pursuing truck and bus OEMs with its battery electric powertrain. Peterbilt showed TransPowered model 520 refuse truck, a 220EV medium cabover and a 579EV regional haul Class 8 in Atlanta.

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A monthly column devoted to the off-highway equipment markets.

By **Chuck Yengst**

CONFUSED ABOUT 2020?

You are not alone if you are wondering how things might work out for 2020. There are endless comments about the economy going into recession, the stock market collapsing, tariffs, angry farmers, fires in California and electrical blackouts because of high winds.

I keep a smile on my face with the good news such as a stronger than expected GDP rate for the third quarter and another month with unemployment at the lowest levels in history.

This past September we did an annual short term forecast to clients of our reporting services for North America. In that, I projected relatively low sales growth for earthmoving and material handling machinery for the current year, with more of the same in 2020. Since then, I have concluded, along with my colleagues, that we were likely a little high on the earlier projections and need to adjust our growth down, to closer to 4 to 5 percent higher for 2019 versus 2018, and 3 to 4 percent growth in 2020.

There have been definite signs of slowing in the industry during the past month, but not so severely that we are anticipating a blowout like 2008 and 2009. It appears that 2019's slowing is in the 5 to 10 percent range off a very strong sales year in 2018, which many are now concluding was a peak year.

Instead of ramping up 12 to 15 percent, we are going to have growth of "only" 4 to 5 percent for 2019. Not too bad considering issues such as higher tariffs, or manufacturing cutbacks, poor housing starts, weak farm income from trade wars (and nasty weather during the current growing season), and a few other debacles.

DISTRIBUTION ADJUSTING ORDERS

Machinery suppliers are reducing output to adjust for lower order levels from dealers, because of the uncertainties and lower growth possibilities. We have seen some modest layoffs by suppliers.

Caterpillar, for example, recently indicated that a loss of $400 million in its third quarter results came from reduced orders from dealers, attributed to inventory adjustments being made. Guess what? The dealers ordered too much stuff in 2018 and now they want to sell some of those new machines. They are hearing all about the uncertainties and they are hearing rumblings from their customers.

Of course, if OEMs are facing lower orders from their dealers, that means they don't need as much component supply from their vendors and the whole supply chain starts to work in reverse.

We are hopeful that a trade agreement between the U.S. and China will get approved before the end of 2019 and that this first phase treaty will lead to other trade agreements. We see other countries including Japan, South Korea, and possibly the U.K. signing new trade agreements with the U.S., which we believe will be positive and be an uplift U.S. business when they occur.

We see 2020 demand as being flat. We know this is not going to be a great year, but it is not going to be a big blowout. Our long-term projections for 2021 are currently for conditions much like 2020, but I know my thinking will change as soon as election results are available in November 2020. ■

ABOUT THE AUTHOR

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RECESSION? NOT LIKELY

We are not headed for a recession in the United States, and most likely not in 2020. This despite the fact that many overseas markets including China, Japan, Korea, India and the EU have very weak economies as we come to the close of 2019.

The U.S. economy has low interest rates and real GDP growth at 1.9 percent and may be even stronger once strikes and other similar temporary bumps are over. Our unemployment rate is currently 3.6 percent, which is historically low. There is little inflation around. Our banking system is strong. And we have no housing bubble or other worries that have been major warning signs of financial trouble.

Housing is a question mark. Housing starts have been declining and housing sales, while up from 2018, have been eroding slowly. Younger people are holding back from buying houses.

But with low interest rates, potential home buyers will realize where they need to move to take advantage of the timing. Housing will get moving again. It's a question of when, not if.

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A 6% DROP IN SEPTEMBER

Among the indicators of the state of the economy, fluid power is unique. Encompassing the hydraulic and pneumatic systems used in machines and machine tools, fluid power touches nearly every segment of the economy and can help identify trends in the advance of many other signals.

The latest data published by the National Fluid Power Association shows industry shipments of fluid power products for September 2019 decreased 6.0% compared to September 2018 and decreased 5.9% when compared to the previous month. Mobile hydraulic, industrial hydraulic and pneumatic shipments decreased in September 2019 when compared to September 2018.

SHIPMENTS	
TOTAL FLUID POWER	
June-19	-1.9%
July-19	-2.3%
Aug-19	-3.3%
TOTAL HYDRAULIC	
June-19	-1.5%
July-19	-2.9%
Aug-19	-4.3%
TOTAL PNEUMATIC	
June-19	-2.4%
July-19	-2.5%
Aug-19	-3.3%

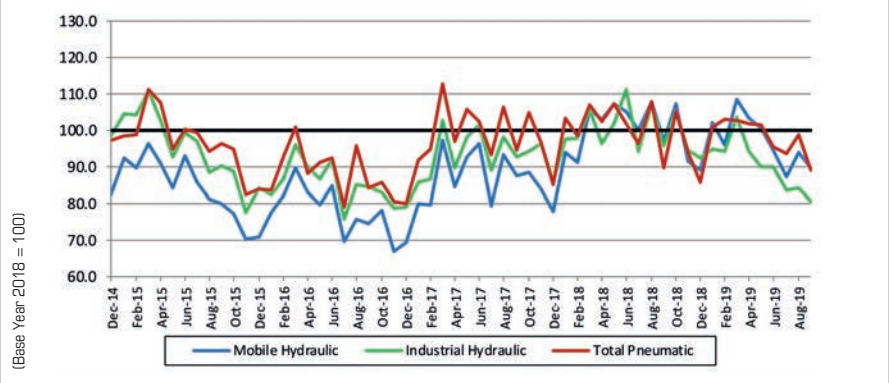
(Base Year 2018 = 100)

The table above is expressed in terms of cumulative percent changes. These changes refer to the percent difference between the relevant cumulative total for 2019 and the total for the same months in 2018. For example, the August 2019 pneumatic shipments figure of -3.3 means that for the calendar year through August 2019, pneumatic shipments decreased 3.3% compared to the same time period in 2018.

ABOUT THE SCOREBOARD

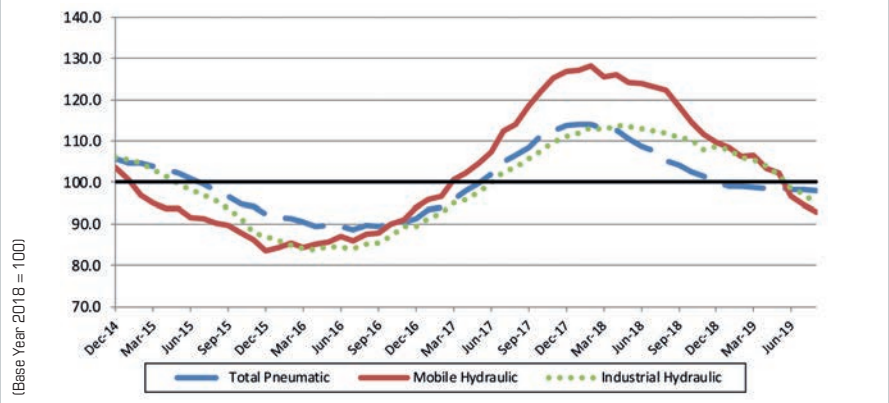
This information is drawn from data collected from more than 80 manufacturers of fluid power products by NFPA's Confidential Shipment Statistics (CSS) program. More information is available to NFPA members. For information on membership contact NFPA at (414) 778-3344.

HYDRAULIC AND PNEUMATIC SHIPMENTS



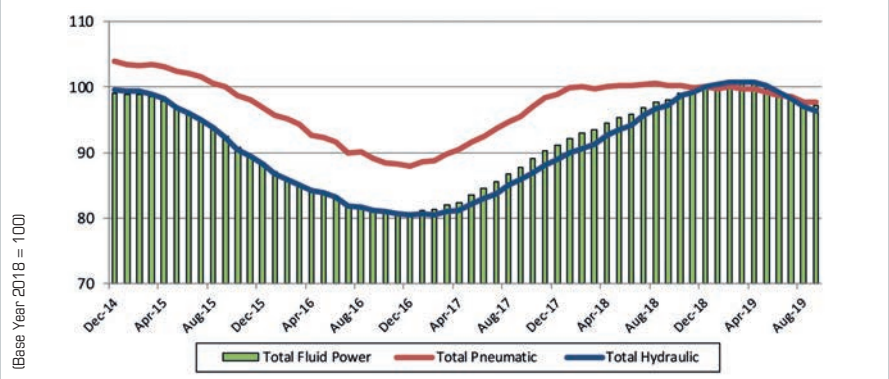
This graph of raw index data is generated by the total dollar volume reported to the NFPA by CSS participants and compared to the average monthly dollar volume in 2018. For example, the September 2019 total dollar volume for pneumatic shipments are 89.2% of the average monthly dollar volume in 2018.

PNEUMATIC, MOBILE AND INDUSTRIAL HYDRAULIC ORDERS INDEX



Each point on this graph represents the most recent 12 months of orders compared to the previous 12 months of orders. Each point can be read as a percentage. For example, the 94.6% (the August 2019 level of the industrial hydraulic series) indicates that the industrial hydraulic orders received from September 2018 to September 2019 were 94.6% of the orders received from September 2017 to August 2018.

TOTAL: HYDRAULIC AND PNEUMATIC SHIPMENTS



This graph of 12-month moving averages shows that in September 2019, both hydraulic and pneumatic shipments decreased.

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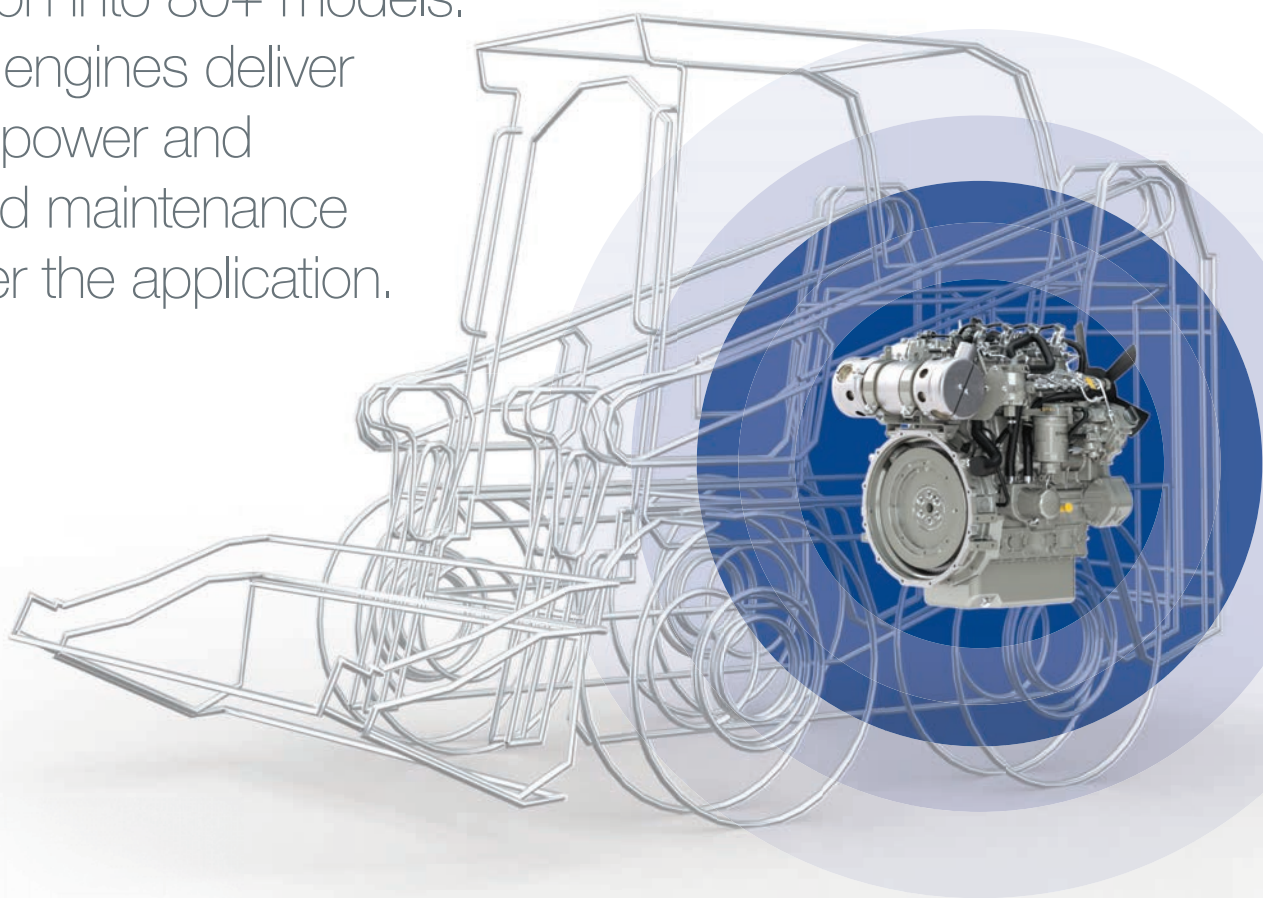

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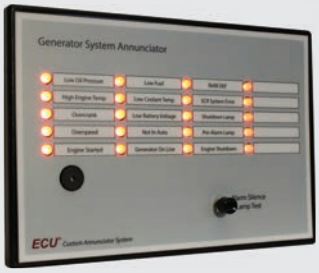

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CRANE ORDER FOR THE U.S. ARMY

Four-axle, 60 ton, 62 mph Grove crane designed for variety of combat and regular construction uses. By **Mike Osenga**

Manitowoc Cranes has received a $28.2 million contract to provide Grove model GMK4060HC cranes (HC for heavy crane) all-terrain cranes to the U.S. Army. The contract is expected to be fulfilled in 2020.

This is the second crane contract Grove has recently secured from the military following a five-year, $192 million order in 2015 order for customized Grove model GMK4100B all-terrain cranes.

The design features on these cranes will enable the U.S. Army to tackle projects on the most extreme sites, even working in high-pressure situations in war zones, Grove said. Top speed is 62 mph.

The cranes will be deployed for constructing barriers, setting up areas of operation, bridge building and vehicle towing applications, among many other uses. Another benefit for the Army is that the cranes are light enough to be transported via C5 and C17 aircraft, as well as by trains and roads.

MERCEDES BENZ DIESEL

For this order, the GMK4060HC cranes are specifically engineered for military use and have unique features that make them suitable for job sites on a variety of terrains.

The 60 ton, four-axle capacity crane is powered by a Mercedes Benz OM501LA diesel rated 428 hp (315 kW) at 1880 rpm. The engine has a maximum torque of 2000 Nm at 1300 rpm. The engine drives a ZF Astronic 2530 transmission with 12 gears forward/2 reverse that includes a two-stage transfer case with longitudinal differential lock.

The hydraulic system has two separate circuits, one variable displacement axial piston pump with load sensing and with electronic power limiting control. The other system has a variable displacement axial piston pump for slewing. The system has a thermostatically controlled oil cooler. Hydraulic tank capacity is 180 gallons.

These models have an all-wheel drive steering system, with dual circuit, hydraulic power assisted steering with emergency steering pump. Axle lines 1, 2 and 4 steer on highway, with separate steering of the 3rd, and 4th axle lines for all wheel steering and crabbing.

The GMK4060HC also features Grove's MegaTrak independent suspension system for increased ground clearance that provides the ability to ford water up to 48 inches and operate in harsh conditions.

ARMORED CABS

The military also asked that the cranes be outfitted to accept armored cabs. The armored cabs were designed by a third party company and are a bolt-on solution that can be done in the field. To install armor, a soldier only needs to unbolt the un-armored panel and replaced it with an armored panel.

Grove said the cab comes equipped with emergency egress and combat locks as well as an EKS full graphic display for crane monitoring and ECOS operating system. There is full electronic control of all crane movements. The controls are integrated with the LMS and engine management system by CAN-BUS.

In addition, the cranes are upfitted with military spec lighting to operate in a blackout light condition when using night vision technologies. The cranes will also be painted with Chemical Agent Resistant Coatings (CARC) for nuclear and chemical attacks, meaning the paint won't deteriorate the same as regular paint.

"Our first contract was signed in 2015. We designed and built directly to the Army's specifications and created the GMK4060HC," said Darryl Mellott, director of government marketing.

Powered by a 428 hp Mercedes Benz OM501LA diesel driving a ZF Astronic 2530 transmission, Manitowoc has received a a $28.2 million contract for Grove all-terrain heavy cranes for the U.S. Army.

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The Cat® C13B engine

FIRE PANTHER

Rosenbauer ARFF truck combines speed, power and off-road maneuverability.

By **Chad Elmore**

Soon after Austria-based Rosenbauer introduced its Panther airport rescue firefighting (ARFF) vehicle in 2015, the firetruck specialist's North American operation set out to find new markets for the truck. In its quest to reach beyond buyers of its structural fire-fighting equipment catalog, the company signed with Defense Logistics Agency to help it find government opportunities not previously pursued. One of the first government entities to take a Panther for a spin was the United States Air Force.

"Rosenbauer knew going into this bid process that a sound, quality product was needed to meet all specifications for the bid," said George Bergamini, government sales manager, Rosenbauer America, Wyoming, Minn. "With the introduction of our newly designed Panther and highly competitive pricing, we felt that a great package could be provided."

It was the right strategy. What began as an Air Force order for a few ARFF units soon expanded to more than 70 trucks. The company will deliver 32 Panther six-wheel-drive units with the remainder four-wheel-drive Panthers in a contract reportedly worth nearly $50 million. Due to size of the order,

the company spread production across several of its factories. Completed trucks will be stationed at Air Force bases in the United States and around the world.

While commercial airports are the traditional customers for ARFF vehicles, the company said the vehicle's potential does not end at the runway – other applications such as mines and rail yards can also use a high-speed off-road fire-fighting machine that can be operated by one person.

DOMESTIC LAUNCH, PRODUCTION

North American crews saw the new Panther during the ARFF Working Group Conference in 2016, and U.S. production commenced the next year at the company's Minnesota factory. While it looked like the European-spec version, engineering had redesigned much of the machine to give it the 60% domestic content as required by the federal government for the application.

In Minnesota, Rosenbauer builds vehicles for the North American market, including structural fire trucks and ARFF vehicles based on supplied truck chassis, such as the Navistar-based Airwolf. The plant has a new chassis factory to help increase production of Panther vehicles.

The four- and six-wheeled Panther machines differ only between the panoramic five-crew-member cab and the aft-mounted engine compartment. The latter variant gets a 3170 gal. water tank and a 400 gal. foam tank, while the former carries 1585 gal. of water and 200 gal. of foam. The foundation is a purpose-built tubular frame with a low center of gravity.

The business end can be ordered with a joystick-controlled HRET (high reach extendable turret) and a Stinger piercing nozzle designed to quickly pierce an aircraft fuselage to flow a pre-selected combination of water, foam or Halotron into at any point on the radius of an airplane. HVLA (high volume, low attack) bumper turrets apply a water, foam or dry chemical extinguishing agent from multiple angles while on the move. Handlines are also on board for when the crew must move out on foot.

Power for the 2100 gpm Rosenbauer N80 centrifugal fire pump as well as the Twin Disc six-speed transmission comes from a Tier 4 final Volvo Penta D16 (model TAD1672VE) diesel engine rated 700 hp. The engine is used for propulsion when the truck is moving and operates the fire pump when it is parked. One feature of the ARFF trucks is they can be used in a pump-and-roll mode, splitting the engine power between the drivetrain and pump to help suppress a fire as the truck approaches and repositions around the incident scene.

"When we designed the Panther, we did a lengthy assessment of multiple engine options, and Volvo Penta's industrial engine stood out with its power-to-weight ratio," said Duane Kann, ARFF regional sales manager for Rosenbauer America. "With the D16 engine we got the most power with the least amount of weight. This vehicle already weighs up to 40 tons and ARFF vehicles have speed requirements to meet. Getting this power in a lighter engine was critical in designing the Panther for long-term operation.

"Maintenance is another critical factor in the ARFF industry because the trucks have to be in service, ready to protect the traveling public. We knew we had reliability with this engine, and we are confident that the service side is covered. Volvo Penta has service dealers all around the world and most are extremely close to the 2000 Panthers we have worldwide with this engine."

MANDATORY VEHICLE PERFORMANCE

Capable of an acceleration of 0 to 50 mph in 35 seconds while fully loaded, the engine supplies the power required to propel an 80,000 lb. six-wheel-drive

Panther ARFF vehicle to a top speed of 70 mph. Additionally, the Panther is required to pump and roll up a 40% grade, stop in the middle and then continue the ascent, all without any disruption to the water flow.

Due to the nature of the job and standards from groups such as the National Fire Protection Agency (NFPA's 414 covers design, performance and acceptance criteria) and the Federal Aviation Administration (FAA) have resulted in a unusually maneuverable off-highway truck (because aircraft incidents typically occur beyond the pavement) that must be ready for anything from a restaurant kitchen fire to a fully involved cargo plane (airports are small cities; and are not immune to each and every one of the challenges found in an urban environment). Because standards say they must be able to reach the midpoint of the furthest runway within two to three minutes (depending on the standard required) it has to be fast, as well.

"The Panther was actually engineered over five years by the Rosenbauer parent company in Austria working with a lot of fire departments to design a truck that is user-friendly for the fire departments," said Rosenbauer's Kann, who is a former fire chief for the Orlando International Airport in Florida.

SPEED AND MASS

Speed and mass are key elements for a successful response to an aircraft in trouble. "Airplanes carry a tremendous amount of fuel and the fuselage may be unsurvivable within just 3 minutes of flame impingement," said Kann. "The truck has to get there fast. And then there needs to be a mass application of fire suppression agents to knock down the fire. You've got a huge thermal column to break through so we can get to the base of the fire where extinguishment actually occurs."

On approach, the Panther's HVLA bumper turrets drop down to about a foot off the ground so "they can come in at the bottom of that thermal column, which gives you a chance to break through quicker than when foam is applied like the raindrop effect firefighters used to practice. The theory, and the requirement for ARFF trucks to get to the fire quickly, is for the rapid break of the thermal column, to get that fire knocked down and provide a rescue path for evacuating occupants. We also need to keep the interior fuselage atmosphere survivable for as long as we can to allow rescue operations for those who could not self-evacuate."

MINING NEW MARKETS

Kann said ARFF trucks are an underutilized asset in the fire service, and that may be because of its full name: airport rescue firefighting.

"A lot of people automatically think if it's not on an airport, then there's no use for it," he said. "I visited a surface mine in northern Canada and was surprised to see they protect their assets with an old structural fire engine. But their roadways are all dirt and mud. It's off-road terrain. ARFF trucks are classified by NFPA 414 as off-road firefighting vehicles and structural engines are for on-road use."

Kann said another Canadian surface mine realized it needed to upgrade its firefighting equipment when one of its house-sized haul trucks caught fire. The mine then leased an older ARFF machine from Rosenbauer; after a subsequent thermal event they bought a new one.

"So, the vehicle has been proven to be effective in the mining industry already," he said. "It's starting to catch on. Fire departments, like mines, are short-handed these days, and ARFF vehicles can be effective with a one-person crew.

"You can also look to applications such as railroads. Railcars have hazardous chemicals, liquids, flammable material and if something happens, they're not usually near a paved road. Structural engines can't get access to them."

Even beyond the airport, speed is a critical factor in fighting conflagrations, of course. Kann said as an ARFF operator approaches a burning haul truck, "they can knock down the fire and get it to where it stays contained within a certain area and hopefully to a single vehicle. You reduce your exposure potential with that technique, which is a very big advantage. That initial knockdown is huge." ■

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2019 NEWSMAKER OF THE YEAR

DIESELS HIGHLIGHT ELECTRIC YEAR

Deutz Corp. engines, service and reman tabbed in a year of electrification and alternatives. By **Mike Osenga**

Deutz Corp., Atlanta, Ga. is the 2019 Diesel Progress Newsmaker of the Year.

For those of you keeping score at home, the Diesel Progress Newsmaker of the Year is awarded annually to the person, product, company, trend, technology or news event deemed by the Diesel Progress editorial board to have generated the most the most news over the last 12 months.

The Newsmaker of the Year started in 1997. Previous winners can be found in an accompanying table. In picking the Newsmaker of the Year we consider a variety of factors; discussions with people around the industry, website and social media traffic, as well as anecdotal impressions about what people in the industry are talking about. It isn't all analytics; it isn't all hearsay.

Some years the Newsmaker of the Year is a fairly easy decision to make. Other years it isn't, and some years we wait until the last minute to see if something tips the balance (ala Caterpillar buying Bucyrus late in 2010).

The decision this time was probably the most analyzed Newsmaker of the Year we've had in the 22 years we've been doing this. There were no shortage of options as mentioned below. But in the end, Deutz Corp., the wholly-owned subsidiary of Germany's Deutz AG, covering the Americas, won out over a host of other contenders.

It's always hard with subsidiary companies to separate out the activities of the local company from the parent, but there's little doubt that Deutz Corp. had an active 2019.

It was interesting that in this time of electrification and alternatives, much of our deliberation centered around the activities of internal combustion engine manufacturers, which resulted in Yanmar receiving the Diesel Progress International Newsmaker of the Year award and Deutz for Diesel Progress.

BUSY 2019 FOR DEUTZ

There was no doubt Deutz Corp. has had a busy 12 months. The year started with the company adding two new small diesels, a 1.2 L and 1.7 L, to its product line via an agreement with Korea's Kukje Machinery Co.

As was 2019 drawing to a close, Deutz signed an engine deal with China's Sany, which has the potential to be a much larger story moving forward. And in one of those late year deals, Deutz added Futavis, a battery manufacturer, to its expanding electric power portfolio.

Also during the year, Deutz made a very interesting move introducing diesel block gasoline engines to the industrial markets. Still in its infancy, that program could change the landscape in some equipment segments and is something the editorial board all noted.

Deutz also expanded its Power Solutions product range adding the first of a line of skeleton gen-sets for food trucks, work trucks, mobile command centers and other "power inside the machine" uses.

Deutz Corp., in recent years has also made some interesting moves on the engine aftersales side, establishing and expanding its company-owned Power Center operations, most recently

Deutz Corp., Atlanta, Ga. is the 2019 Diesel Progress Newsmaker of the Year.

TOP 20 STORIES OF 2019 FROM

1. More legal woes for GM Diesel
2. MAN Energy Solutions on the block?
3. CNH announces huge reorganization
4. Cummins turbodiesel out of Titan
5. Cummins to debut engine
6. Where the Volkswagen emission money is going
7. Cummins buying fuel cell company
8. Kubota Buhler hook up on big tractors
9. New engines new alliance for Deutz
10. Cummins talks Isuzu China pre buy

PREVIOUS DIESEL PROGRESS NEWSMAKER OF THE YEAR RECIPIENTS

2018 CUMMINS

2017 ELECTRIFICATION

2016 THE COLLAPSE OF COMMODITIES

2015 2 DAYS IN SEPTEMBER

2014 GENERAC AND BRIGGS & STRATTON

2013 CUMMINS INC.

2012 NAVISTAR

2011 THE WEIRDNESS OF THE NORTH AMERICAN MARKET

2010 CATERPILLAR, INC.

2009 THE GLOBAL ECONOMIC MELTDOWN

2008 SELECTIVE CATALYTIC REDUCTION

2007 CUMMINS INC.

2006 OSHKOSH TRUCK CORP.

2005 INTERNATIONAL TRUCK AND ENGINE CORP.

2004 THE PRICE INCREASE/ SHORTAGE BOOM

2003 CATERPILLAR INC.

2002 CUMMINS INC.

2001 THE MARKET REBOUND

2000 DAIMLERCHRYSLER CORP.

1999 THE POWER GENERATION MARKETS

1998 CATERPILLAR INC.

1997 DANA CORP.

expanding Deutz Power Center Great Lakes in Chicago. It also announced and is growing its service of Genie mobile elevated work platforms with the Deutz Power Centers now being authorized service and parts centers for some Genie-branded machines.

And after celebrating the tenth anniversary of its Deutz Xchange operation in Pendergrass, Ga., Deutz announced it is expanding the footprint of that operation and adding the TCD 2.9 engines to its portfolio. With the remanufacturing of smaller output diesel engines an oddity 10 years ago, today the expanding Deutz Xchange program is a key part of its North America operations.

ALSO CONSIDERED

But as mentioned, 2019 had no shortage of Newsmaker of the Year candidates. The one story during the year that really caught the attention of the editorial board was Briggs & Stratton's launch of a line of batteries, which they are making themselves to power off-highway machines. There is the feeling that when electrification becomes a widespread industry reality, this may be the sort of path it follows. Definitely a glimpse-of-the-future story.

Likewise the debut of the first Chinese-built EPA-certified diesel engines by Weichai and Power Solutions International certainly got a lot of notice. The Toro acquisition of Ditch Witch was also one of the top news stories of 2019.

The overall Volvo Group was all over the news in 2019. Almost weekly it seemed, the Swedish manufacturer was announcing something to do with electrification or its engine-powered equipment, both on-highway and off-highway. There is no "second place" with the Newsmaker of the Year, but if there was Volvo would have been a strong contender.

CNH Industrial was also a strong contender with a flurry of activity late in the year. In September the company essentially split into two groups, on-highway and off-highway; it made an investment in Nikola, the highly publicized electric vehicle manufacturer and then followed that up with a collection of smaller deals adding mostly to its farm machinery segment.

Certainly anything to do with electrification was everywhere in 2019 and Cummins once again made a bunch of moves in that regard including one of the many electrified off-highway demo vehicles shown at bauma. Fuel cells also seemed to have caught the attention of the Columbus, Ind. manufacturer leading them to buy Hydrogenics and partner with Hyundai for that technology.

An economy that seems to be slowing globally also got everyone talking, especially in the second half of the year. The economy is almost always a major story in any given year, but after a steady line of growth since 2009, any slowdown has people talking.

The powertrain side of the business was also busy with John Deere Power Systems, Meritor, Dana and Allison making acquisitions and introductions, many in electrification. ■

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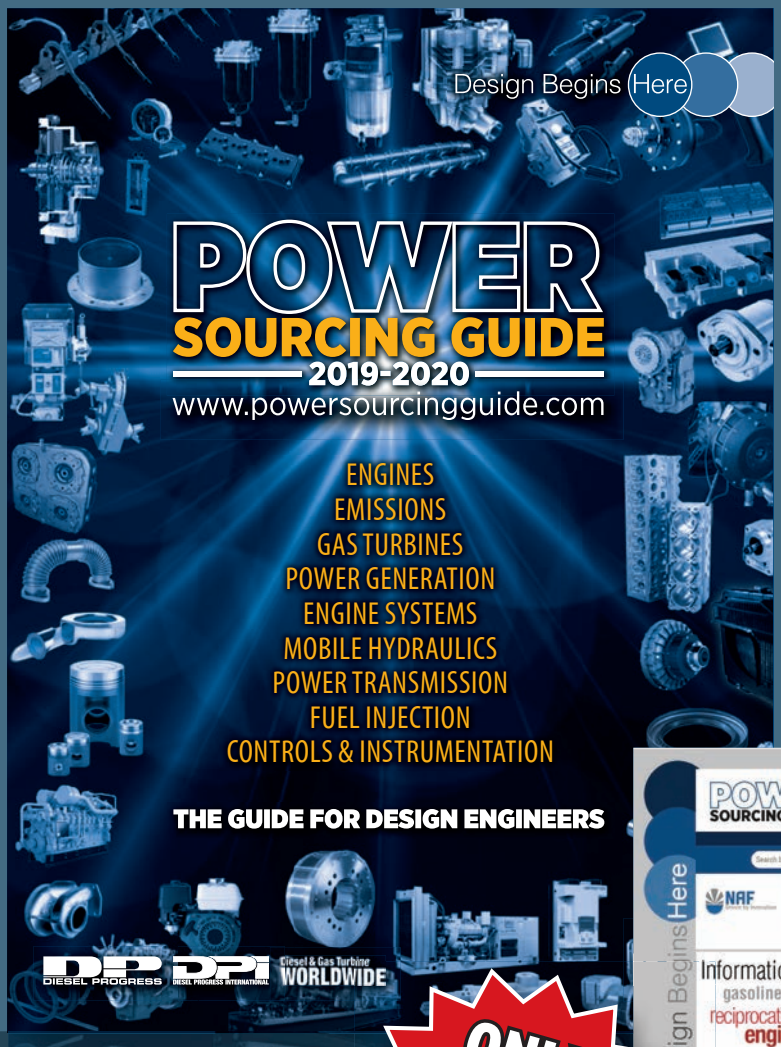

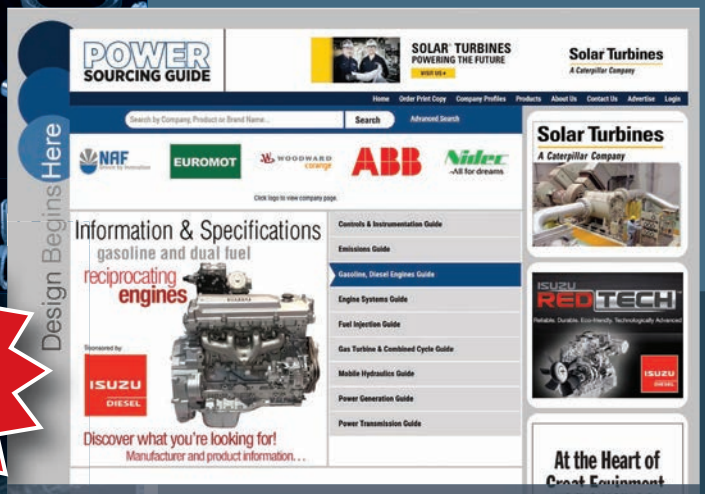

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ELECTRIC POWER ON AN ALASKAN MOUNTAIN TOP

Gen-sets supporting marine differential global positioning system. By **Mike Osenga**

Helping mariners navigate the waters near the Port of Valdez and the islands southwest of Alaska, the U.S. Coast Guard (USCG) has updated a series of generator sets to support a network of microwave-based differential global positioning system (DGPS) towers in Alaska at Potato Point and Cape Hinchinbrook.

In short, the DGPS helps mariners navigate the waters of Alaska by increasing the accuracy of positions derived from GPS receivers. This includes a real-time broadcast of differential corrections, the National Weather Service's Forecast Systems Laboratory for short-term precipitation forecasts, and the University NAVSTAR Consortium (UNAVCO) for plate tectonic monitoring.

Frontier Power Products, Vancouver, B.C., Canada packaged the generator sets involved in the project for Silver Mountain Construction, Wasilla, Alaska for the DGPS towers.

PROPANE-FUELED SETS

There were 10 sets total involved in this phase of the project. There are six, 12 kW sets powered by Kubota propane-fueled WG1605 engines and four, 24 kW sets powered by Kubota WG2503 engines.

All the sets power Newage alternators. Frontier packaged the gen-sets with its long run oil system, as service calls to a mountain top in remote Alaska are not exactly an easy trip.

The sets function as standby units as there is also solar and wind power at each of the sites. The sets and controls and radio repeating systems were all housed in "snow huts," individual buildings designed to protect those systems from the extreme weather elements that go along with operating in Alaska.

The second gen-set becomes standby when the load reaches a preset level. controlled by fully-automated paralleling, load-sharing, and load-demand sequencing, all monitored and controlled remotely via microwave transmission.

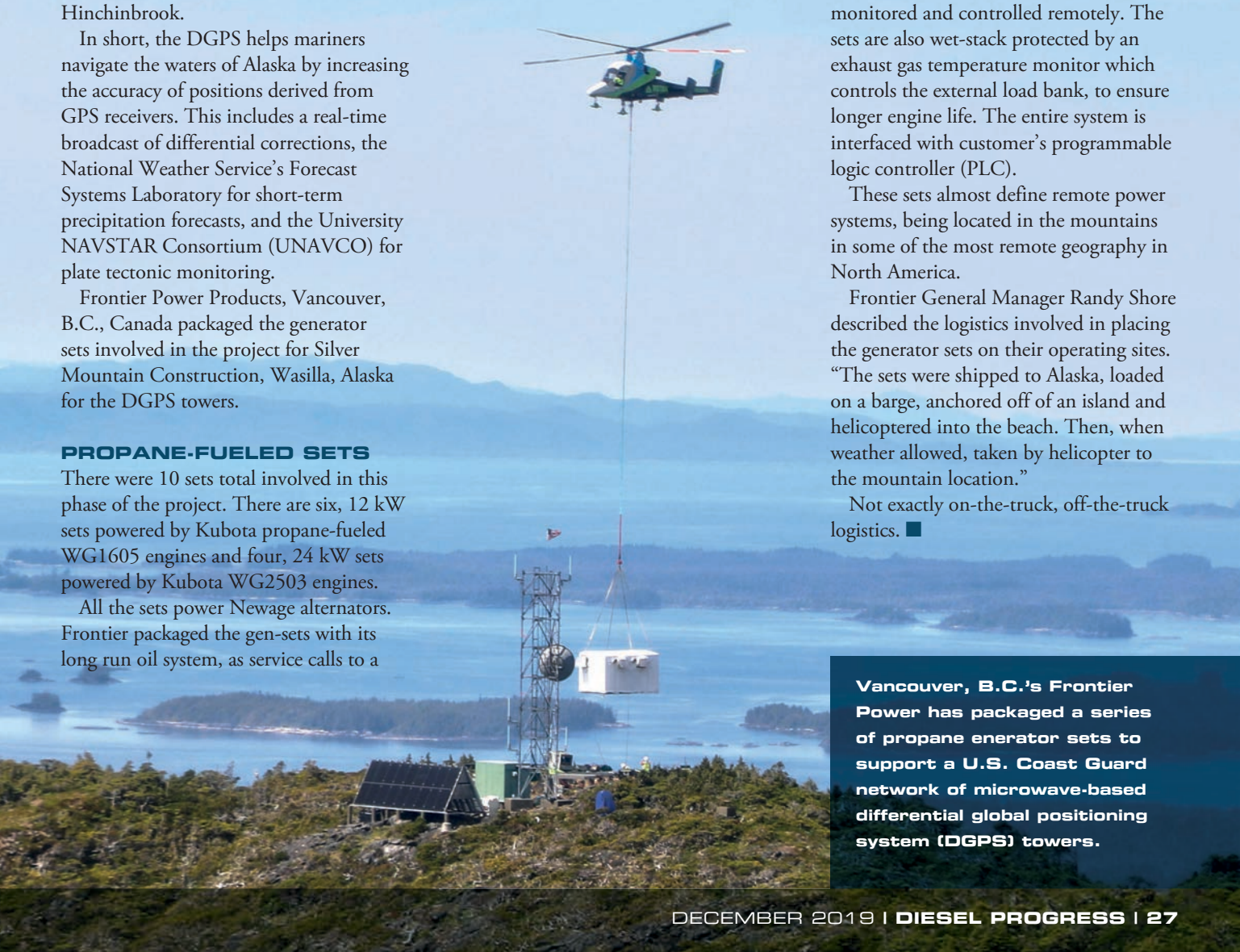
REMOTE CONTROL

The sets all have Deep Sea Electronic 7310 MKII controllers that can be monitored and controlled remotely. The sets are also wet-stack protected by an exhaust gas temperature monitor which controls the external load bank, to ensure longer engine life. The entire system is interfaced with customer's programmable logic controller (PLC).

These sets almost define remote power systems, being located in the mountains in some of the most remote geography in North America.

Frontier General Manager Randy Shore described the logistics involved in placing the generator sets on their operating sites. "The sets were shipped to Alaska, loaded on a barge, anchored off of an island and helicoptered into the beach. Then, when weather allowed, taken by helicopter to the mountain location."

Not exactly on-the-truck, off-the-truck logistics. ■



Vancouver, B.C.'s Frontier Power has packaged a series of propane enerator sets to support a U.S. Coast Guard network of microwave-based differential global positioning system (DGPS) towers.

CHANGING SHAPE

Known for their up-and-over clearance and jobsite adaptability, articulating booms have long been a mainstay for a range of applications. By **Lindsey Anderson**, Access, Lift & Handlers

Articulating booms have historically been used for a variety of industrial and commercial applications. Their up-and-over reach capabilities make them an ideal product to use when doing any new build or restoration work on exterior facades, as well as in industrial settings where spaces are confined and the reach of a telescopic boom or scissor lift is too restrictive.

According to Sean Larin, Genie product manager, Terex AWP, articulating booms make up approximately one in every three boom lifts in the North America, as their compact footprints and unique up-and-over capabilities make these machines some of the quickest and most efficient tools for condensed jobsites.

Manitou recently introduced its articulating boom line product to North America.

Bill Dovey, product manager of boom lifts for JLG, says construction is occurring at a peak rate currently, and articulating booms are experiencing high utilization because of such.

The flexibility of articulating booms has boosted demand over the course of the last few years, but there's a note of caution in the air.

"Demand for articulating booms remains high, however it likely will not be at the same level as in 2018," says Corey Connolly, product manager, Skyjack. "External industry tensions have had an adverse effect on a variety of matters that have driven commodity prices up. Looking forward, combining these cost increases with changes to the design standards in North America, demand is expected to slightly recede again in 2020."

Overall, the U.S. demand for articulating booms should remain strong through 2019. But due to market uncertainty, there seems to be a slight pause moving into 2020.

"The current market demand for MEWPs is still expected to grow, which is led by the U.S. rental market," says Mike Sover, North America product marketing manager – MEWPs, Manitou. "However, rental revenue for MEWPs is starting to slow to a more moderate pace which could delay future MEWP fleet expansion. The construction segment dominates the overall MEWP rental market with a significant part of the revenue generated from construction."

Articulating booms, like these JLG units, offer flexibility on many sites.

A Genie Z-45 XC boom.

Matthew Elvin, CEO of Snorkel, says while the North American market remains buoyant, with rental activity driving continued and steady demand for articulating boom lifts, there is a wind of caution blowing.

"Although not specific to articulating booms, recent reports are suggesting we will see a reduction in the rate of growth of the rental sector where many articulating booms are sold," Elvin says.

Connolly with Skyjack expects the articulating boom market will slow due to legislative and economic uncertainty.

"We are already starting to see commodity price increases trickle down to machine prices and continued uncertainty will further exasperate the cost burden on manufacturers and subsequently purchasers and renters of the equipment," he notes. "In North America, the eventual publication of new standards, and the implementation of new designs and their associated costs, will also likely affect demand and buying decisions."

THE ANSI EFFECT

Part of the new ANSI suite of standards requires manufacturers to incorporate design changes into their machines. These will include: active platform load sensing; new wind force requirements; new stability tests; required entrance gates with toe boards; new tilt sensing requirements; solid or foam-filled tires; and machine markings and manuals.

Manitou, which entered the North American articulating boom market just during the last year, says these possible pain points won't be of issue for them: All of its machines were already designed to be in compliance.

In fact, in North America specifically, manufacturers began planning and incorporating these design features, such as load sensing and foam-filled tires, into machines about two years ago – when the standards were drafted.

Genie's XC line is one that has been debuted. It has updated its boom line to meet upcoming ANSI standards. Its Z-45 XC articulating boom was redesigned as the Xtra Capacity version of the popular rough-terrain Genie Z-45/25 J RT diesel powered articulating boom. It was the first Genie XC articulating boom model with a dual-envelope design to provide an unrestricted platform capacity of 660 lb. and a restricted capacity of 1,000 lb.

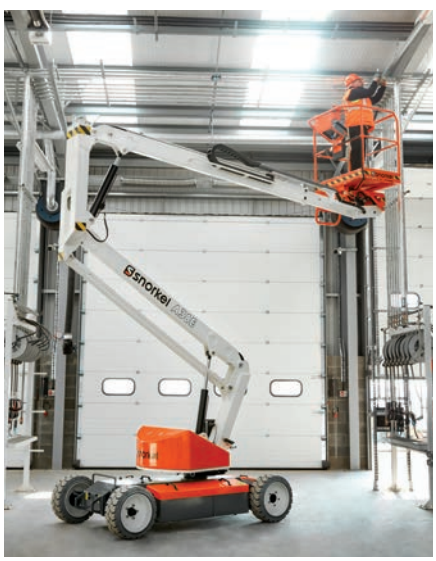
"Many construction sites are built around the 45-foot workhorse of the articulating boom category," Larin with Genie notes. "The recent introduction of the Genie Z-45 XC boom lift added more lifting and more welding capability to this space, supporting to increasing use of heavy materials.

In regard to the upcoming machine design changes in relation to the ANSI standards, OEMs have been working to address the range of adjustments coming to market.

"The aforementioned standards change has afforded Skyjack the opportunity to make changes that go beyond just addressing the design standards; incorporating new and developing technology that will help benefit not only themselves but also the rental companies and their customers," Connolly notes. "An example of this would be Skyjack's Elevate telematics solution and the products within its digital suite, Elevate On and Elevate Go."

While already available on all Skyjack models, Skyjack's future lineup of articulating booms in North America will be able to generate additional data points for Elevate. Skyjack has looked to provide rental companies with information beyond just machine location and runtime – providing data that will help maintain the health of the machines, as well as more effectively tracking the way equipment is being used.

Manitou also reports increased interest for telematics on its machines. Manitou's telematics product offering is called Easy Manager and is a standard feature on the majority of its product lines. Easy Manager is a web portal and mobile app that gives actionable data at customer's fingertips to help with the day-to-day management of operations.



"Demand for articulating booms remains high, however it likely will not be at the same level as in 2018," says Corey Connolly, product manager, Skyjack.

"It makes preventative maintenance, machine security, increasing uptime and customer service easy, all of which allows the customer to concentrate on its core business and let you manage the machine life cycle," says Sover.

Sover also points out how OEMs are increasingly focused on improving the efficiency and productivity of machines and reducing the total cost of ownership. To address this, Manitou offers a stop-and-go system on its ATJ 46 articulated model. This system allows the engine to be running only when the machine is actually working, lowering fuel consumption, providing less wear and tear and a better resale value.

Snorkel is also feeling the pressure to offer more to its customers.

"Most manufacturers, including Snorkel, are working hard in the design stages to deliver articulating boom lifts that offer greater platform capacities to help increase productivity on the jobsite," Elvin says. "The engineering challenge is that the market also wants articulating booms that are lighter in weight for transporting, with lower ground loadings, and with reduced engine/horsepower demands to meet jobsite emission targets."

Most manufacturers, including Snorkel, are working hard in the design stages to deliver articulating boom lifts that offer greater platform capacities to help increase productivity on the jobsite.

EATON'S NEW HYDRAULIC HOSE

Synflex Optimum thermoplastic hose targets broad range of mobile machine applications

Eaton's new Synflex Optimum family of thermoplastic hydraulic hoses and fittings target a range of mobile applications, including aerial lifts, agricultural and construction machinery, forestry equipment, car hauler trailers, lift trucks and marine steering systems.

Eaton has launched a new family of thermoplastic hydraulic hoses and fittings designed to work together to improve hydraulic system performance, simplify assembly and optimize inventory. Offering high abrasion resistance and a range of pressures, the Synflex Optimum hoses are targeted toward applications such as aerial lifts, agricultural and construction machinery, forestry equipment, car hauler trailers, lift trucks and marine steering systems.

"Optimizing the hose and fitting to work together can result in longer hose assembly life and less equipment downtime. And because one fitting can be used across multiple hose styles, it is easier to both streamline inventory and assemble the system," said Eric Stager, product manager, Fluid Conveyance, Eaton.

Constructed with a new thermoplastic material, Eaton said the Synflex Optimum hoses offer the low temperature and flexibility of polyester lined hoses along with the chemical compatibility of nylon lined hoses. There are smaller outside diameters than rubber braided hoses with an identical internal diameter, while at the same time are two times lighter than equivalent wire-braided rubber hoses, reducing machine weight and power requirements, the company said.

THERMOPLASTIC COVER

The thermoplastic and polyester outer cover resists ozone, ultraviolent light and aging and has an operating temperature range of -40º to 212º F (-40°to 100°C) with oil-based hydraulic fluids and -40° to 150°F (-40° to +66°C) for water-based fluids. The thermoplastic composition prevents absorption of most oils and hydraulic fluids and multiple configurations provide chemical compatibilities, Eaton said.

Available with pressure ratings from to 1015 to 5100 psi (70 bar to 350 bar), Eaton said its custom thermoforming process allows for hoses to be molded into configurations that match system design, resulting in tighter routing, faster machine building and optimized performance. In addition, the hose covers were engineered to require 50% less routing force, reducing the chance of kinking, the company said.

Hoses are available in three sizes (100R7, 100R8 and 100R18) with inside diameters from 0.25 in. 1 in. (6.4 to 25.4 mm). Twin line configurations are also available.

The Synflex Optimum fittings, specifically designed to complement Synflex Optimum thermoplastic hydraulic hoses, incorporate a compact design and smaller profile to provide easier routing and assembly. The fittings follow a one-piece design to reduce matching errors and assembly time while eliminating brazing failure risks. Eaton said its captive nut helps eliminate weak spots and can increase safety in applications with high levels of vibration, as well as prevent cracks and leaks that lead to unplanned downtime. More than 500 terminal end combinations can be specified and the company's Dura-Kote plating, which is designed to deliver up to 1000 hours of corrosion resistance, comes standard on the new fittings.

THE CONNECTIVITY ECOSYSTEM

A look at the key components in advanced machine control systems in off-highway equipment.

The connectivity ecosystem is growing in the world of mobile off-highway equipment, especially agricultural and construction machines. Gone are the days when the quality of a job was down to the performance of the machine and the skill of the operator alone. Today, advanced machine control systems can help improve the quality and reduce the time it takes to conduct a wide array of construction site activities, including paving, loading, hauling and digging. Using Volvo Construction Equipment machines as a backdrop, what follows is an overview of the five key components that make up such a system.

Above: Sensors keep an eye on things while data flows from orbiting satellites to GNSS receivers (below).

SENSORS

An inertial measurement unit (IMU) is an electronic device that measures and reports the specific force, angular rate, and sometimes the orientation of the thing it is attached to – for example, a bucket, boom and arm of an excavator.

An IMU works by detecting linear acceleration using one or more accelerometers and the rate of rotation using one or more gyroscopes. Some also include a magnetometer which is used as a heading reference. Typical configurations contain one accelerometer, gyro, and magnetometer per axis for each of the three machine axes: pitch, roll and yaw.

In the case of an excavator, IMUs know when it swings its superstructure, lifts or digs – or is on the level or on a slope.

These IMUs relay positioning information to a central in-cab computer. This can help in building up a picture of how much activity has been undertaken, as well as improving safety. For example, setting limits on how deep an excavator bucket can dig so it doesn't hit underground services or how high in the air it can reach (so it doesn't hit overhead electricity lines or the roof of a structure.) An IMU also allows a GPS receiver to work when GPS-signals are unavailable, such as in tunnels, inside buildings, or when electronic interference is present.

IN-CAB COMPUTERS

Electronic touch screens help operators stay in control. The best example of these are powerful tablet computers capable of running in-cab applications that can make the operator's life simpler, safer and more productive.

The Volvo Co-Pilot, for example, is a tablet that powers all Volvo Assist applications. The interface also generates job-specific documentation to record work undertaken.

Simple and intuitive, touchscreen tablet computers allow operators to set up projects in just a few touches by selecting the required job parameters. The operator then monitors progress of the job as it gets underway, with on-screen alerts indicating when pre-set parameters are met. The tablets are often 3G-compatible, allowing for the system to automatically and wirelessly receive software updates.

GLOBAL NAVIGATION ANTENNA

Satellites are capable of transmitting data back to Global Navigation Satellite System (GNSS) receivers. GNSS is a constellation of satellites that together provide signals from space that transmit positioning and timing data to GNSS receivers. The receivers then use this data to determine location.

GNSS and Global Positioning Systems (GPS) work together, but the main

Advanced machine control is boosting efficiency and safety for those who use it.

difference between GPS and GNSS is that GNSS-compatible equipment can use navigational satellites from other networks beyond the GPS system. And more satellites means increased receiver accuracy and reliability.

GNSS antennas provide the reception of positioning information sent out by satellites in the orbit. A GNSS transceiver chip will process the received signals and then calculate the current position. A GNSS antenna should 'see' at least four satellites for the calculation to work. The frequency range for GNSS is in the 1.6 GHz and 1.2 GHz range.

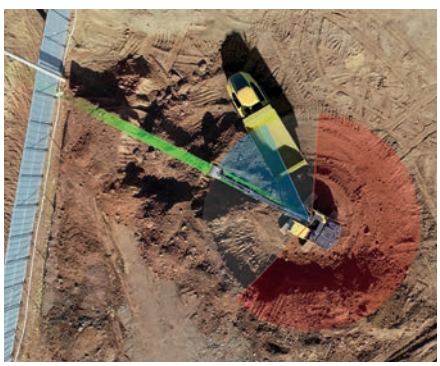
GNSS RECEIVER

A GNSS receiver is an electronic device fitted to the machine that receives and digitally processes the signals from a GNSS satellite constellation in order to provide machine position, speed and time data.

They have been traditionally implemented in hardware form, but software GNSS receivers are catching up fast, said Volvo Construction Equipment. A hardware GNSS receiver is a dedicated chip that has been designed and built with the sole purpose of being a GNSS receiver. In a software GNSS receiver, all digital processing is performed by a general-purpose microprocessor. In this second approach only a small amount of hardware is needed, known as the frontend, which then digitizes the signal from the satellites. The microprocessor can then work on this raw digital stream to implement the GNSS functionality.

Electronic touchscreens help operators stay in control. The Volvo Co-Pilot is a tablet computer.

Satellites transmit data to receivers on the equipment.



RTK, real time kinematics, is a highly accurate method of positioning.

REAL TIME KINEMATICS

Real time kinematics, better known by its initials RTK, provide more accurate positioning than normal GPS systems. It is a technique that uses carrier-based ranging and provides more accurate positioning than using normal GPS systems – as accurate as 1 cm. The technique uses a base station to help iron out errors between the satellite and the machine.

The position is calculated by determining the number of carrier cycles between the satellite and the machine, then multiplying this number by the carrier wavelength. Even then, the calculated ranges include errors, such as atmospheric delays. To eliminate even these errors a process called "ambiguity resolution" is needed to determine the number of whole cycles. Despite being a complex process, high precision GNSS receivers can resolve the ambiguities almost instantaneously.

The position accuracy of the machine also depends on its distance from the base station and the accuracy of the corrections. Corrections are as accurate as the known location of the base station and the quality of the base station's satellite observations. Where the base station is sited is important for minimizing environmental effects such as interference, as is the quality of the base station and machine receivers and antennas.

IT'S BAZOOKA FARMSTAR

Iowa manufacturer uses big diesels, sophisticated electronics to move manure. By **Chad Elmore**

As it turns out, pigs are valuable for more than bacon. The Iowa Pork Producers Assoc. estimated there are more than 22 million pigs in Iowa, giving the state the position as the number one pork producer and exporter in the country. Those operations generate millions of gallons of manure, which is used to contribute to the nutrient needs of cropland – the association estimates 25% of the state's crops are fertilized by the leftovers from livestock production.

Washington, Iowa, is the seat of Washington County, one of the state's top spots for pork production. It is also home to the 100,000 sq. ft. factory of Bazooka Farmstar, which for more than 40 years has developed and built machinery to quickly, safely and reliably move manure from Point A – anaerobic lagoons often built under or close to livestock barns – to C – crop land.

FULL SYSTEM SUPPORT

For farmers and contractors tasked with moving massive amounts of manure via the dragline method, Bazooka Farmstar offers the full system. The material gets pumped out of the lagoon, pushed through many miles of flexible 6 or 8 in. hose, boosted by trailer-mounted, engine-powered pumps along the way, and then injected into a waiting field through a tractor-pulled toolbar applicator, such as the company's Titan Series that can be up to 60 ft. wide.

Closest to the lagoon, an engine-driven truck- or trailer-mounted boom and pump unit is designed to reach deep into the pit and extract the nutrient-rich manure.

"The Infinity truck is the Cadillac of manure pumping equipment," said Phil Minino, director of engineering, Bazooka Farmstar. "Because some of these lagoons are 30 ft. deep, people haven't been able to pump the bottom out. Over time solids build up and the capacity of the lagoon diminishes. When that happens, they have to empty it and go in with bulldozers and loaders and get all the solids out. With good agitation beforehand this boom gets it all out, whether it's a lagoon or a confinement pit.

"The boom can get to the bottom of deep lagoons, but once you start going that deep, even these big pumps can struggle getting it moving. We have

Customers, often contractors, can selected trailer- or truck-mounted pumps.

a hydraulic-driven pump on the end that forces the manure through the boom pipes to the back of the primary pump. So on the end of the boom is a high volume, low pressure pump, and it pumps to a high-horsepower high-volume, high-pressure pump."

Mounted on a variety of Class 7 or 8 on-highway truck chassis that permit highway speed transport, Infinity Series has a 65 or 85 ft reach with its folding boom and is good for more than 3500 gpm. Customers can opt to use their own engine to power the pump, otherwise the company can supply a new Caterpillar C18 rated up to 780 hp or a range of John Deere Power Systems diesel engines up to 600 hp. The engine turns an MP Series pump from Cornell Pump Co., a model made from white iron designed specifically to handle coarse slurry, including sand and heavy solids. The submersible hydraulic booster pump on the boom end is from Nuhn Industries of Ontario, Canada.

Cornell pump and high-horsepower diesel engines can push liquid manure for several miles.

"We've built a few trucks with 780 hp Cat diesels just to give customers more – horsepower means more gallons per minute," said Minino. "That's how the guys get paid, per gallon. If they can move it faster, they can pump more, and they can get out and on to the next job."

The company also offers the Full Throttle series of trailer-mounted pumps. The Outlaw 3500 gets a 17 in. Nuhn submersible pump on the end of a boom with a 40 ft. reach or 19 ft. below grade depth. It's good for 3300 to 3500 gpm. Here again, customers can use their own engine up to 780 hp a new powerplant from Caterpillar or John Deere Power Systems connected to a 500 gal. fuel tank. The whole unit is mounted on a bumper hitch or gooseneck trailer fabricated by the company in Washington, Iowa, with a heavy-duty tube and I-beam frame riding on 15,000 lb. leaf spring axles.

TIGHT APPLICATION WINDOW

While horsepower ratings have climbed and tool bar widths expanded, Minino said there's a limit to how big everything can get. "The sky's the limit on how much you can pump. But you have to be able to manage all of that manure that's going to be coming at you. What do you do with all of it in the field? The limit is really on the tractor side, and there's only so much that the field can take. The toolbar has to be able to evenly distribute manure that's flowing at 4500 gpm."

Even with speed and power on their side, the task can still be arduous. On large lagoons, crews might be onsite for weeks, running long 12- to 16-hour days. Some contractors run 24-7 with multiple crews. That helps explain why manure pumps are often connected to some of the highest horsepower engines on the farm.

"Their window of application is very short," said Minino. "They have to be in there right when crops come out in the fall. A lot of times they're sitting waiting for combines to harvest corn and then they're in the field the second a 40-acre set is done. It's critical that they can get all that manure out; a lot of these lagoons and hog buildings are designed for a year's worth of storage. And then sometime in the spring, as soon as the ground thaws and before crops are planted, they're back out there again."

Equipment uptime is expected. "A huge skillset we've hired for is service," said Minino. "We have a lot of engineers working for our company, not just

The firm offers a complete system for the dragline method, including hydraulic hose reels.

developing new products, but also servicing. If there's an issue, we work to solve it quickly." The company also sells its equipment through a dealer network, further helping with after sales support.

CONTROL SYSTEMS

In order to aid in the reliability and functionality of Bazooka Farmstar's pumps, the company recently released its Nexus control system. The dashboard can be accessed from a mobile phone and gives customers the ability to fine-tune functions such as suction and discharge pressure, start and stop and emergency shut down. The display also gives important engine information.

"Labor is a tough situation," said Minino, "and especially ag labor. Pumping manure is hard, dirty, with long hours in a short season, and they've got to get a lot done in that short season. So, it's hard work. What we have worked toward with our equipment is to decrease the time it takes to do everything and make it as clean and easy as possible."

Nexus keeps the company moving in that direction, allowing crews to monitor and run remote pumps from a tractor cab or anywhere in the world.

ICE MACHINE

Prinoth develops purpose-built vehicle for long-distance hauling in Antarctica. By **Chad Elmore**

Prinoth is one of a few off-highway equipment manufacturers that can say its equipment is used on every continent — and not have to add the qualifier "except Antarctica." The company's snow groomers have been used on the southernmost landmass for decades, and its utility vehicle business recently developed a machine for a customer that needed something that could haul large loads over long distance to support research camps on the ice.

Given the internal project code of "Troll," the transport vehicle will be based at Troll, a research station central to Norwegian territory in Antarctica. The station is located in Queen Maud Land about 146 miles from the coast and is staffed year-round, with a crew of eight that stay through the austral winter.

Prinoth said its Norwegian customers were inspired by the company's T16 crawler carrier. They believed it could form the basis of something that could reduce overall operational costs through lower fuel consumption, reduce total time of transport and minimize the number of people dedicated to transporting fuel and goods in the region.

"This project certainly challenged our teams to push boundaries to refine our know how and to come up with a cutting-edge machine to allow traveling in the crude climate of the Antarctic while still providing the same high levels of productivity Prinoth is renowned for," said Eric Steben, engineering director, Granby, Québec, Canada. Because the project was to be based on a utility vehicle, the work was handled by the company's Canadian headquarters. Prinoth's snow groomer business is based in Italy with North American headquarters and production also in Granby.

Prinoth machines have been on the ice in Antarctica for decades. The company recently developed a new hauler to help Norwegian scientists haul gear to its research station.

In many cases, pig operations outsource their manure pumping to specialists. Bazooka Farmstar knew it needed a specialist, as well, when it sought an electronics supplier that understood diesel engines as well as the application.

It met with MurCal Inc., a California-based instrumentation and engine control company with experience in pumps and Tier 4 final engines, at World Ag Expo in Tulare, Calif., several years ago. The company has since worked on Nexus as well as the engine control system on the Outlaw and Infinity series pumps.

"When it comes to the control system, we offer OEMs such as Bazooka vertical integration. They can just come to us with a wishlist and everything's handled for them," said Bob Murphy, president of Murcal. "We provide a turnkey solution. We do quite a bit of work where it's branded for an OEM and we're kind of a silent partner. We step in to do the work that's not their core competency."

When liquid manure flows at too high of a pressure, things can go wrong fast. Nexus monitors the flow and the pressure and controls the engine speed as needed.

"It's really like cruise control," said Minino. "I can tell the system, I want 10 psi in and 200 psi out and it'll keep it there. If there's a problem on the line ahead of the booster pump, say it's starving that inlet, it'll rev that engine down to an idle to prevent cavitation and ruining that pump."

www.bazookafarmstar.com

www.murcal.com

The project actually started with the company's dealer, Owren AS, in Vingrom, Norway. "We did some meetings to explore the requests they had for the machine and we brainstormed together to understand exactly what the main features were to be," said Steben. "Through that process we came up with the idea of putting two machines together."

The end result paired two T16 chassis and two sets of tracks, two on the prime mover and another pair on a hydraulically driven trailer. The tractor gets a Caterpillar C15 diesel engine rated 580 hp that is certified to U.S. EPA Tier 3. The cab is from a Prinoth Bison snow groomer, chosen because of its cold-weather properties, including a heated windshield, wiper and seats.

Steben said one of the biggest challenges in creating the machine was in the powered trailer. "We are very experimented on hydrostatic transmissions because we have used them for 20 years in every machine we do. But the complexity of this one came from the need to synchronize the four tracks and to steer the machine properly and to get good efficiency. The overall machine efficiency was a requirement because fuel is very expensive there since everything in Antarctica is brought in from the main land. Traction was important, also. To manage the transmission parameters and acceleration and deceleration was a nice challenge There's a magic in the software."

The concept vehicle was validated during the 2018 to 2019 Antarctic summer and the company then fine-tuned the design to optimize its performance and comfort. Members of Prinoth's engineering team, including Steben, will travel to the continent at the start of the summer season in Antarctica to complete some updates and continue improving the overall performance and efficiency as well to train mechanics as needed.

"Safety was one of the most important characteristics we took care of," said Steben. "And along with that it needs to be very reliable because service is not accessible easily. Risk management is very important there, and so is comfort because they have to drive many hours. It might work more than 12 hours a day on over-ice hauling operations that could take up to a month round-trip depending on the base location and route. So they need a very comfortable cabin."

Due to the machine's complexity and remote working conditions, the company created a kit of spare parts that was delivered with the vehicle; some also travels with it on the ice.

www.prinoth.com

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Some of the latest products for on- and off-highway equipment.

COMMERCIAL VEHICLE STEEL WHEEL

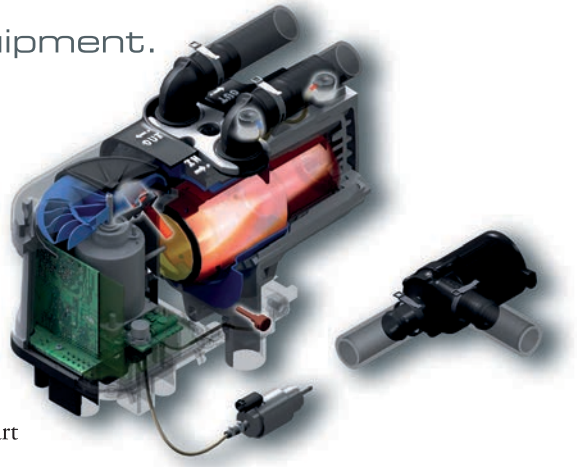
Weighing in at 64 lb., Maxion Wheels' newest truck wheel for North America is a standard 22.5x8.25 commercial vehicle steel wheel. Available in 2020, the Tough and Light wheel weighs less than its predecessor – yet is stronger as a result of optimized design, engineering and flow forming technologies, the company said.

With a 7400 lb. wheel load rating, it has a new circular hand hole shape deviating from the traditional D-shape. Changing the hand hole combined with design optimization reduced wheel structural stresses by more than 10%.

"Maxion Wheels' commitment to cost-competitive lightweight wheels is a key force behind our latest weight reduction breakthrough," said Donald Polk, president of Maxion Wheels, Americas. "Improved fuel efficiency and fewer emissions are just two benefits. Multiply that by 18 and you have a serious top-line payload opportunity and a bottom-line cost benefit."

www.maxionwheelsandrims.com

COOLANT HEATER



Webasto North America has introduced a new Thermo Top Evo coolant heater, the latest in engine-off heating technologies that operate with diesel fuel drawn from the vehicle's primary fuel tank.

"Fleets can save fuel by reducing idling time, warming engines so they start easier and by avoiding extended engine warm-up times," said Don Kanneth, aftermarket sales director, Webasto North America. "It also helps reduce maintenance by reducing the strain on emission control devices."

The system has a quieter heater and fuel delivery system. With its 8600–17,200 BTU/h (2.5–5.0 kW) range and low power consumption, the system can pre-heating a wide range of vehicle types, from light-duty commercial vehicles to heavy-duty trucks, it said.

The unit comes with a longer fuel line, universal controller harness and mounting bracket. Its coolant inlet and outlet ports at the top of the heater can rotate up to 180 degrees for flexibility when routing coolant lines. It also operates at a higher maximum combustion air temperature that allows it to be mounted in more locations within the engine compartment.

www.webasto.com

LED WORK LAMPS

Golight Inc. has announced new versions of its Stryker ST and Golight GT remote-controlled LED work lamps. The lamps have a beam strength of 544,000 candela – 33% more powerful than before.

Both lamps use the company's proprietary P-Vex lens that controls the raw lumens generated by 10 high-flux LEDs, creating an tightly controlled 544,000-candela spot beam pattern that can brightly illuminate a target at a distance of 4839 ft.

Both models focus the beam patterns at an 8˚ angle. These lenses are designed for targeting objects in the distance and for utility and telecom fleets performing riding-line inspections in dark conditions .

Optional snap-on and off flood lenses are also available and produce a more diffused beam with a 35-degree angle. These lenses are designed for scene lighting and illuminating work sites.

www.golight.com

CUSTOMIZABLE DISPLAYS

Topcon Positioning Group has announced a pre-series release of its new Opus B-Series display available for the developer, systems integrator and manufacturer market for user-interface design and implementation research. It is the first of a new family of displays designed for rapid, customizable implementation in agricultural, industrial and construction applications.

"We believe the versatility of the display will make it attractive for a range of applications. Plus, the ability to quickly configure the look and functionality will contribute to faster delivery times to market," said Thilo Nagel, general manager, Topcon Electronics.

The display has a 5 in. touchscreen, aluminum housing and customizable frame that can support the color and branding choices of the manufacturer. Its IP66 rating and operating range of -22˚F to 167˚F allow the display to be used in extreme applications and environments.

The display can be customized using programming languages and tools including OPUS Projektor, CODESYS and C/C++.

www.topcon.com

Hyundai's fuel

HYUNDAI MOTOR CO. REVEALED TWO NEW CONCEPTS, BOTH OF WHICH ADD PRODUCT DETAIL TO ITS FUEL CELL ELECTRIC VEHICLE 2030 VISION FOR THE WIDESPREAD DEPLOYMENT OF HYDROGEN-POWERED FUEL CELL TECHNOLOGY.

Hyundai Motor Co. unveiled the HDC-6 Neptune concept Class 8 heavy-duty truck, while trailer manufacturer Hyundai Translead (HT) announced the launch of its new, clean energy refrigerated concept trailer, the HT Nitro ThermoTech.

HMC unveiled the HDC-6 Neptune concept Class 8 heavy-duty truck, while trailer manufacturer Hyundai Translead (HT) announced the launch of its new, clean energy refrigerated concept trailer, the HT Nitro ThermoTech.

In 2013, Hyundai launched one of the first mass-produced and commercially available fuel cell electric vehicles and in 2018, Hyundai launched its Nexo dedicated fuel cell SUV. Last December, Hyundai said it invested $6.4 billion to accelerate the development of a hydrogen society, looking beyond passenger vehicles.

"By showing HDC-6 Neptune, the first hydrogen-only concept for Hyundai Motor Co.'s commercial vehicles, we will start exploring opportunities in the United States commercial vehicle market," said Edward Lee, head of Hyundai Commercial Vehicle Business Division. "Furthermore, we are willing to work with other partners to pave the way to establish a hydrogen ecosystem for CV."

The HDC-6 Neptune truck is a Class 8 vehicle that uses seven tanks that store gaseous hydrogen at 5000 psi to fuel a pair of 196 kW Nexo fuel cell stacks. The fuel cell generates energy to power a 476 hp electric motor that drives the wheels through an automatic transmission.

Fuel cells for the Swiss

Through its joint venture with H2 Energy, Hyundai is commercializing fuel cell electric

NAVISTAR NEXT IN E-MOBILITY

Navistar has announced the launch of a new business unit. Next eMobility Solutions is dedicated to deliver customized electrification solutions in the truck and school bus markets, Navistar said. The Next business unit will be based in the Detroit area.

Vehicles developed by Next will be offered under the International Truck and IC Bus nameplates and will be sold and supported by International Truck and IC Bus dealers. Using Next as a catalyst for implementation, Navistar plans to have IC Bus electric school buses available at the end of 2020, while International medium-duty electric trucks will be introduced in early 2021

The Next team will be led by Gary Horvat, Navistar's vice president for eMobility.

Next eMobility Solutions displayed

cell truck

trucks by providing 1600 FCEV heavy-duty trucks to the Swiss commercial vehicle market, beginning in 2019 through to 2023. With Hyundai's commercial vehicle entry to the European market, the company said the U.S. market is an important next phase of the company's FCEV 2030 vision.

Hyundai also chose the recent NACV show to Introduce Hyundai commercial vehicles to the U.S. market. While Hyundai's commercial offerings are well-known elsewhere, this is the first time they have been shown in the U.S. Moving forward, Hyundai said it will start exploring opportunities in the United States commercial vehicle market, as well as being open to working with other partners to pave the way to establish a hydrogen ecosystem for CV.

its prototype electric version of the International MV Series medium-duty vehicle, the eMV, at the International Truck booth at the North American Commercial Vehicle (NACV) show in Atlanta recently. The International eMV Series concept is based on the production version of diesel-powered the International MV Series.

The truck incorporates a redesigned aerodynamic hood and is powered by an electric motor with peak power of over 474 kW (645 hp) and continuous power of 300 kW. The vehicle was designed to accommodate multiple battery capacity options that range from 107 to 321 kWh.

Navistar believes customers operating a truck with a 321 kWh battery in typical, pickup and delivery cycles should expect to be able to travel up to 250 miles on a single charge.

Cryogenic trailers

Hyundai said the HT Nitro ThermoTech will be one of the first trailer manufacturers in North America to introduce a refrigerated trailer using a cryogenic nitrogen refrigeration technology system. The concept trailer, developed in collaboration with Air Liquide, has a carbon footprint up to 90% lower than a traditional unit.

"The fuel cell powertrain gave us the opportunity to redefine the classical typology and architecture of the truck," said Luc Donckerwolke, chief design officer of Hyundai Motor Group. "The Hyundai Commercial Vehicles Design Team started with a white sheet of paper focusing on the new defined functionality resetting all standards in order to project commercial vehicles in the future."

EATON EV TRANSMISSIONS

Eaton announced its eMobility business will launch an all-new four-speed transmission for heavy-duty electric commercial vehicles for segments, including pickup and delivery and port drayage in North America, China and Europe.

The new transmission, designed for Class 7 and 8 commercial vehicles, is currently in the testing phase with major OEMs and is set to debut in 2022.

"Electric buses and trucks need to be able to go up hills and run at highway speeds when they are fully loaded," said Scott Adams, senior vice president, eMobility, Eaton. "Our solution is to expand the range of the motor by adding an EV transmission. With this addition, the vehicle can perform well on hills and efficiently at highway speeds with a smaller, less costly motor."

Eaton said the heavy-duty four-speed EV transmission solves an issue related to single-speed drives – contradictory requirements for high efficiency at top speeds and increased torque at launch and low speeds.

Fine-pitch helical gears ensure a smooth, low-noise operation, while the Eaton Transmission Control Unit's shifting strategy is designed for fast gear changes and efficiency, which extend range and battery life, the company said.

Eaton said the transmission is based on traditional lay shaft architecture but is designed specifically for commercial EV applications. Eaton's four-speed EV gearbox does not have a clutch and shifts are synchronized using the traction motor. It also operates at higher speeds than a traditional gearbox. By providing higher output speed capability and torque range, Eaton said the transmission enables the use of a smaller, lighter electric motor for large commercial vehicles.

NOTABLE NEW PRODUCTS OF 2019

All kinds of engines, a fatigue detector, a DEF system and more ... some of the notable new products reported by **Diesel Progress** in 2019

BRIGGS NEW BATTERIES

One of the more intriguing articles in 2019 was the Briggs & Stratton launch of a line of commercial lithium-ion battery packs designed to power a range of equipment applications. The first units, rated 5 kWh and 48V, debuted in October at GIE + Expo. A 10 kWh, 48V unit is due in 2020.

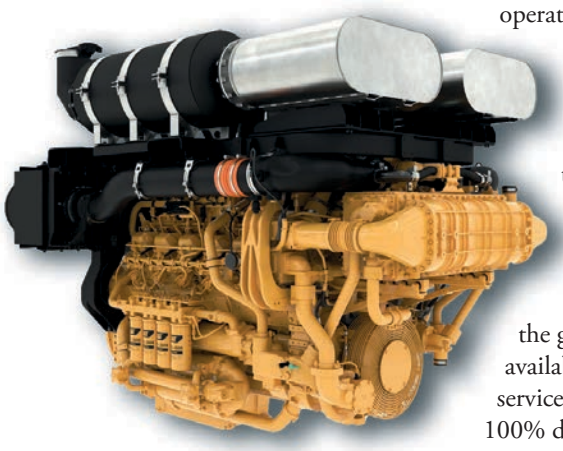
And, somewhat unusually, Briggs & Stratton is building the batteries themselves.

This is one of those product launches that makes you wonder if we're also seeing glimpse of the future of electrified equipment power.

See the story on page 18 of the October issue.

CATERPILLAR'S 3512E DGB ENGINE

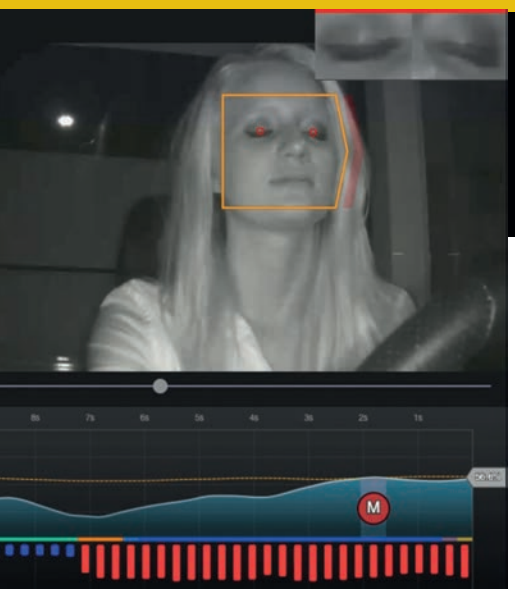
Named Engine of the Year > 175 hp, at the Diesel Progress Summit, the Caterpillar 3512E Dynamic Gas Blending (DGB) Tier 4 final engine is a turnkey, factory-installed solution designed specifically for well service operations. The 3512E DGB engine is capable of operating on compressed natural gas (CNG), liquified natural gas (LNG), pipeline gas, associated field gas and automatically adjusts to changing ambient and fuel quality conditions. No customer input or gas analysis is required, and no recalibration is necessary when equipment is moved, or the gas supply changes. When gas isn't available, the 3512E DGB gives well service operations the flexibility to run on 100% diesel.



HONDA'S NEW V-TWINS

One of the most hotly contested engine segments in recent years has been the gasoline V-Twin markets. Honda launched its entry into the V-Twin sweepstakes with four new models, the iGX700, iGXV700, iGX800 (pictured) and iGXV800.

The four, air-cooled, four-stroke, overhead valve engines have both EFI technology as well an integrated self-tuning regulator. Power outputs are 17.67 or 20.39 hp (13 and 15 kW) at 3600 rpm.



DETECTING OPERATOR FATIGUE

Hexagon AB introduced a system to detect operator fatigue and distraction by monitoring alertness in light-duty vehicles, buses and trucks. Based on a system created for operators of mine haul trucks, the new HxGN MineProtect OAS-LV scans an operator's face. A machine-learned algorithm leverages the facial feature data to determine if an alert should be activated.

See the story on page 45 of the July 2019 issue.

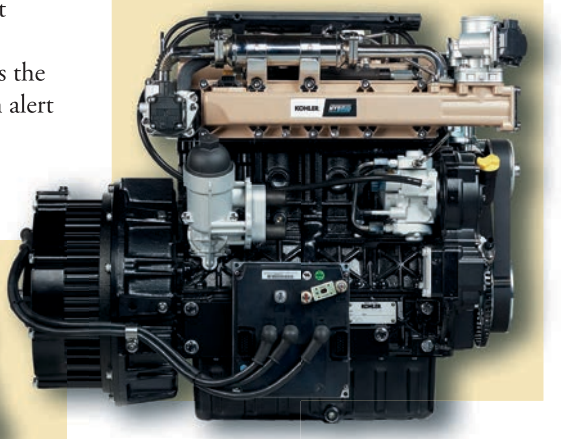
See the story on page 21 of the April 2019 issue

KOHLER'S K-HEM HYBRID

Kohler's new hybrid platform, the K-HEM 2504, is an electrical and mechanical combined power generation unit, which was first shown at bauma earlier this year. The K-HEM 2504, the Engine of the Year < 175 hp at the 2019 Diesel Progress Summit, combined a KDI 2504TCR diesel engine with a 48V electric motor generator.

The K-HEM platforms, which also includes the K-HEM 1003, are seen as applicable for boom lifts, telehandlers, skid-steer loaders, woodchippers and forklifts.

See the story on page 48 of the June issue

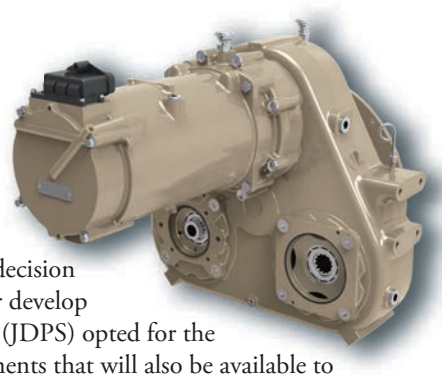


ELECTRIC OFF-HIGHWAY DRIVETRAINS

Yanmar's powertrain group, Tuff Torq Corp., has developed three new electric off-highway drivetrain systems specifically targeting zero-turn, lawn tractor, and UTV OEMs.

The Tuff Torq drivetrains feature compact, high-speed motors, controllers, sensors, and displays. The new Tuff Torq products include the e-DS ZTR: (pictured) designed for the "prosumer" zero-turn market and powered by a 48V DC source. Also new is the e-DS D, a fully electric differential system for UTVs that can also be configured into an electric-hybrid solution. The third newly launched drivetrain is the e-DS LT targeting the residential tractor market.

Tuff Torq said the new drives can be used in the current configurations or can serve as a starting point for further customization based on specific product and application.



DEERE ELECTRIC DRIVE COMPONENTS

With OEMs all over the world considering adding electrified components to their vehicle drivetrains, a decision looms to either buy those products from a supplier or develop their own componentry. John Deere Power Systems (JDPS) opted for the latter route, introducing a series of electrified components that will also be available to other vehicle manufacturers.

First shown at bauma, JDPS introduced a single-speed transmission and a generator pump drive (pictured), with a three-speed transmission coming next year.

See the story on page on page 24 of the April 2019 issue.

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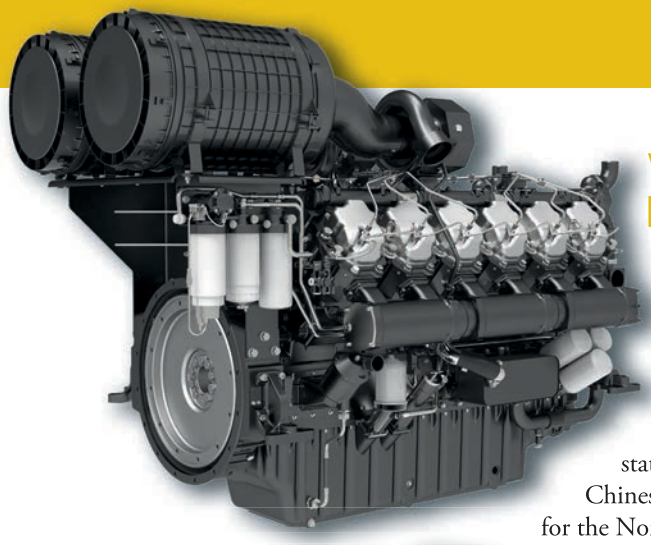


WEICHAI EPA-CERTIFIED DIESELS

Speaking of surprising and notable announcements, Power Solutions International Inc. (PSI), has launched a line of 20-, 40- (pictured) and 53-liter EPA certified Weichai diesel engines. The engines are based on an established marine diesel platform from Weichai's Baudouin operations.

The three engines were U.S. Environmental Protection Agency (EPA) emergency standby certified on September 3, 2019. The certifications cover stationary emission regulations for operation on diesel fuel for model year 2020.

Chinese-built, EPA-certified diesel engines have long been the elephant in the room for the North American engine business. And now here comes the first move in that direction.

See the story on page 19 of the November 2019 issue.

DEUTZ DIESEL BLOCK GASOLINE ENGINES

Deutz Corp surprised many in the engine business with the introduction of 2.2 L, and 2.9 L engines, with a 3.6 L model possibly to follow. The engines introduced will be offered as gasoline engines, with LPG and bi-fuel versions.

The surprise is that these gasoline models are based on industrial diesel engine blocks. The 2.2 L (pictured) is in production as an LPG engine, while the 2.9 L will be available about now in gasoline and LPG versions. The G 2.2 L3 is an inline three-cylinder design, while the G 2.9 L4 is an inline four-cylinder engine. Outputs are currently 35 to 72 hp at 2800 rpm.

See the story on page 40 of the May 2019 issue.

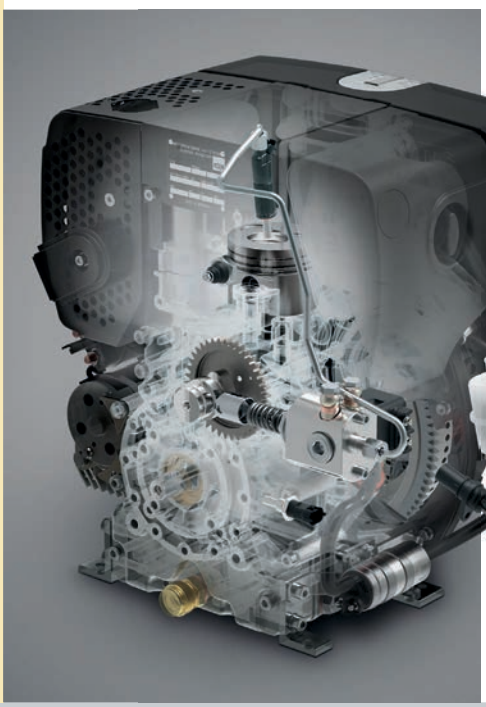
DEF REPLENISHMENT SYSTEM

Multiquip Inc. introduced the MQ DEF Replenishment system to help portable gen-set operators manage the diesel exhaust fluid (DEF) required by selective catalytic reduction (SCR) used with Tier 4 final diesels.

The system monitors DEF levels in diesel gen-sets and refills the onboard tank from a separate 100 gallon reservoir, all designed to reduce the number of site visits to replenish the fluid. The system is designed to fit in the bed of a pick-up truck.

See the story on page 28 of the August 2019 issue

HATZ AND E1 TECHNOLOGY



One of the many new engine launches at bauma in April was the debut of the Hatz E1 single-cylinder, air-cooled engine technology for Tier 4 final and EU Stage 5 applications.

Three E1 models were introduced covering outputs from 6 to 14.5 hp. The E1 engines bring full-authority electronics to single-cylinder diesel engines. One of the keys to the E1 technology is a control unit that constantly measures parameters like engine speed and fuel injection rate as well as communicating all that to a CAN J1939 network.

The use of the E1 technology on smaller output diesels was recognized as the Industry Achievement of the Year at the inaugural Diesel Progress Summit.

See the story on page 38 of the June issue.

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VOLVO TRUCKS' DYNAMIC MAINTENANCE SERVICE

Volvo Trucks has introduced dynamic maintenance, a connected vehicle maintenance service which seeks to improve fleet operations efficiency through proactive and flexible vehicle-specific maintenance planning. The service is designed in partnership with Noregon Systems, an IoT (Internet of Things) company specializing in connected vehicle solutions.

Dynamic maintenance leverages intelligence from vehicle data analytics using enhanced software features from Volvo Trucks' remote diagnostics systems, Volvo Trucks' ASIST service communications platform, combined with Norgon's Trip Vision Interface. It allows a more accurate approach to planned maintenance needs and replaces traditional 'set-mileage scheduled' service appointments. Currently, dynamic maintenance is specific to powertrain-related maintenance services in Volvo Trucks.

Volvo Trucks is applying its data and analytics capabilities to vehicle service with the launch of what it calls dynamic maintenance, a connected maintenance service that allows for vehicle-specific maintenance planning.

Volvo Trucks' new dynamic maintenance service further expands its partnership with Noregon Systems and opens up new capabilities with vehicle telematics.

The new service uses existing connected technologies and data analytics, combined with Noregon's platform, to enable customized service plans to an individual-vehicle level to improve fleet operations efficiency. ■

HANDS-ON TRAINING FOR TELEHANDLERS

Pettibone/Traverse Lift, LLC has launched a service school program to provide in-person machine training opportunities for members of its dealer network. Hosted by Pettibone dealers at various regional locations, the service school is specifically focused on Pettibone's next gen X-Series Extendo and Traverse telehandlers.

The X-Series Service School consists of one-day sessions that cover product information in a classroom style setting, in addition to hands-on training with the machines. Topics include an overview of hydraulic system and components, and tutorials on servicing the booms for all X-Series telehandlers and the traversing carriage found only on Traverse models.

"We try to do as much training as we can in the field," said Brian Anderson, senior service technician. "Our parts and service department team works hard to deliver personalized support for all our dealers and customers." ■

Focused on its X-Series Extendo and Traverse telehandlers, Pettibone/Traverse Lift has launched a service school program to provide in-person machine training opportunities for members of its dealer network.

PALMER JOHNSON has opened its second service center in Sun Prairie, Wis. The 20,000 sq. ft. Recon Equipment Center is dedicated to reconditioning, modernization, repowers, service and repairs of off-highway equipment. Specifically, the facility is expected to service telehandlers, boom lifts, cranes, scissor lifts, backhoes, forklifts, utility vehicles, wheel loaders and skid steer loaders.

CAUTION IN THE AG SECTOR

Combines slightly up, four-wheel-drive and two-wheel-drive tractor sales down, according to AEM stats

October 2019 saw increases in U.S. sales of self-propelled combines while both four-wheel-drive tractors and two-wheel-drive tractor sales fell modestly compared to October of last year, according to the latest data from the Association of Equipment Manufacturers (AEM).

U.S. total farm tractor sales decreased 3.5 percent in October compared to last year while U.S. October self-propelled combine sales grew 8.1 percent.

Total U.S. sales of two-wheel-drive tractors in October decreased 3.5 percent compared to October last year: under 40 hp two-wheel-drive tractors decreased 3.9 percent, and sales of 40 to 100 hp tractors fell 4.9 percent. Sales of 100-plus hp tractors grew 1.9 percent.

Total October U.S. four-wheel drive tractor sales were down 2.8 percent.

UNITED STATES AG TRACTOR AND COMBINE REPORT OCTOBER 2019

	October			YTD – October			Beginning Inventory
	2019	2018	% Chg	2019	2018	% Chg	Oct 2019
2WD Farm Tractors							
< 40 HP	14,129	14,698	-3.9	144,713	137,488	5.3	91,024
40 < 100 HP	6,312	6,636	-4.9	51,426	51,133	0.6	36,166
100+ HP	2,851	2,797	1.9	16,017	15,527	3.2	9,051
TOTAL 2WD FARM TRACTORS	**23,292**	**24,131**	**-3.5**	**212,156**	**204,148**	**3.9**	**136,241**
4WD Farm Tractors	**518**	**533**	**-2.8**	**2,464**	**2,312**	**6.6**	**934**
TOTAL FARM TRACTORS	**23,810**	**24,664**	**-3.5**	**214,620**	**206,460**	**4.0**	**137,175**
Self-Propelled Combines	**495**	**458**	**8.1**	**4,114**	**4,015**	**2.5**	**1,158**

MEANWHILE, IN CANADA

For Canada, October four-wheel-drive tractor sales fell 51 percent (from 102 to 50 units sold year-over-year) and self-propelled combine sales decreased 9.2 percent. Two-wheel-drive tractor Canadian sales in October were mixed: 11.6 percent decrease for under 40 hp; 6.1 percent increase for 40 to 100 hp; and 18.8 percent decrease for 100-plus hp.

"This month's numbers show cause for caution in the Ag sector," said Curt Blades, senior vice president of Ag Services at the Association of Equipment Manufacturers (AEM). "We're hoping a return to stability in global trade policies and practices occurs soon in order to ease uncertainty for North American farmers, and ultimately, agricultural equipment manufacturers."

The full reports can be found in the Market Data section of the AEM website under Ag Tractor and Combine Reports.

U.S.: https://www.aem.org/market-data/statistics/us-ag-tractor-and-combine-reports/

Canada: https://www.aem.org/market-data/statistics/canadian-ag-tractor-combine-reports/

CANADA AG TRACTOR AND COMBINE REPORT OCTOBER 2019

	October			YTD – October			Beginning Inventory
	2019	2018	% Chg	2019	2018	% Chg	Oct 2019
2WD Farm Tractors							
< 40 HP	1,713	1,937	-11.6	12,758	12,622	1.1	9,321
40 < 100 HP	1,223	1,153	6.1	4,648	5,083	-8.6	5,114
100+ HP	489	602	-18.8	2,739	3,300	-17.0	2,601
TOTAL 2WD FARM TRACTORS	**3,425**	**3,692**	**-7.2**	**20,145**	**21,005**	**-4.1**	**17,036**
4WD Farm Tractors	**50**	**102**	**-51.0**	**478**	**740**	**-35.4**	**356**
TOTAL FARM TRACTORS	**3,475**	**3,794**	**-8.4**	**20,623**	**21,745**	**-5.2**	**17,392**
Self-Propelled Combines	**257**	**283**	**-9.2**	**1,295**	**1,719**	**-24.7**	**718**

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IN BRIEF

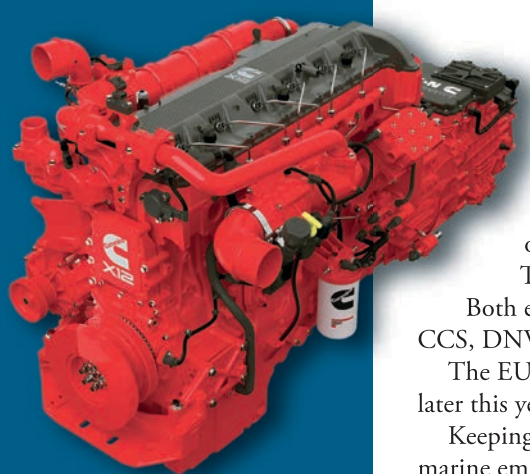
NEW MARKET FOR CUMMINS' X12

Cummins announced its X12+Endurant powertrain from its Integrated Power portfolio is now available for customers in regional haul applications. The powertrain can be now be ordered in Freightliner's new Cascadia day cab truck.

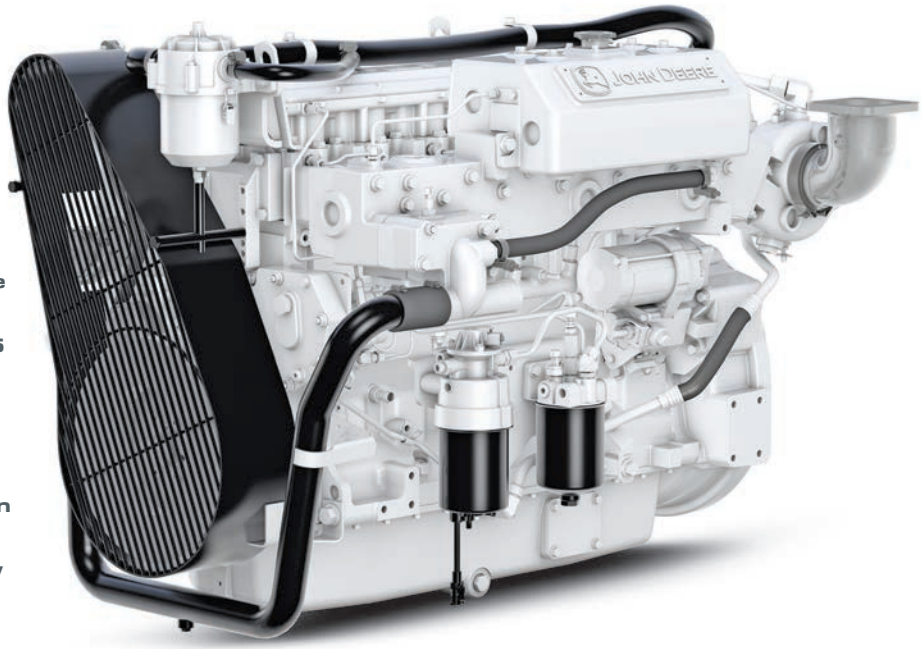
This is a new market for the X12 engine, which had previously only been available in vocational and refuse truck applications. At just over 2700 lb., the X12 paired with the Eaton Cummins Endurant transmission is designed to be a match for weight-sensitive duties such as bulk and regional haul applications.

Cummins is expanding maintenance intervals for the X12 platform. Oil-drain intervals are now up to 75,000 miles, and those that participate in Cummins OilGuard program may see extensions of up to 100,000 miles.

The day cab Cascadia with the Cummins X12 and Eaton Cummins Endurant begins production mid-2020.



Cummins X12+Endurant powertrain is now available for regional haul applications.



Ratings for China, a new hybrid rating for the PowerTech 6090SFM85 (right) for hybrid vessels with diesel power. highlight John Deere Power Systems new global marine ratings.

DEERE'S NEW GLOBAL MARINE ENGINE RATINGS

John Deere Power Systems (JDPS) has announced new global marine diesel ratings, including ratings for China, as well as a brand-new hybrid rating.

With many in the marine markets considering a hybrid power solution, John Deere is announced the upcoming release of a PowerTech 6090SFM85 rating for hybrid vessels with diesel power. The variable speed rating will be 325 hp (242 kW) at 2000 rpm and will meet U.S. Environmental Protection Agency Marine Tier 3 and International Maritime Organization Tier 2 emissions standards and will be certified to E3 propulsion test cycle for commercial applications used with variable pitch or electronically coupled propellers.

JDPS said this rating is applicable for hybrid vessels that require a variable-speed generator drive engine to develop electrical power for any combination of electric propulsion, energy storage, hotel load and auxiliary electric loads.

For inland waterway applications, John Deere will offer two marine generator drive ratings that are EU Stage 5 compliant on the PowerTech 4045TFM85 and 6068AFM85 models. The 4.5L rating will be 61 kWm prime at 1500 rpm and the 6.8L rating will be 117 kWm prime at 1500 rpm. Both prime ratings include a 10% overload capability and conform to ISO 8528 prime power.

The 4.5L and 6.8L engines feature a water-cooled exhaust manifold and turbocharger. Both engines are type approved by the following Marine Classification Societies: ABS, BV, CCS, DNV-GL, and LR.

The EU Stage 5 generator drive ratings below 130 kW are anticipated to be available to order later this year, with production set to begin in early 2020.

Keeping its global customers in mind, John Deere said it is prepared to meet China Stage I marine emissions standards. These standards apply to new marine engines at or above 37 kW that are registered in China for operation in Chinese territorial waters.

John Deere will release new emission label options for 50 Hz generator drive ratings for the PowerTech 4045TFM85, 4045AFM85 and 6068AFM85 engines, which will comply with China Stage I marine emissions standards. The new emission label options are expected to be available in early 2020. ■

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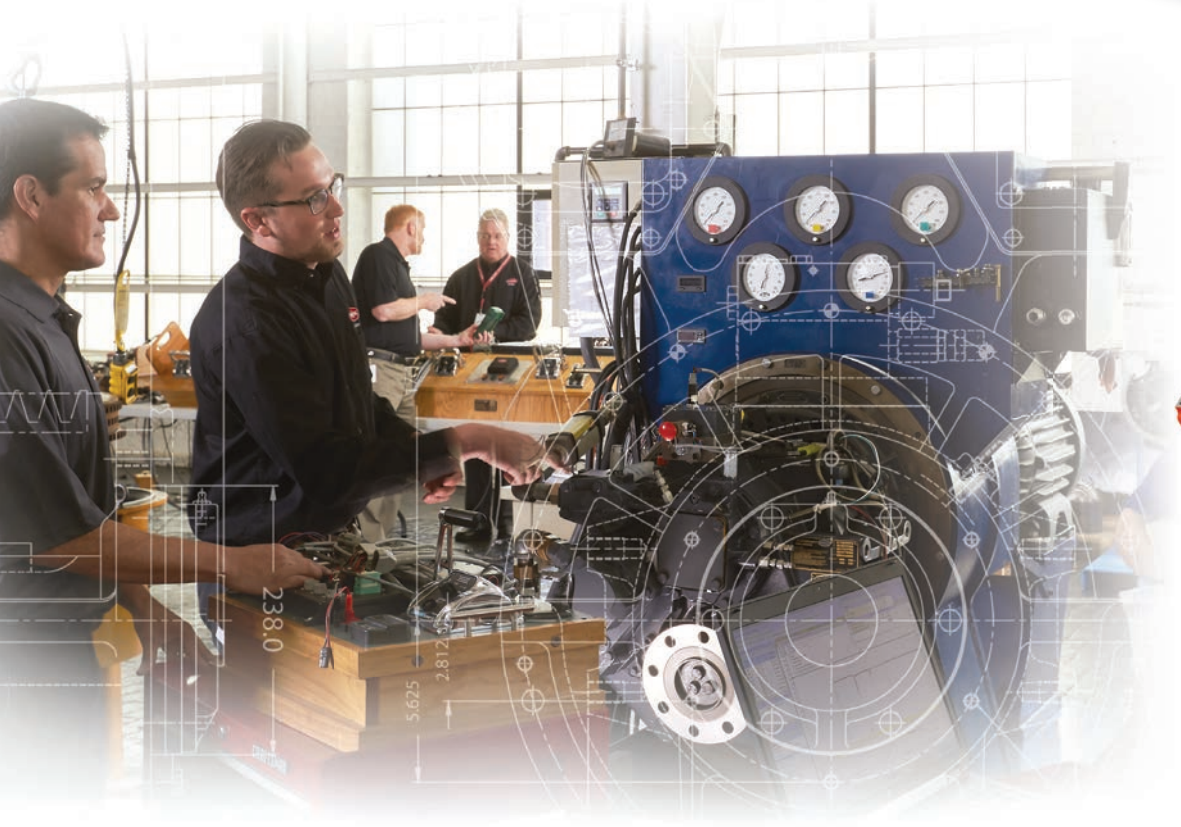

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