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The first Tier 4 final Tigercat 845D feller buncher was shipped to Scotland and was equipped with a leveling undercarriage to work steep slopes.

BETTER THAN A BLUE OX

Tigercat engineers and partners work to design machines for the rigors of logging operations

BY CHAD ELMORE

Feller bunchers and skidders typically work as a team during logging operations, traversing difficult terrain that's often covered in obstacles such as boulders and stumps. The conditions can take a toll on the equipment.

"The forestry application is very rough," said Steve Bredschneider, a designer for Tigercat Industries who works with its tracked machinery. "We say if a product makes it on a Tigercat machine, it can make it on just about anything out there. We pride ourselves on beating up on things and making them fail during the test phase so we can find better components and get our suppliers to come up to our level."

The forestry equipment specialist based in Brantford, Ontario, Canada, is busy rolling out new models fitted with Tier 4 final diesel engines. In 2013, it formed an alliance with FPT Industrial to supply the new engines across its product line. Tigercat 620E, 630E and 635E skidders were the first to get the 6.7 L NEF Tier 4 final diesel engine while the 726E feller buncher and M726E mulcher got the 8.7 L Cursor diesel engine. The engines use a fixed-geometry mechanical wastegate turbocharger, selective catalytic reduction (SCR) and a diesel oxidation catalyst (DOC) to meet the latest regulations.

"The duty cycles of Tigercat machines are very tough," said Moe Jabouri, director of Engine Sales for Genrep Ltd., FTP Industrial's engine distributor for Canada based in Mississauga, Ontario, Canada. "The only applications I can compare their cycles to are tough underground mining or military specifications. And the machines really work — once they are at operating temperature, they are working at full load until the shift ends."

The company's feller bunchers required a few changes in order to make room for the new engines and emissions control system. "For Tier 4 final, we had to grow some metal to fit in a few new components," Bredschneider said. "There was some shoehorning, but we have good solutions for meeting the regulations, and they're serviceable."

The first production Tier 4 final Tigercat 845D feller buncher was shipped to Scotland last year and

A new Tigercat 845D feller buncher awaits shipment behind the company's factory in Paris, Ontario, Canada.

was equipped with a leveling undercarriage to work steep slopes. The second machine went to Maine. The 845D feller buncher uses a Tier 4 final FPT Industrial N67 diesel engine rated 282 hp at 2200 rpm and is a midsized machine with a limited tail-swing design.

"The 845D is the first Tier 4 final machine that we produced in the tracked group," Bredschneider said. "The machine in Maine has about 800 hours on it right now, and we have heard no complaints."

The feller bunchers use the company's patented ER boom system, which extends and retracts on a horizontal plane with a single joystick. The design is productive in small-diameter, timber-accumulating applications where multiple boom cycles are required for each swing, the company said. It rides on a Tigercat-built F8 undercarriage and a large-diameter swing bearing. The upper assembly is built on a one-piece turntable based on thick steel in Tigercat's plant in Paris, Ontario, Canada — one of the company's nine factories.

The engine compartment is accessed through a clamshell-style retracting enclosure, and a swing-out door on the right side gives access to daily service points, the company said, while the hydraulic pumps are separate from the engine and are easily accessed. Dedicated pumps run the saw and clamp arms to provide fast cycle times.

The hydraulic components come from a range of suppliers and support systems that are designed in-house. "We try to not keep all of our eggs in one basket in order to prevent supply and demand issues and to ensure our customers are getting good quality components," Bredschneider said. "We use major components from Bosch Rexroth, Linde, Kawasaki, Hawe and Parker Hannifin.

"We work with people who are willing to work with us for our specific needs. I know that all of those manufacturers have come here and spent time with us to get their components to work on our machines. A lot of R&D is going on for these component manufacturers here, as well. If it's Tigercat tough, you have a good product."

Forestry equipment operators typically log long hours in locations that are far from a primary source of diesel fuel. Because of that, fuel quality can pose a serious challenge, especially with Tier 4 final engines.

"Customers are getting better at handling diesel," Bredschneider said. "But it wasn't long ago that you saw fuel tanks that were open to the atmosphere and with no filtration between it and the fuel tank on the machine. You can't do that anymore. Our machines are the final filtration point, so they have got to have as good a filtration system as we can get to protect the engines. We can't assume operators will handle the fuel correctly from the tank to the machine. Plus, there are some places in the world where fuel quality is questionable to begin with. We have to be prepared for all of that."

Tigercat and its dealer network have full responsibility for the FPT engines, including maintenance and warranty work. Service technicians at dealers in North America and Europe have been trained to work on them.

"We are 100% responsible for the engines, and so we need to give our customers the best possible fuel filtration that we can give them so that

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The 845D feller buncher uses a Tier 4 final FPT Industrial NEF N67 diesel engine rated 282 hp at 2200 rpm. The red platform at the bottom of the photo is included on machines with leveling undercarriages to help make regular maintenance safer and easier.

To protect the engines from damage due to water or dirt in the diesel fuel, Tigercat engineers spec'd a Racor GreenMAX fuel filter/water separator (left) for new machines. Custom-fit Firwin insulation blankets (right) help isolate hot spots in the engine compartment of this 845D feller buncher.

they have absolutely no downtime, no matter what the quality of fuel is," Bredschneider said.

To that end, feller bunchers equipped with Tier 4 final FPT Industrial diesel engines are shipping with a Racor GreenMAX 4400R10 fuel filter water separator installed just inside the right-side access panel and next to the engine. With the new filter, the company now uses a 10 micron unit compared to the 25 micron filter still spec'd for the Tier 3 engine in machines destined for less-regulated countries.

With a 150 gph flow rate and a built-in primer, the GreenMAX filter is designed to remove bulk and emulsified water as well as dirt trapped in the fuel. The heart of the system is dual-stage coalescing and filtration from a Racor Aquabloc filter element.

"Tigercat's engineers have to build products to handle harsh environments and accept all types of fuel because they ship all over the world," said Ed Wiebe, senior territory manager for Parker/Racor in Canada and the northeastern United States. "The GreenMAX filter is made for Canada and other cold climates. We have three heater options — there's a heater in the bowl, in the head and the recirculation valve takes fuel coming off the fuel injection system that is hot to heat the filter before it goes back to the tank. This is the best filter for Canada, bar none. Plus, for fast maintenance, you can see into the bowl and drain the water it has removed from the fuel."

The cold weather option melts the paraffin that can separate from diesel fuel in freezing temperatures — the fuel's cloud point — and can restrict fuel flow during the filtration stage. The option includes a fuel recirculation valve that is thermostatically controlled to direct engine return fuel into the GreenMAX prior to the filtration stage. The engine return fuel is mixed with the filter's incoming fuel flow from the tank, providing the right temperature for efficient fuel filtration and engine performance. The recirculating valve is self-regulating based on the temperature of the fuel and closes automatically once the fuel is warm so that the fuel returns to the tank.

"The technicians I've talked with really like the visibility aspect of the filter," Bredschneider said. "They like that they can see the filter and the water buildup. Even the operators say that's a good feature."

A filter upgrade helped engineers meet the challenge of cold, wet and dirty fuel. The need to prevent and fight equipment fires has also become an integral part of the machine's design.

"Out in the woods, we have a big issue with sawdust, leaves, twigs and pine needles. The fewer spots we can give it to collect and ignite the better," Bredschneider said. "In the feller bunchers, we are constantly getting a good wash of cool air across the engine from the fan, which also pressurizes the entire enclosure and helps to keep debris outside."

When so ordered by the customer, Tigercat installs the optional fire suppression system as the machine is being assembled. "We designed the system here with help from Amerex, which also certified it," Bredschneider said. "At the end of the assembly line it's functional, but it gets disconnected before the equipment goes down the road. When it gets to a dealer, Amerex comes in and activates the system and certifies that it is working. It's a good partnership that has been working very well for years." Nearly every tracked machine gets ordered with the system installed, he said.

As the feller buncher moves through the forest collecting trees, skidders pull the timber from the cutting site to a landing where it can be sorted and processed. Tigercat recently introduced the 610E skidder with a Tier 4 final engine. The machine is in the small size class intended for tight spaces, soft soil conditions and selective logging applications.

The skidder uses the company's

The new Tigercat 610E skidder is designed for tight spaces and soft soil conditions. It uses a 6.7 L FPT Industrial NEF N67 Tier 4 final diesel engine rated 203 hp at 2200 rpm.

efficient, high-speed (EHS) drive system, which is based on two variable displacement motors that connect to a transfer case. Front and rear shafts are connected to the front and rear Dana inboard planetary axles.

EHS provides high tractive effort as well as top speed through advanced computer logic and the ability to take one of the drive motors offline when high tractive effort is not required. In that case, all pump flow is directed to one hydraulic motor, increasing both travel speed and motor efficiency, Tigercat said.

The cab is equipped with Turnaround, which allows the operator station to face the direction of travel and provides the operator with comfort and clear sightlines.

Its 6.7 L FPT Industrial NEF N67 Tier 4 final diesel engine is rated 203 hp at 2200 rpm and is fully supported by Tigercat. The engine meets the latest emission levels using SCR. An automatic variable pitch Flexxaire radiator cooling fan reduces fuel consumption in cold climates.

"The engines are really robust, and they are rated at a continuous duty cycle, so when Tigercat tells someone they are getting 100 hp, they are getting that power all day," Jabouri said. "The NEF and Cursor engines are based on designs that are well-proven, and their fuel injection system and their SCR-only Tier 4 solution is advanced and with a low emissions output level. It's really adaptive to the different environments these machines go into."

The engine and emissions system can be packaged into a physically smaller engine enclosure, which provided the design team with some flexibility to develop a machine layout that optimizes operator sightlines while factoring in access to service points, machine balance and overall size and weight, the company said.

"They have really done a great job integrating that engine into their machines, and it has performed well so that it has helped make their integration to Tier 4 final smooth," Jabouri said. "Tigercat is very engineering and technically savvy. They ask for the best and they put the best out there for their customers." **dp**

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