

COMBINES

High inertia cylinder allows more aggressive processing



Photo / Sunnybrook Welding

Designing a rotor or a cylinder that requires less power and doesn't distort under load is one challenge. Extracting top performance from that new design is an altogether different problem ~ Ron Lyseng

BY THE MID-1990s, Sunnybrook Welding had mastered the art of fabricating a rigid combine cylinder that did not flex or bend in a heavy crop. Now it was faced with a challenge. Was its high inertia cylinder an academic engineering exercise, or was there a way to extract superior harvest performance so a farmer had good reason to pay \$4,000 or \$5,000?

"We took a real good look at those first Cat Lexion combines that came to North America," says Gerald Foster, owner of Sunnybrook Welding in Sunnybrook AB.

"Now here was a combine with 35,000 pounds of steel rumbling across the field, compared to 25,000 pounds of the day. In a good barley field, the Cat processed 1,600 bushels per hour while the competition processed only 900 bushels per hour.

"Many people say the difference is that everything on the Cat is bigger, and that's true. But, purely in terms of harvest function, we think the most significant factor is their unique accelerated pre-separation cylinder. Everything else is engineered bigger to support the higher capacity created by that extra cylinder up front."

At that point, Foster said his goal at Sunnybrook was to take a traditional cylinder design and get it as close as possible to the Cat performance, but without an additional pre-cylinder drum.

"Their extra drum tends to put a more uniform flow of material through the main processor. I think we have accomplished that without the extra cylinder."



Gerald Foster and Jay Holt check for grain out the back of Jay's 9600.



Cylinders are carefully balanced at the shop, and farmers say they keep that balance in heavy harvest conditions.

WP photos / Michael Raine

High inertia cylinder

Foster says there's no mystery about the basic high inertia cylinder. The company started building these when it first produced enclosed rotors for Gleaners beginning in 1991. Since then, it has built rotors and cylinders from scratch for just about every type of combine sold in North America.

"The term 'high inertia' simply means the weight is displaced outward from the centre of the cylinder. The more weight you have out at the circumference of a drum, the more inertia you have and the more it wants to keep spin-

ning, like a heavy flywheel. On a high inertia combine cylinder, we put more weight out at the circumference. It may weigh about the same as an original equipment high inertia cylinder, but ours has more rolling force once you get it rolling. Once it starts spinning, it wants to keep on spinning."

Foster says all this spinning mass, by itself, offers only a small advantage in a harvest operation. The rigidity of the cylinder helps a lot, but Sunnybrook had to find a way to take full advantage.



Photo / Sunnybrook Welding

Large Browning hubs on the end plates support the cylinder.

Aggressive bars

"The primary factor affecting combine performance is the crop contact area, or the surface of the cylinder bar. So if we wanted to make use of this high inertia to gain a functional advantage, we had to put in more aggressive cylinder bars. When we tested our first prototypes in the field, we saw as much wear between the teeth as we saw at the tips. That confirmed that something different was happening in there."

Rigid tube

While conventional combine cylinders are built with spiders and a shaft down the centre, with cylinder bars as braces, the Sunnybrook design uses the cylinder tube itself as the structural shaft. Large Browning hubs mounted on the two end plates support the cylinder. This creates a rigid tube that resists bending or warping in the middle.

"In a conventional design, the cylinder/concave bows anywhere from an eighth to a quarter of an inch. Our design creates a mat that is more uniform from side to side. We don't compress the mat in the middle and we don't get bunching. That's another factor in preventing flex. PAMI tests show 40 percent less force generated by the mat with our cylinder compared to original equipment cylinders, through a range of feedrates," says Foster.

PAMI tests

To determine if there really is a functional difference between the aggressive high inertia cylinders and more conventional designs, Sunnybrook contracted with Prairie Agricultural Machinery Institute at Humboldt SK to do lab tests comparing power to run the cylinder and weight exerted on the concave.

PAMI used a stock John Deere 9610 combine that could be fitted with either cylinder. With the combine running but stationary, a 60-foot long tarp evenly piled with wheat straw was used to draw the straw to the combine pickup point at various feedrates. Most tests were conducted in the range of 700 pounds of product per minute because this is the upper threshold of a class six combine.

To ensure accurate measurements, a tractor pto was used to drive the cylinder. A torque sensor recorded 800 readings per second. The lab tests showed the Sunnybrook cylinder required about 17 percent less power.

Of significant note is the reduction in torque spikes with the Sunnybrook cylinder. In a 20 second span, the OEM cylinder exceeded 800 foot pounds eight times. In a similar 20 second span, the Sunnybrook exceeded 500 foot pounds only once.

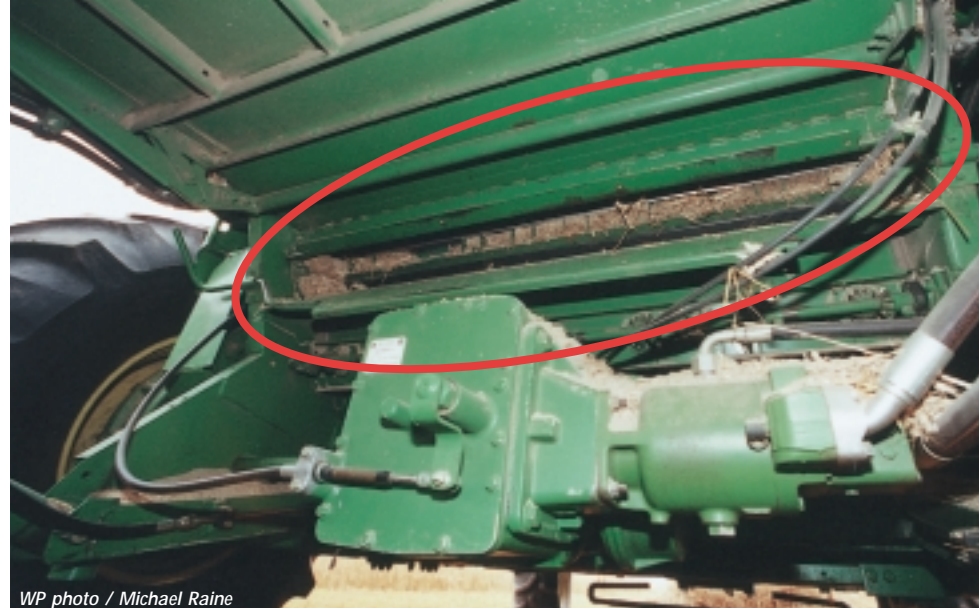
Corresponding load cells on the front concave mounts proved so sensitive that they could record the effect of each cylinder bar as it passed the first bar on the concave. Concave weight load was reduced by about 40 percent, indicating the design does spread the product load across the processing area.

Reversible cylinder

Rub bars on the Sunnybrook high inertia cylinder are made in 12-inch to 16-inch sections instead of continuous bars across the whole 55-inch to 70-inch width of the cylinder. This makes for quick repairs when a stone damages one or two bars. Each bar is reversible, for longer service life. Service doors typically allow quick access, with enough working room for impact wrenches.

Another unique feature is a reversible cylinder. It can be turned end for end with all bars in place. This means a producer can flip-flop and get all new rub bar edges without individually reversing the rub bars.

Sunnybrook products are built from scratch with all new metal. They are not rebuilt cylinders.



WP photo / Michael Raine

Big service lids allow access to the bars with impact tools.

ders. A complete kit, with boronized bars, for a class six/seven combine costs \$4,000.

"If this is such a good idea..."

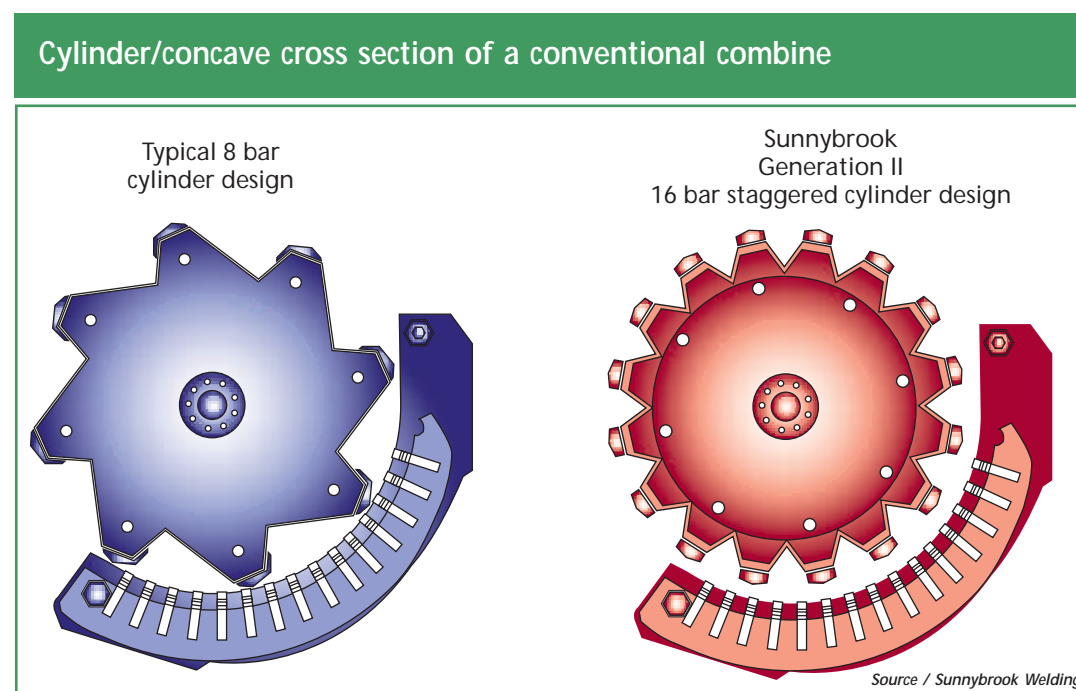
"If this is such a good idea, why doesn't John Deere, Cat, New Holland and AGCO all have it on their combines? That's a question I get all the time at farm shows and field demos," says Foster.

"There is no polite answer to that question. For one thing, manufacturing costs are not comparable. Ours cost a lot more to build. That extra cost is probably a factor for combine manufacturers.

"But, the other thing that always annoys me is when people infer the best products come from the United States or Europe. The simple fact is that Canadian farmers don't realize some of the top engineers down in Iowa and Kansas and Nebraska are Canadians who can't find work up here.

"Not many years ago, Canada was the world centre of design excellence for combines and ag machinery. Well, some of that brain power is still here, and it's still being put to good use in smaller business. So maybe we should realize we have people here in Canada who can design and construct as well, if not better than, their American cousins or the Europeans." ■

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Source / Sunnybrook Welding

Farmers say it's the real deal

Jay Holt Viking AB

Jay Holt runs a five-year-old 9600 and a three-year-old 9610, which has 25 more horsepower. He wondered if it was possible to bring the older combine up to the performance level of the newer unit, so he installed a Sunnybrook cylinder and beater in the 9600.

"We could tell the difference right away just sitting in the machine," Holt says. "The one with the Sunnybrook is a lot smoother. It's quieter. When you're running, you don't feel the whole combine shake if you put a plug through."

This year was good for combine comparisons on Holt's farm, with canola at 35 bushels and wheat and barley at 60 bushels. They harvested 5,000 acres with the two combines side by side.

"In the previous years, I'd run the 9610 and my brother would run the 9600. I'd always be ahead of him and I'd be lapping him in the field. Now, if he starts ahead of me, he stays ahead of me all day. We had been thinking about trading off the 9600 to get another 9610, but this cylinder puts the two combines very, very close."

Lawrence Schmidt Wetaskiwin AB

"It flexed and flexed until it flexed itself right out of there," chuckles Lawrence Schmidt, recalling what happened to the original cylinder on his 1982 John Deere 8820. That was during the 1999 harvest. Schmidt already had nearly 10 years of experience with his 8820. He liked the combine, but decided a Sunnybrook cylinder, concave and back beater might be smarter than replacing his broken pieces.

"It's a total difference," he says. "The machine runs so much smoother. The original cylinder had no weight. It was not solid, so it went out of balance. That's when you get the flexing.

"This set up feeds so much better. I don't feel the plugs. Before, a plug would just sit there. Then it would all go through at once and you'd feel the sudden change in rpm. The cylinder speed needle would jump around 300 or 400 rpm all the time. Now it's very gradual up or down, only 50 rpm."



WP photo / Michael Raine

Schmidt says the new setup somehow spreads out the material and feeds it through gradually so the combine doesn't seem to feel it. It's easier on the whole machine.

"It's hard to understand why the manufacturers have been building combines for this many years and they can't build something like this at the factory."

Bill Ramsey Irma AB

When Bill Ramsey bought his new Gleaner C62 four years ago, he removed the original cylinder and back beater and put them in storage. "That way they're in good condition so I can put them back in when it comes time to trade combines," he says.

In their place, he installed a high inertia cylinder and back beater from Sunnybrook. "I looked pretty closely at their design. It's a lot heavier, because it's totally enclosed. I think that makes it a lot stronger and I find it's vibration free. It has staggered bars, which makes it a little bit more aggressive in getting the straw spread evenly throughout the concave area."

Ramsey has stony fields. He also has the distinction of having bought the only unit Sunnybrook ever built with chrome instead of boronized bars.

It hasn't been a problem so far. "I might break a leading edge on a rasp bar, but that's all I've seen. The bars have a good strong backing on them, so you're not as likely to break the whole thing. I think the boron bars are supposed to be even stronger, so if I ever have to go through and replace the bars, I think I'll buy the boron ones."

Mel Stickland Red Deer AB

Mel Stickland runs three 8820 combines. One has the older Sunnybrook sealed cylinder unit. The other two have the newer style high inertia cylinders.

Stickland says he likes the high inertia cylinders in tough conditions. "We really notice it in the peas and canola when you slow the cylinder down. It's quite a dramatic difference because each rub bar does less work.

"A regular cylinder has eight bars all the way



Photos / Sunnybrook Welding

The Sunnybrook rub bars are deeper than the original bars, which helps reduce load spikes on the concave.

across. I think these cylinders I have are set up into groups of three. They're closer and they're deeper so they handle heavy crop much better.

"The other thing we've noticed is they never go out of balance. We do quite a bit of tough going and high moisture harvest, so it's easy to get things out of balance. And that beats up your combine so bad. We don't have that problem with these cylinders."

Claus Toerper Wembley AB

Claus Toerper bought a 1997 Massey 8680 in 1998. A year later, he decided to try the Sunnybrook high inertia cylinder. He feels he has gained fuel efficiency, but the main advantage has been harvesting in tough crops.

"It runs much smoother in tough conditions. The crop seems to flow a lot better, especially when you get into something like wet pea vines. You put a wad through and it just sort of gradually slows the engine down a little bit and then it spits it out. Of course, we can't see what's happening in there, but I'd be pretty sure that what we're getting is an even spread of crop right across the entire cylinder."

He put a rock through and broke a bar in the first 400 acres with the new cylinder, but the repair was quick. "It was just a couple of bolts. Strap in the new bar and away we went."

Murray Palin Calgary AB

Murray Palin runs four Lexion 480s on his farm near Calgary. He converted one unit to the Sunnybrook setup before this harvest, but says conditions this year didn't put any of his combines to the test.

"We had a pretty good crop this year, but the straw was dry. This wasn't the kind of year we could really tell any difference." ■

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