

Krone Optimaxx 250 versus 305 crackers:

For the crack

Krone's Big X 680 to 1180 foragers are available with two different cracker rollers. profi checks out the differences



There was quite a bit of hype about long-chop forage maize, and, when it had abated, we'd learned one thing – that the way maize kernels are cracked in the forager merits your maximum attention if the grain is to be quickly and fully digested in the rumen or a digester.

Contractors want to be flexible so they can offer their customers as many variations in chop lengths as possible, along with optimum grain processing. Our test machine was a Big X 780 with the VariLOC gearbox, which allows various chop length ranges. This reduction gearbox mounts on the pulley where it can

reduce the drum speed from 1,250rpm to 800rpm. This extends the chopping range from 3mm to 24mm – without removing a single blade.

But what about the conditioning roller? Which roller suits which conditions?

The choice

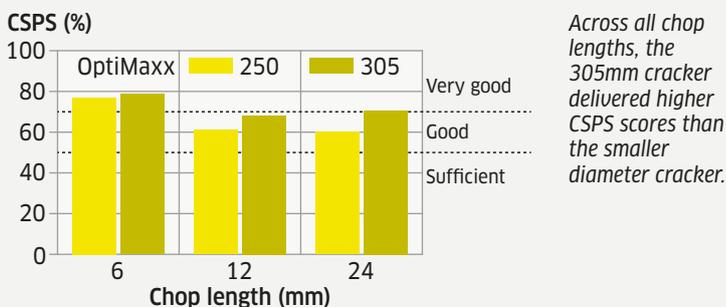
Since 2018 and the launch of the new Big X series, Krone has been offering two new roller conditioners:

- **Optimaxx 250:** 250mm diameter, 105/123 teeth (123/144 as an option), slanted and serrated teeth, choice of 30, 40 or 50% speed differential. The cost for this unit is £14,560.
- **Optimaxx 305:** 305mm diameter, 125/150 teeth (150/175 as an option), slanted and serrated teeth, a 30% (standard) or 40% difference in speed. This unit costs £20,225 (with HD BusaClad). Cost difference between the two is £5,665.

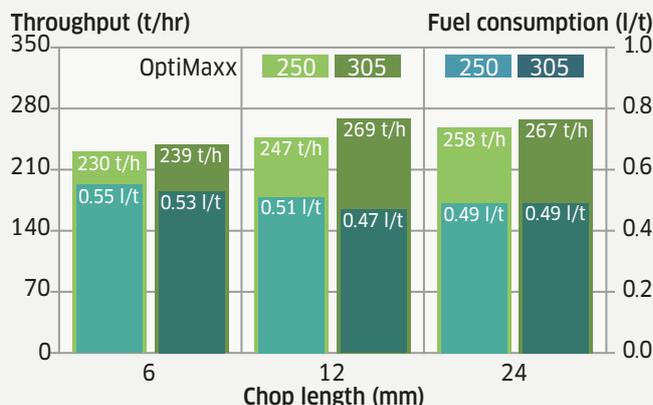
WHAT'S THE SCORE WITH CSPS?

The Corn Silage Processing Score is a benchmark that helps assess the level of kernel processing or chop in maize silage: the higher the CSPS score, the better the digestibility of the starch in the silage. The CSPS score is obtained by sieving a sample and determining two different fractions – material larger than 4.75mm and cuts smaller than 1.18mm. Based on the starch level in the entire sample, the percentage of starch is quantified by analysing the coarse chop fraction. The aim is to find 70% starch levels in the material smaller than 1.18mm.

KERNEL PROCESSING EFFICIENCY COMPARED



THROUGHPUT AND FUEL CONSUMPTION



Throughputs averaged to 32% DM. The fuel consumption drops only minimally per tonne when chop length increases. Graphs: Tovornik

KEY POINTS

- ▶ Krone offers two different 250mm and 305mm diameter roller crackers for its Big X foragers.
- ▶ The larger diameter unit gives a more intensive kernel treatment.
- ▶ Conditioning intensity decreases and throughput increases when using a longer chop.

DATA SHEET

Krone Big X 780

Engine

Liebherr D 9508, V8, 16.2-litre, 570kW/775hp at 1,900rpm, 930-litre diesel + 170 litres + 400 litres (option)

Ground drive, running gear

Hydrostatic transmission, in-wheel motors from Bosch-Rexroth with ASR, four-wheel drive (option), independent wheel suspension on the rear axle, 40km/hr, 900/60 R42 front tyres, 710/60 R30 rear tyres

Chopping assembly

Six pre-compression rollers; 660mm diameter, 800mm wide drum, VariLOC gearbox for 1,250rpm and 800rpm; two sets of 18 blades for 3-24mm chop lengths; two corn cracker rollers (250mm and 305mm diameter, 710mm width)

Machine weight, dimensions

Length 7.50m, width 3.20m, height 3.90m, unladen weight 16,700kg

Manufacturer information



Swapping the cracker takes an hour after the rolls are clamped to the unit. Solid ground, such as concrete or tarmac, is a 'must'.



The two crackers side by side – the 250mm unit (left) and the 305mm diameter cracker on the right.

As you'd expect, both crackers fit smoothly into the appropriate space. Swapping them takes about an hour, and concrete or other solid ground is a big aid to getting the job done easily. Once removed, each unit rolls on caster wheels that are clipped onto the frame of the unit. Swapping pulleys, which alter the speed difference, takes about the same time. A pulley costs £520, according to the list price, and provides a 10% speed difference.

Which diameter is right? And which is the maximum speed difference a cracker can cope with without suffering too much wear? We can't answer the question on wear since we're unable to draw on any long-term experience. At the same time we should point out that the Optimaxx 305 cracker offers a 22% larger wear area and a 11% bigger friction surface area when compared with the smaller 250mm diameter unit.

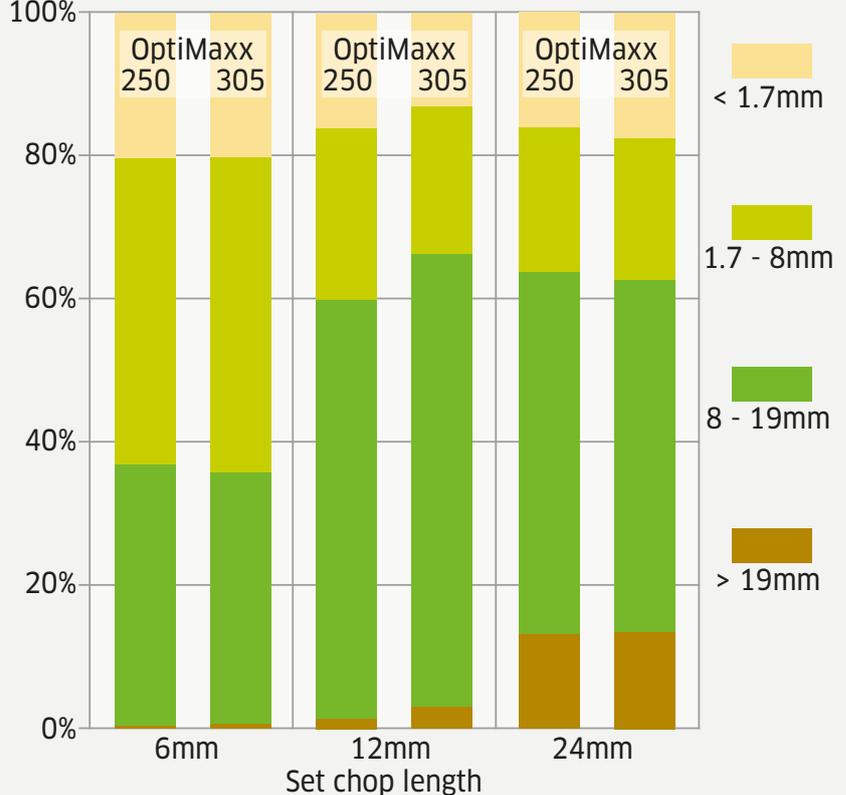
The CSPS score

The Corn Silage Processing Score is explained overleaf. The question here is which level of processing does each roller set-up achieve at various chop lengths? This is the information provided within the graph 'Kernel processing efficiency compared'.

At crop chop lengths of 12mm and 24mm, the overall conditioning quality of the 250mm

RESULTS FROM THE SHAKER BOX

Percentage of chopped material in the various samples



The graph shows that the structure of the chopped material is not really affected by the cracker size. The percentage of coarse material increases when the length of chop is 24mm.



Consumption for each test run was measured with these fuel metering columns.

cracker (30% speed differential) was OK, but there was still some room for improvement. By comparison, the 305mm cracker achieved substantially better results as the chop length was increased.

At 6mm lengths, much of the chopping is taking place at the chopping cylinder, so there is less work left for the crackers. These then come under greater pressure as chop lengths increase, because the particles that need chopping and slicing are larger. In addition, throughput increases to more than 270t of fresh mass per hour on both crackers when the chop length increases. This means that 75kg of fresh mass need processing per second! The rollers spin at speeds of up to 4,280rpm.

When chop length increases, the power requirement for the chopping cylinder and corn cracker also changes. Krone says that the chopping drum and the cracker absorb

HOW THE MEASUREMENTS WERE TAKEN

The tests were carried out in October 2019, when profi and Krone harvested a 15ha field in north west Germany. During the season the field had been irrigated three times, so fresh mass yields were about 55t/ha.

Once the headland was cleared, we had 24 passes left to take the measurements. The forage harvester, a Big X 780, was equipped with a 7.50m Easy Collect header. The fuel consumption during the test runs was measured with the help of meters installed at the rear of the machine. We also measured throughput per hour. One trailer was used to travel alongside the forager for each run and the load then passed over a weighbridge.

We drew samples from the crop stream as it was blown into the trailer. These were sent to the Lufa Agricultural Research Institute in Munster, which analysed the DM levels and the CSPA score. In addition, we sampled the material in the shaker box. The trial tested for cracker variants with chop lengths set to 6mm, 12mm and 24mm: Oplitmaxx 250 was set to the 30% and 40% speed differential and the Oplitmaxx 305 to the 30% and 40% speed differential. The gap was always 1mm. Each of the settings was tested in two runs. To minimise the effect of natural variations during the day of the test, such as moisture levels, we repeated the test runs for each chop length and each cracker

setting only after the initial dozen runs were completed. This involved swapping the crackers again.

Average DM content of the silage samples taken during the day was about 37%. Dry matter starch content was between 34% and 37%.

Unfortunately, our measurements in the 40% speed difference test run did not produce reliable results due to a technical defect in the main clutch and also because of a heavy rain shower that spoiled the samples. Although we decided not to publish these results, we can say that they show the following trend – it is possible to achieve higher CSPA scores in longer chops than with the 30% differential.



The 15ha field was split into parcels. It had been irrigated three times during the season so the yield was a consistent 55t/ha across the field.

about 80% of the engine power. In short chop lengths, the drum absorbs about 50% and the cracker about 30% of the power. This ratio changes when the length of chop shifts up to 24mm, with 30% flowing to the drum and 50% to the cracker.

Throughput increases with a longer chop

In all of the test runs, the throughput of fresh mass (averaged out to a 32% DM content) increased from 230t/hr to 268t/hr when the chop length increased. The machine with the bigger 305mm cracker unit had notably more output than when equipped with the 250mm cracker. This is attributed to the larger friction surface area as well as a better crop flow into and through the rollers. Compared with the 250mm cracker, the bigger cracker led to 3.6% more throughput at a 6mm chop, nearly 9% higher output at 12mm cuts and improved by 3.6% with a 24mm target chop.

Fuel consumption decreases per tonne of chopped material when chop length increases.

With absolute consumption remaining much the same (126-130 litres/hr), the consumption per tonne of chopped material decreases as throughput increases.

The 305mm cracker benefits from the fact that output rises when the chop length is extended. As it allows more maize to flow through the machine per hour (processing it more effectively), consumption per tonne of crop is lower than on the 250mm cracker version. This applies to all three chop lengths.

Summary: Our cracker check produced the following insights. Krone's VariLOC system is certainly a good investment for contractors needing the flexibility to meet different customer demands, because VariLOC allows them to produce chop lengths from 3mm to 24mm – it just takes a bit of time with the spanners. If you're looking for more treatment intensity, then you need to go for the bigger diameter cracker ... at least when the length of chop is 12mm and longer.

In short chop lengths, most of the kernel

processing is taking place at the chopping cylinder. Hence, the 250mm cracker is a good choice for those who prefer a shorter chop. The bigger 305mm cracker unit is the better choice in long chops and if you seek excellent kernel processing results. In our view the €4,300 price premium for the bigger cracker is not a massive investment when you have already sunk the bones of half a million into a machine.

The longer the chop length, the higher the throughput of fresh material per hour. Fuel consumption per tonne of chopped material drops to suit because absolute consumption per hour remains much the same. The level of kernel processing is also down to the gap between the rollers and the difference in speed, but these key parameters couldn't be reliably assessed in our test. However, the test results do show the trend that a 40% higher speed difference leads to higher CSPS rates than those at a 30% speed difference.

Tobias Bensing