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Trends in the process technology of grain crop harvesting

Below, important trends in combining technology are presented which will characterize the Agritechnica 2007. This preview cannot replace a trade fair visit. It only provides pre-information and does not claim to be complete.

Given higher grain crop prices, more and more difficult harvesting conditions and shorter harvesting times require efficient, reliable combines. In the upper performance classes, working widths keep growing, and the throughput of the machines is increased by means of detail improvements in the separating units as well as more engine power and clearer information systems. In conventional combines, straw and work quality are becoming more and more important. Separating systems which crimp the straw less and detail improvements, such as the possibility of constant tailings control, can be mentioned as examples here.

Wider range of rotary combines

Even though the number of threshing and separating systems for tangential and axial rotary combines has not grown, these machines are offered with different engine outputs and detail equipment. Up to one third of the combines produced by manufacturers who also offer conventional combines are rotary combines. Claas and John Deere are still the only manufacturers of tangential rotary combines, which are also termed hybrid combines. Axial combines are produced by the companies Case, John Deere, Massey Ferguson, and New Holland.

Some of the goals which Claas tries to achieve with the hybrid combines Lexion 570, 580, and 600 are maximum threshing capacity and reliability as well as many possibilities of adaptation to different harvesting conditions. For the first time in combine history, a cutter bar having a working width of 10.5 m and variable table length is available for the Lexion 600. Since stability limits have already been reached at a working width of 9 m, the new cutter bars are equipped with central bearings for the reel and the feed table augers. The hydraulic system features overload protection for the rape separating knives. In addition, these cutter bars are equipped with reel tine carriers, which provide wrapping protection so that a problem-free harvest is guaranteed even under difficult harvesting conditions.

The telematics system, which allows for gapless combine monitoring at the screen in the central office, is also intended to increase the output. This is a management aid designed to raise the productivity of the combine. which registers all machine data (cf. LT SH07 / p. 278). It includes a service module, a schedule optimizer with automatic worktime analysis, as well as setting optimization and a novel fleet optimizer, which means that the combine with the highest throughput or the highest work quality and the best setting provides the guideline for the other machines of the farm.

John Deere sells the CTS combine (Cylinder Tine Separator) built in Zweibrücken as the only variant with tangential rotary threshing technology. As of the coming season, the CTS will be called C 670. The output of the 9 l engine was increased to 294 kW.

Among axial combines, type variety is increasing. Case is still marketing the proven type 2388 as well as the two newer types AFX 7010 and 8010 with different engine power. With regard to the frame and the cleaning system, the design of the AFX types is virtually identical with the CR combines from New Holland. The combines offered by Case exclusively feature axial threshers.

John Deere markets the STS (Single Tine Separator) type manufactured in the USA with more engine power. As of the 2008 season, a 13.5 l engine with 387 kW is going to drive this axial combine, which is now termed S 690. The threshing and separating systems are unchanged. However, an elevator drive with variable rotational speed is available, which can transmit more torque. This drive allows the combine to be better adapted to the requirements of special crops, such as maize and beans. The new S 690 combines are now also available with the well-known Hillmaster chassis slope compensation system.

As of the 2008 season, Massey Ferguson is going to market the axial combine 9895. With regard to threshing and separating technology, it is based on the old type 8780, which was not sold in Germany and which was improved in several aspects. The axial rotor arranged parallel to the ground features a fourth "pre-threshing" segment in addition to the three conventional segments "gathering and redirection", "threshing", and "separating". Given a diameter of 80 cm and a length of 3.56 m, it is the largest-dimensioned axial rotor.

The emptying of the grain tank is another remarkable feature. The sump of the overloading auger is arranged on the right side, and an inclined auger conveys the harvested crops to the left side of the machine. This design does not require the vertical auger commonly used for top unloading and increases the unloading rate to 158 l/sec. The grain tank holds 12.3 m^3. The MF 9895 is offered with a 9.12 m wide Power-Flow or a 10.5 m wide Free-Flow cutter bar with fixed table length. Its engine power amounts to 335 kW.

In the 2008 season, New Holland is going to increase its range of 2-rotor axial combines. In addition to the well-known types CR 9060 and 9080, the CR 9070 and the CR 9080 Elevation are offered. At 10.5 m^3, the grain tank volume of the CR 9070 is as large

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Fig. 1: The new rotary combine MF 9895

as that of the CR 9080. In addition to optimized rotors and rotor casings, these combines are equipped with new cleaning systems, whose separating performance is higher.

Moreover, New Holland is going to offer the throughput controller "IntelliCruise" for this combine. This new controller determines the drive power required for the header and the elevator by measuring belt tension and thus controls the harvesting speed based on the earliest available signal. This system is self-calibrating. Since the actual value for the control circuit is measured at the combine, the controller works with different headers.

For soil protection, New Holland offers the two types which feature the new cleaning system with 710/70R42 tyres. This becomes possible thanks to the space-saving hydraulic fan drive. The CR combines have a transport speed of 30 km/h at reduced engine speed. Engine power was increased to 342 kW (CR 9070) and 387 kW for the CR 9080 Elevation.

For the first time, New Holland is going to offer a sensor which measures kernel damage and the percentage of material other than grain (MOG). The harvested crop is also identified automatically.

Extended capacity range of conventional combines

It has become virtually impossible to increase the threshing capacity of conventional combines because the sophisticated walkers raise the design volume up to its permissible limits. Especially due to the transport width limitations for six-walker combines with threshing channel widths of more than 1.6 m, alternative rotary combines having the width of five-walker machines are bought in the upper capacity segment because special permits for the road transport of wide machines are being granted more and more restrictively. Combines with a transport speed of more than 30 km/h are an exception because they obstruct the traffic less.

In the next season, Claas is going to market the combines of the new Tucano series. They are going to replace the well-known series Medion (except for the Medion 310) and Mega. The position of the engine is new. Like in all other combines, it is now situated behind the grain tank. Other new features are the large-volume cab and operation with the aid of the coloured CEBIS system (Claas electronic on-board information system). An interesting detail is the additional window in the cab for the monitoring of the tailings. For the first time, this window allows the illuminated tailings auger to be observed in order to maximize work quality and output without requiring any windows or flaps to be opened.

The Tucano combines are equipped with many units and details known from the Lexion series, such as the laser pilot. The cutter bars, for example, are now also coupled with the aid of a quick coupler and are exchangeable between the combine series. The illumination system is as extensive as the Lexion´s, and the data management system Telematics is also available.

Deutz-Fahr is optimizing the proven combines of the 56 series. In addition to the new outward design, the synchronized threshing and beater drum as well as a more efficient elevator must be mentioned here. Larger tyre volumes and improved cutter bar guidance as well as a cutter bar with variable table length from Geringhoff round the programme off.

Fendt sells the combines of the 8000 series with eight walkers produced in Randers and the combines of the C and E-series manufactured in Breganze. The 8000 models are equipped with a centrifugal separator. In the C-models, the pan underneath the centrifugal separator can be swivelled away under dry harvesting conditions. The machines of the E-series are equipped with a conventional threshing system. The design of the conventional combines from Fendt is identical with the MF combines of the Ceres, Beta, and Aktiva series. Thanks to identical adapter plates on the gathering channels, the proven Power Flow cutter bars are mutually exchangeable. The design of the conventional combines of the E and C-series from Fendt and the Beta and Activa series from MF is largely identical with the design of the M, LCS, and REV combines from Laverda.

John Deere developed a conventional combine with higher threshing capacity. The core of these combines of the T-series is the thresher known from the CTS series, which features a 66 cm threshing drum, a stripping roller, and the couterrotating stripper rotor. This rotor throws the straw with the non-separated grain from the top into the opening of the centrifugal separator. This design enabled the pan underneath the centrifugal separator to be extended, which increases separating capacity. In this threshing unit, the straw is also bent less than in comparable variants so that straw quality stays better. A beater behind the centrifugal separator throws the straw evenly onto the shortened walkers. With this thresher concept, John Deere reaches the uppermost capacity range of conventional combines. As of the coming season, the combines with walkers and a conventional threshing system will be called W-series (in the past: WTS).

In addition, the JDLink management system, which was known from tractors, has been extended and adapted to combines. Performance values, such as average driving speed during threshing and transport, throughput and fuel consumption, as well as combine settings can now be called up on the internet.

Fig. 2: In its new Axial Flow 9010, Case uses a small tube rotor, which is particularly advantageous for moist and tough crops (company photo).