ROTEX couplings used in the PremiumFlow belt cutting systems by Zürn – Excellent connection under challenging conditions

During the harvest season combine harvesters along with their cutter bars are heavily stressed. Here it is a high, permanent performance and a smooth operation under adverse ambient conditions that counts. In those circumstances the PremiumFlow systems by Zürn provide significantly better results compared to conventional cutting attachments. KTR developed a tailor-made coupling for combining the individual belt conveyor segments in the cutter bar.

„Performance starts with the cutting system“. The motto of Zürn Harvesting GmbH & Co. KG is in need of explanation for people who are not involved in agricultural engineering: A cutting system is a combine harvester’s „tool“. It cuts corn or colza via cutter bars conveying the yield to the combine harvester. Here it is vital to grasp the crop which is to be conveyed with the ear ahead through the slope conveyor to the threshing unit preventing the material from jamming. The „PremiumFlow“ high-performance cutter bars (illustration 1) by Zürn succeed in doing so extremely well thanks to active conveying via the extended cutting table. It allows the user to raise his combine harvester’s threshing capacity by up to 15 per cent, thus making better use of the machine’s performance potential with no need for the machine to utilize more energy. Another benefit is that the cutter bar can be adapted to various types of fruit by a few handgrips only. This is a vital argument for the user, since the time frames in harvesting become shorter and shorter and the change between cultivations becomes more frequent because of a shift in maturing caused by new breeds. The Schumacher alternating cutting system of the PremiumFlow cutter bars ensures low cutting force and a neat cutting pattern even with high speed. Part of the design features of the series is an active and uniform conveying of crop from the cutter bar feeding the table auger through elastic elements with individual bearings. The special sealing between the belts reduces daily cleaning and inspection, thus diminishing the maintenance effort to a minimum. The optimum crop flow in the cutting system ensures uniform feeding of threshing bodies which increases area output and consequently productivity (illustration 2).

Operating width up to 12.20 metres with up to eight belt conveyor segments

The PremiumFlow series was specifically developed for the combine harvesters by John Deere, initially with six cut widths from 5.50 (18 ft) to 10.70 m (35 ft). Later the product range was supplemented by model 640PF having an operating width of 12.20 m (40 ft) for large combine harvesters of this brand (illustration 3). Here the feeding belts are driven hydraulically infinitely variable, with the smaller types PF the belt conveyor is driven mechanically. Depending on the cut width up to eight belt segments arranged in parallel which can be folded up individually are positioned in one cutting system (illustration 4). The benefit of this segmented design is that individual belts are easily accessible and can be cleaned or replaced, if necessary.

One shaft coupling – numerous functions

For the connection of belt segments Zürn had to find a solution allowing for mounting and dismounting every single segment without great effort which is a task which the driver completes on his own in most cases. In addition the connection is to dampen vibrations and generally contribute to increasing the service life of the drive train. One essential factor is the resistance to corrosion, moisture and high mechanical loads. That is why agricultural engineering is said to be a particularly sophisticated industry with high

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demands on the components installed in the machines. In the present case a ROTEX coupling by KTR was chosen as a connection element (illustration 5). The shaft coupling has already been used in different versions on numerous agricultural machines: Among those are attachments such as field sprayers, fertilizer spreaders and seeders as well as self-propelled units like corn choppers, potato harvesters and grape harvesters. The torsionally flexible, maintenance-free jaw coupling consists of two hubs meshing which an elastomer spider is installed between. This coupling type reduces vibrations in the drive train, absorbs shocks and compensates for shaft misalignment. Apart from that it reduces the restoring forces affecting adjacent components such as bearings and gaskets which increases the service life of the belt cutting system and consequently the operating period.

Customized type for the cutter bar

KTR developed a tailor-made coupling solution for the PremiumFlow series (illustration 6). This option is provided by the business unit „Core Business“ adapting existing coupling series to the respective application. The development work was based on a ROTEX size 28 with split hubs, taper bore and feather keyway. This standard type allows for radial assembly and disassembly of the coupling with no need for shifting or removing adjacent components. As requested, this option allows for dismounting individual belt segments. Compared to the catalogue version KTR reduced the coupling hubs to the minimum length to keep the distance between the belt strap segments as small as possible. This provides for a maximum belt strap surface optimizing the crop flow and creating the condition for tight seal between the individual belt conveyor segments.

Permanent connection via clamping and hollow dowel pins

A customized solution was found for the connection of shaft and coupling hubs as well. The customer requested for a solid coupling that can quickly be mounted and dismounted in the field. Clamping between the coupling hubs ensures a reliable nonpositive connection. In addition hollow dowel pins make sure that the hubs are properly positioned on the drilled shafts and the mounting dimension specified is observed (illustration 7). This is essential since the coupling compensates for the tolerances in length of the numerous successive shafts along the cutting system extending to up to 12.20 metres. Apart from that the dowel pins centre the halves of the hubs aligning them symmetrically in an optimum way. This ensures for uniform power transmission and uniform load on the spider. In total the combination of a nonpositive and positive-locking shaft-hub-connection ensures the transmission of high torques with a small mounting space. Another benefit of this kind of connection is that the coupling can be mounted and dismounted by means of standard tools such as hammer, pin punch and Allen key. This is a vital argument in agricultural engineering where the machine drivers usually carry out cleaning and smaller repairs on their own.

Characters: 6.691

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Lead photo (© Zürn)

Illustration 1 (© Zürn)
The Premium Flow cutting system with active crop conveying raises the threshing capacity of a combine harvester by up to 15 per cent.

Illustration 2 (© Zürn)
Perfect feeding of the cutting system forms the basis of high output. The active crop flow always supplies the corn optimally to the threshing unit.

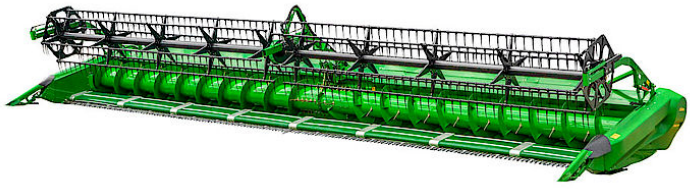

Illustration 3 (© Zürn)
Having an operating width of 12.20 metres, the cutter bar 640PF is the biggest model of the „PremiumFlow“ series adapted to John Deere’s large combine harvesters.

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Illustration 4 (© Zürn)
The belt segments that can be folded up individually and large cleaning openings in the cutting table provide for a comfortable access with cleaning and maintenance.

Illustration 5 (© KTR Systems)
The ROTEX jaw coupling is used in different types in many agricultural machines and attachments.

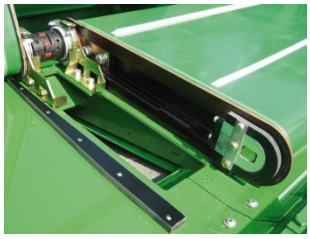

Illustration 6 (© Zürn)
The coupling in the belt conveyor drive can be mounted and dismounted radially with no need for shifting or removing adjacent components. This provided for the option of dismounting individual belt conveyor segments.

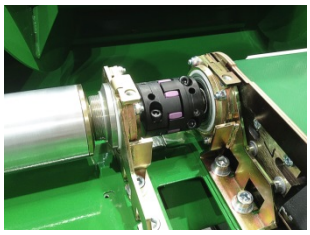

Illustration 7 (© KTR Systems)
The reduced coupling hubs keep the distance between the belt strap segments as low as possible. The combination of a nonpositive and positive-locking shaft-hub-connection ensures the transmission of high torques with a small mounting space.

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