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LINEAR ACTUATORS IN AGRICULTURE

Lyubochko I.A.
Belarusian State Agrarian Technical University, Minsk

The article describes linear actuators in agricultural machinery and attachments. These actuators are electrically actuated and they work in coordination with various automation technologies to assure efficiency. Linear actuators play a significant role in agricultural mechanization.

Agriculture is one of the very first industries that have adopted automation as a tool for improvement. Automated agriculture is also referred to as smart farming. Implementation of automation in agriculture helps in improving farm efficiency and enhances the livestock production cycle. Agricultural automation is highly dependent on the mechanical equipment used in the system. The mechanical components like linear actuators play a significant role in agricultural mechanization. These actuators are electrically actuated and they work in coordination with various automation technologies to assure efficiency.

Agricultural actuators play a vital role in mechanization of agricultural processes. Actuators offer motions like push, pull, injection and trigger to the agricultural equipment. Electrical actuators being precise devices offer efficient working.

The following tasks typically occur in an arable farm over the year:

Tillage;

Sowing;

Stand care (weed and pest control, fertilization);

Harvest;

Transport/storage.

These tasks are implemented in the combination of tractors with suitable attachments or with a specially made self-propelled machine such as a combine harvester. Most of the attachments are only used for a small amount of time each year. Large and expensive self-propelled machines such as combine harvester or field chopper are only purchased by larger companies. For medium-sized and small businesses, these are booked and provided through machinery contractors or machine pool.

Tillage: In the case of tillage, the focus is on the uniform and specific processing of the area. Typical optimization parameters are the processing quality, the minimization of the energy input and the optimization of the speed. Soil erosion due to processing adapted to the site must be minimized. The arrangement of the processing equipment into its position, angle and depth is set manually. The depth guidance is controlled mechanically via rollers and trailing wheels. In order to ensure that the tools ease off in the event of obstacles (stones), the tools usually have spring suspension. The spring strength, the tools and the arrangement are manually adjusted to the specific location.

Sowing: When sowing, the influencing factors such as the sowing depth, the row spacing and the singling or even distribution of the seed are important. If these are guaranteed, the focus will be on a conventional attachment to allow more area to be processed in less time. Changes in sowing strength are now also automatically adjustable on new machines. Tillage is often combined with the sowing. The no-till and strip-till techniques are interesting variations. The latter works only on the area of sowing and leaves the rest of the field untouched.

Stand care: All work which serves the preservation and the care of the stand after its establishment is summarized understand care. This includes fertilization, weed control, and pest and disease control. Different requirements arise depending on the task and the stock. It is important to act in a particularly plant-friendly manner and to carry out the process optimally and precisely. Precision agriculture offers the greatest potential here.

Harvest: It is important to harvest as much area and crop as possible in a short window of time/weather when harvesting in arable farming. The harvest should be collected and transported in good quality. For these reasons, harvesters are the largest and most expensive machines in agriculture. For some time, these have already reached the maximum permitted sizes for road traffic. The main focus for development in recent years has been on further optimizing crop quality and minimizing harvest losses.

Transport/Storage: Especially during harvesting, transportation is essential for the smooth running of a harvest chain. Usually several vehicle combinations are required to transport the harvest from the harvesting machine. There is potential for optimization in approach, overloading time, overloading position and loading quality. For example, when chopping maize, the tractor with loader wagon must be able to drive parallel to the forage harvester during the overloading period so that no crop is lost. This can partly already be done with sensor support, e.g. by means of a camera.

The implementation of autonomous field management will trigger a disruptive change in agriculture over the next few years. Robots will probably only be used in parallel with existing systems and machines and then gradually take on new tasks. Driver assistance systems in existing agricultural machinery will continue to be expanded. The start of robotics will presumably be the use in inventory maintenance and will then be extended to other tasks. Autonomous robots will become economically interesting as soon as the costs for the machines are affordable and the effort is worthwhile for the farmer or contractor to transport the machine to the field and remove it again after the work is done.

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СУЩЕСТВУЮЩИЕ СХЕМЫ ЭНЕРГОСНАБЖЕНИЯ СЕЛЬСКОГО ХОЗЯЙСТВА

Гаркуша К.В., **Волосюк А.А.**, студент, **Жук Д.А.**, студент

Белорусский государственный аграрный технический университет, г. Минск

В настоящее время в Республике Беларусь и других регионах страны сложилась определенная система энергоснабжения сельского хозяйства. Эту систему можно разбить на пять основных подсистем.

Первая подсистема. Потребитель получает электрическую энергию от энергосистемы. В этом случае органическое топливо от места добычи доставляется на электрические станции, где с определенным значением КПД преобразуется в электрическую энергию. Часть выработанной электроэнергии расходуется на собственные нужды электростанции, оставшаяся передается потребителю.

При транспортировке в электрических сетях неизбежно происходят потери электрической энергии. Таким образом, подведенная к потребителю электрическая энергия равна энергетическому эквиваленту добытого органического топлива, за вычетом потерь при транспортировке, потерь при преобразовании топлива в электрическую энергию, потерь на собственные нужды электростанции и потерь в электрических сетях. Потребитель получит полезную (конечную) электрическую энергию, которая меньше подведенной на величину потерь в энергоиспользующих установках.

Вторая подсистема. Потребитель получает электрическую энергию от местной электрической станции. В этом случае органическое топливо от места добычи попадает на перерабатывающие заводы. После переработки поступает на базы снабжения и топливные