

Live



KORALIN HYBRID CULTIVATOR

BY PROFESSIONALS
FOR PROFESSIONALS

Dear readers,

In recent months, most of us have probably felt COVID-19 to be our greatest limitation, both professionally and privately. It didn't take long at all for people to realise just how important a well-functioning agriculture is for ensuring a reliable food supply even in times of crisis.

Thanks to prudent safety plans with a focus on protecting the health of our employees and customers, LEMKEN has been able to keep manufacturing without disruption.

We have used this time well to develop our products and services further. For example, end customers are now able to access genuine LEMKEN spare parts directly.

What's more, we have optimised solutions around mechanical weed control. After only a year with our

newest subsidiary, we're happy to say that Steketee hoeing technology fits in exceptionally well with LEMKEN's crop care philosophy. The Steketee approach to hoeing with the company's innovative camera technology constitutes a truly unique selling point. And that's precisely the feedback we get from farmers.

The new LEMKEN fertilising technology also integrates optimally with the company's crop care strategy. We deliberately refrained from reinventing the wheel and instead build on proven Sulky technology. The Spica, Tauri and Polaris series have everything it takes to become a fixture in the fleets of arable farming businesses.

Whether cash or special crops, organic or conventional farming – we have solutions for any areas of arable farming. The most recent example of our abilities is LEMKEN's new Koralin hybrid cultivator, which is about to go into serial production. The Koralin has been put through its paces at the Müller-Oelbke organic farm in Lower Saxony. According to the farm managers, it is "the right machine at the right time." It'd be difficult to think of a better verdict from farming professionals.

Recognising future challenges and designing practical solutions has always been our strength. We have demonstrated again and again how to do this successfully for 240 years. You'll find a number of insights into our company's history on our website, on Facebook and in this magazine. We hope you'll enjoy this read.

Yours,

N. Lemken
Nicola Lemken
Associate

Yours,

Anthony van der Ley
Managing Director

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Weseler Strasse 5 • 46519 Alpen • Tel.: +49 2802 81-0
info@lemken.com • lemken.com
Person responsible under German media laws:
Anthony van der Ley, Managing Director
Editors: Friederike Krick and Matthias Wiedenau
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Koralin hybrid cultivator



KORALIN HYBRID CULTIVATOR:
THE RIGHT MACHINE AT THE RIGHT TIME

The new Koralin has been put through its paces at Christoph and Johannes Müller's farm. After cultivating only 400 hectares, the two successful organic farmers were adamant that they want to add this new LEMKEN gem to their fleet as an essential tillage tool.



The Müller-Oelbke organic farm

- **Organic farm:** since 1989; certified Bioland farm since 1992
- **Agricultural land:** 350 ha
- **Crops:** 30 ha potatoes, 25 ha cauliflower and broccoli, 17 ha carrots and beetroot, red and white cabbage, savoy cabbage, oxheart cabbage and celeriac, also grains, sugar beets and legumes.
- **Soil and climate:** Fields are located in hilly terrain with red sandstone soils with soil fertility ratings between 20 and 80 points. The average annual rainfall is 600 mm with frequent dry spells in early summer.

← Johannes (left) and Christoph Müller count on high quality standards and professional marketing of their produce.

Their high quality standards and professional marketing of their produce have contributed to the rapid growth of their business: "Both flavour and appearance must be flawless, that's what consumers and wholesalers are willing to pay for." But getting to that level of quality takes a lot of expertise. This also includes optimal storage for agricultural produce. In 2020, the Müllers added another element to their business. "When we built our new barn, we invested in efficient cleaning technology and climate control for spelt, oats and malting barley", says their son Johannes Müller, who joined the business as farm manager in 2017 after graduating in agriculture.

Weed control – a key factor for success

Effective weed control is decisive for the success of organic farming. This practice, which more often than not merely involves a single pass with a sprayer in conventional agriculture, takes on very different dimensions for the Müller family. Just one hectare of carrots, for example, means about 180 hours of weeding. With other vegetable crops and sugar beets, weeding takes up about 20 to 300 hours, depending on the weather. "The more weeds we can control directly or preventively with machines, the better." That's why the Müllers

The Koralin in use:



Many things in life start by chance. One of them has been the relationship between the Müller family and the new LEMKEN Koralin hybrid cultivator. "In the winter of 2018, I met Burkhard Sagemüller at an event in Hannover", remembers Christoph Müller. "While we were talking, Burkhard, LEMKEN's Head of Development, mentioned that they were working on a new stubble tillage and weed control implement in the Alpen factory." And that got the farm manager interested. Especially because the implement was designed to cut across its full working width at a very shallow depth. That was precisely the type of machine that the Müller family was looking for.

Special crops and high quality standards

The Müller family manages a 350-hectare organic farm employing 25 people in the small town of Etzenborn, right in Germany's geographic centre in southern Lower Saxony. Their farming business is only 30 years old. In 1990,

Christoph and Andrea Müller-Oelbke, both recent agriculture graduates, leased 35 hectares of land. They knew right from the start that they wanted to farm organically. That's why they joined the Bioland organic farmers' association, and they soon decided to focus on potatoes and vegetables. Christoph Müller explains: "If we'd grown grains, we would have competed with international markets to some extent, and this would have meant tight margins for our business, which was only small at the time." Also, there were good opportunities to sell potatoes and vegetables via regional wholesalers for organic produce. The young couple started out with only two rows of carrots and initially worked with borrowed machinery. These days, the Müllers harvest about 800 tonnes of different vegetable crops from 17 hectares.

Typical applications for the Koralin

- Initial and second stubble tillage after grains and field beans
- Pea tillage in early spring where peas are planted for winter greening ahead of carrots in crop rotation
- Grass-clover tillage without promoting unnecessary mineralisation
- Weed cutting and removal of residual weeds after the potato and carrot harvest
- Preventing growth on fields without catch crops
- Cutting of vital green manure crops such as oil radish at the growing point after a winter with little frost

→ The Koralin hybrid cultivator works at a shallow depth across its full width, if required. It presents an alternative to disc harrows when tilling peas for winter greening.



run quite an impressive fleet of hoeing machines, harrows and tillage implements. "It's absolutely decisive that we're able to use the right machine at precisely the right time", both father and son agree. It is therefore only logical that they rely on their own machinery rather than working with contractors.

The Koralin operates at a shallow depth across its full working width.

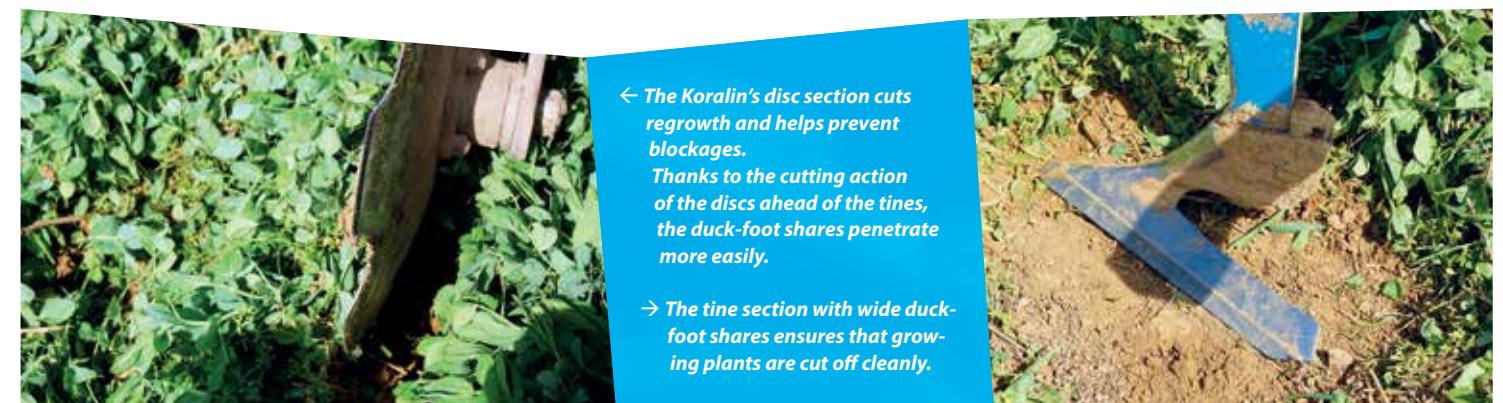
Adding this implement to their fleet was a no-brainer for the Müllers. Johannes Müller explains: "We need a machine that cuts at a shallow depth, works across its full working width and complements our disc harrow." Their new hybrid cultivator features a disc section to cut plant regrowth and prevent blockages, a trailing tine section with fixed

beams and wide duck-foot shares to cut off new growth, spring tine furrow closers and an optional trailing roller or harrow as required.

The strengths of this machine are ideal for stubble tillage. The 6.60-metre-wide implement is equipped with eight depth control wheels for precise depth guidance. "We try to use the Koralin at the shallowest depth possible, at about two centimetres. This works really effectively with our problem weeds, that is dock and creeping thistles." Johannes Müller believes that these rhizomatous weeds become weaker and weaker after several passes with the Koralin.

Climate change affects farm management

Do repeated tillage passes cause heavy losses of moisture and unnecessary mineralisation? Christoph Müller explains: "This isn't a concern at all, because the Koralin works at such a shallow depth." And: "Given where our farm is, we need to manage our water resources very carefully. Due to climate change, we're experiencing long dry spells more and more frequently. Irrigation, which has become more common since 2003, is expensive, and there is only limited water available. Also, we only want to boost nitrogen



← The Koralin's disc section cuts regrowth and helps prevent blockages. Thanks to the cutting action of the discs ahead of the tines, the duck-foot shares penetrate more easily.

→ The tine section with wide duck-foot shares ensures that growing plants are cut off cleanly.



economical, consuming only three litres of diesel per hectare, the farm managers have found. They work with a 240-hp Fendt tractor at a speed of about 10 km/h. "Of course you can work faster. But that's the speed at which we protect our material and avoid soil separation", says Johannes Müller. After all, natural soils are better able to absorb heavy rains if they haven't been separated.

Upward trend in mechanical weed control

In winter, the Koralin was also used for green manure fertilisation with oil radish and white mustard that had not died off in the frost. The shares cut the oil radish roots just below the surface and therefore prevent regrowth. This is important for organic farmers, because they don't plough and obviously can't rely on glyphosate as an emergency measure. However, given the way approvals for chemical crop care products are going, the Müllers are expecting that their conventionally farming colleagues will soon have to deal with a changed environment. As a result, the hybrid cultivator will also become more and more attractive for conventional farms.

As experts in professional crop production, the Müllers have been in constant exchange with LEMKEN engineers since they started to use the Koralin on their fields. They suggested that wider duck-foot shares be used to ensure greater overlap and therefore more reliable work across the full width. The harrow has also been improved. After all, good products can always be made even better. Apart from the Müller family, LEMKEN has also worked with many other farmers participating in trials and sharing their experiences. The result is a mature Koralin product that will go into series production in 2021.

mineralisation when necessary, because this precious nutrient plays a decisive role in organic farming." This is yet another reason why the Koralin is the right machine at the right time.

The Müllers were pleasantly surprised to see how evenly and shallowly the Koralin tills a dried-out field after a crop of field beans: "Part of the weight of the heavy centre frame is distributed across the two beams to achieve an even pressure throughout. What's more, the duck-foot shares, which are carbide-coated at the tips and sides, ensure even penetration." Having tilled more than 400 hectares, they say that there's hardly any visible wear. As a result, they are sure that they'll enjoy a consistently high quality of work for a long time.

Because it operates at such a shallow depth, the Koralin is very



The Koralin allows full-width tillage from a depth of only two centimetres. This saves water and prevents unnecessary mineralisation of nitrogen in the soil.

A SOLUTION FOR ANY CROP

Hoeing machines for mechanical weed control have long ceased to be anything exotic. Instead, they're now increasingly a part of the inventory of conventional agriculture. The integration of smart digital solutions ensures optimal results from these machines, as Steketee hoeing technology clearly shows.



The deal was completed in 2018: The crop care specialist LEMKEN acquired the Dutch company Steketee, which already enjoyed an excellent reputation for its innovative hoeing technology. Steketee was particularly strong in manufacturing implements for special crops, and LEMKEN and Steketee now collaborate to establish the company's red implements broadly on the market.



LEMKEN Digital Event "Hoeing" - a solution for me?

"Mechanically, we offer a solution for any crop," explains Alexander Kuprat, product specialist and area sales manager with LEMKEN. "We're able to design a customised machine for each of our customers." And at the heart of each Steketee machine lies its camera system. "In the late 2000s, we decided to develop our own system," re-

members Lauwrens Struik, Manager Engineering at the Dutch site in Stad aan't Haringvliet. "We trialled second-best solutions with various partners we collaborated with. But none of these was good enough for us, because they quickly reached their limits in difficult conditions."

What matters

The great challenge in hoeing technology is to hoe as closely as possible to crops without damaging individual plants. Just as with spraying, the ideal solution will leave clean crops to reduce weed pressure.

But if this is to be achieved, several prerequisites need to be met, including precise sowing to ensure that the sowing and hoeing widths match. The more precise the row spacing, the closer machines can hoe to individual plants without causing damage.

As a matter of principle, the sooner farmers hoe, the more efficient this is. Weeds are most sensitive when their shoots are just emerging. This is the growth stage where hoeing is most effective. Hoeing before weeds emerge is also useful to stimulate weed germination. When hoeing at any later time, the crop should always be taller than the weeds to be removed. Crop rows must be spaced sufficiently wide to allow vehicles to pass – this is what wide row spacing is designed for in grain crops – but closely enough to ensure that timely coverage can be achieved.



Lauwrens Struik, Steketee's Manager Engineering, and farmer Cornelis van Eck (from left)

The success of mechanical weed control additionally depends on weather conditions. If the ground is too wet, soil can stick to the hoe tools and then be transferred onto crop plants. Smearing must also be avoided so that hoed weeds cannot become re-established. Hoeing in dry, sunny weather causes weeds to die off more quickly.

A good camera system supports operators and sets new benchmarks for hoeing precision. Ideally, tractors used in hoeing will be equipped with GPS. "This allows operators to focus fully on monitoring the machine and checking crops," explains Kuprat.

How does IC-Light work?

The Steketee range of hoeing machines sets new benchmarks. The range involves two different approaches: The EC Easy Concept comprises all product groups – the use of cameras is optional and independent. The IC Intelligent Camera Concept comprises both the camera control optionally available for any of the hoeing machines and implements whose function is based on camera technology.

The IC-Light camera control selects targets by plant colour, size and position. Just like an automatic camera, the control system calculates the optimal average from several shots, dynamically adapted as conditions change throughout a pass. The camera's field

of view, i.e. the area it is able to detect, can be set and optimised by adjusting the camera height and angle. Visual checks via the live monitor image in the tractor cab provide helpful guidance. The detected rows, row widths and plants are displayed in colour in the work section.

"The camera is also able to work reliably in crops sown in the Delta Row array. Twin rows are easily recognised. We're also trialling the camera system in combination with band spraying," adds Struik. This would be interesting for conventional sugar beet cultivation.

When looking towards the future of hoeing technology, the Steketee development engineers like to talk about high-value crops. "These are crops where there isn't yet a machine to replace manual hoes. This could give a real boost to the cultivation of organic sugar beets, for example," says Struik.

Interacting elements

The IC-Light camera control comprises three key components: the camera, the terminal including job computer and the parallelogram frame. Together, these form a high-precision automatic steering system for the EC-Weeder, which ensures that crop plants have enough space to grow. The system is so successful because the camera is able to detect up to five rows of plants based on green hues or the full RGB colour spectrum. The high-resolution camera takes photos of the crop rows and sends the image data to the terminal.

Colour identification then allows the machine to hoe as close as two centimetres from crop plants without damaging them. The system works reliably at ground speeds of up to 15 km/h. With larger working widths, a second camera ensures precise control of the EC-Weeder in wedge-shaped fields. If one of the cameras does not detect a crop row because the machine has reached the headland, the other camera takes over control.

Overview of the Steketee steering systems

IC-Light automatic camera control

IC-Light is an automatic camera control for precise, fatigue-free hoeing at day or night. Based on camera images processed by the terminal and job computer, the EC-Weeder is guided precisely between the crop rows. The camera's field of vision can optionally be illuminated by LED work lights. This makes work at night a breeze. If more than one sowing width or one bed is to be hoed in a single pass, an EC-Weeder can be fitted with several IC-Light camera controls, which operate independently of each other and are controlled via a single terminal.

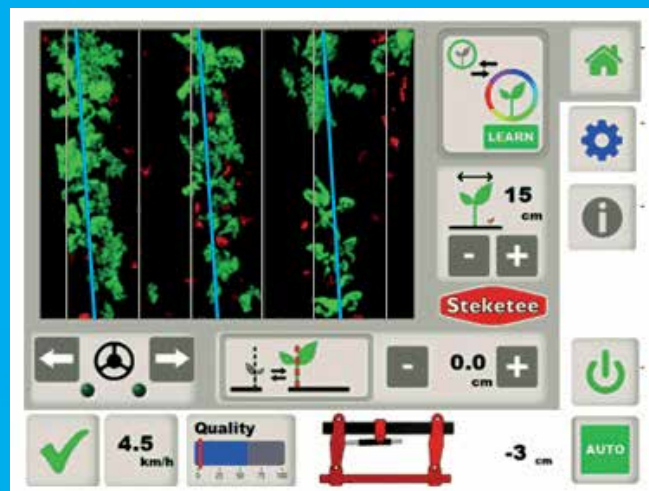
If IC-Light camera control is to be used for multiple EC-Weeders or competitors' hoeing machines, the EC-Steer parallelogram frame allows the implements to be attached via an A-frame or a category 2 three-point linkage and then to be controlled via IC-Light. EC-Steer therefore even permits legacy hoeing machines to be upgraded with a steering system.

Manual steering

The signal for manual steering is provided by the operator, who is seated comfortably at the rear of the EC-Weeder. The operator controls the machine visually via a joystick.

Parallelogram frame

The parallelogram frame transmits the steering signal received from the IC-Light camera control or manual steering to the hoeing machine via the hydraulic system. The hoe is then guided between the rows independently of the tractor's movements. Steketee is the only manufacturer to provide parallel steering with support wheels.



Blue line = detected row, white line = detected row width, green = detected plant



EC-Weeder with camera

The touchscreen terminal is integrated into the job computer, which converts the camera images into precise steering signals. The operation is very intuitive; if additional help is required, this is easily accessible via a SIM card, which is installed by default. Settings can be adjusted to changing conditions from the tractor cab without needing to stop. "With a view to the future, we're currently working on artificial intelligence systems. Sooner or later, the implements will be self-correcting", says Lauwrens Struik, Steketee's Manager Engineering.

The parallelogram frame transmits the steering signal received from the terminal to the hoeing machine via the hydraulic system. The hoe is then guided between the rows independently of the tractor's movements.

The three components of IC-Light camera control (camera, terminal, parallelogram frame) allow fatigue-free, precise work with the EC-Weeder. The system steers the hoeing machine precisely between the rows to minimise damage to crop plants.



CONTROL NOT ERADICATION

Hoeing technology will soon form an integral part of cultivating maize. That's the firm conviction of a contractor in Bevern, who has therefore invested in powerful machines.

The contracting business of the Hansa agricultural dealership in Bevern is an expert in maize cultivation. After all, maize is one of the main crops grown in the region. "The district of Rotenburg has a lot of dairy farmers, and as far as I'm aware our region also has one of the highest densities of biogas plants in the whole of Germany", explains Kenneth Herbst, one of Hansa's branch managers. "We have therefore good reason to specialise in maize", he adds. "Our service range for maize includes sowing and crop care, and we have offered maize hoeing services since 2018. This is something more and more of our customers are asking for." This year, the contractor has already deployed his hoeing machines on 1,200 hectares.

For the current season, Herbst, a master tradesman in agricultural services, upgraded his fleet with Steketee hoeing technology. "This machine offers two key strengths", he explains. "First, it features sophisticated camera technology. Our eight-row hoeing machine is equipped with two cameras. Second, the Steketee machine is a perfect fit for the LEMKEN Azurit maize seed drill." Herbst uses two of these precision machines for sowing maize. "The Steketee hoeing machine allows me to hoe in twin rows. There's no other implement that can do that." Even more positive feedback was provided by the contractor's operators, who found the machine's intuitive controls very easy to use.

A "clean slate" is not what we're after Herbst is happy with the results produced by the Steketee machine. But his customers still need a little more persuasion. "This is fundamentally due to the fact that the result produced by hoeing looks very different from what you get from spraying, and that's entirely independent of the manufacturer. Organic farmers know that and are happy to accept it," says Herbst, speaking from experience. "Older farmers also remember that this is what fields used to look like. But younger farmers often need a lot of convincing and advice."

The dream team of the future

Yet Herbst is convinced that hoeing technology is the way to go. "Our customers are already deeply impressed by the Azurit", he adds. "LEMKEN therefore offers a comprehensive set of implements for the maize cultivation of the future." And the technology is perfectly integrated into LEMKEN's excellent service, starting with the local dealer Heinrich Schröder Landmaschinen KG in Ahlerstedt and extending through to LEMKEN's field staff. "They're always ready to listen and address customer requests", says Herbst. "And LEMKEN employees provided optimal support for our initial commissioning."



← Kenneth Herbst is open to new ideas. That's why Steketee hoeing technology is a great match for him and his customers.



FARM DEVELOPMENT
IN THE 21ST CENTURY
PART 1



MAKING BEST USE OF
TECHNICAL PROGRESS

In 2020, LEMKEN celebrates its 240th anniversary. Throughout its long history, the company has played a key role in shaping the development of agricultural technology – always with the goal of supplying optimal technology for each application. After all, conditions and therefore requirements often change even over relatively short periods of time. This is exemplified by the following reports on two farms in Denmark and Czechia, which we visited twice, 16 years apart.

Søren Bonde's farm is on the undulating island of Funen, within sight of the Baltic. This area about 200 kilometres west of Denmark's capital Copenhagen, near the small town of Middelfart, is a very productive farming region by Danish standards. Bonde's farm has about half sandy and half loamy soils. With 800 to 900 litres of rain and fairly even temperatures, Bonde achieves wheat yields of about 8.5 to 9 tonnes per hectare following rapeseed and wheat.

Going forward together

Yields from arable farming haven't changed much since we last visited in 2004. But there has been a major change in how they are achieved. The most significant change relates to the farm's management. On 1 January 2020, Bonde, who is now 58, formed a small corpora-

tion together with Jakob Stentebjerg, 26. Stentebjerg has already been working for the business for eight years and now holds an equal 50-percent ownership share together with Bonde. Responsibility will be gradually transferred to the younger partner over the coming years. Bonde cooperated with a different partner before, who has since left agriculture.

Together, the new partners are trialling how best to mechanise their business. Bonde explains: "After more than 15 years of excellent results, we replaced our Rubin 9 compact disc harrow by a lighter Heliodor compact disc harrow." The Rubin 9 had originally been bought as an alternative to a plough. "There's high weed grass pressure in grain crops, and using herbicides for weed control is getting more and more difficult. As a result, there are limits to the trend towards reduced tillage," is how Bonde explains his change of tack. That's why his two Juwel six-furrow ploughs are regularly used before both spring and winter crops. One of the ploughs is set up for on-land use and features ISOBUS controls.

Fans of LEMKEN compact disc harrows

The Heliodor is ideal for subsequent seedbed preparation. The wide, spring-loaded levelling tines in front of the disc section level surfaces very well. The Heliodor is also ideal for stubble tillage. Rapeseed, which is drilled in early August in

Bonde has been managing the business, which specialises in arable farming and pig rearing, together with Jakob Stentebjerg (left) since early 2020.

↓ A grass seed propagation field after the harvest.



Comparison 2004 – 2020

	2004	2020
Arable land	600 ha	750 ha
Average yields	8.0 tonnes of wheat 4.0 tonnes of rapeseed	8.5 - 9 tonnes of wheat 4.4 tonnes of rapeseed
Core LEMKEN machines	Rubin 9 compact disc harrow, 6 m Solitair seed drill	Heliodor 9 compact disc harrow, 7 m Compact-Solitair 9 HD seed drill, 6 m
Tillage	VariDiamant mounted reversible plough, 7 furrows	2 Juwel fully reversible ploughs, 6 furrows
Livestock	600 sows 11,000 fattened pigs/year	600 sows 22,000 fattened pigs/year
Land price	€26,000/ha (2008)	€22,000/ha
Leasing price	€604	€670
Crops	Sugar beets, rapeseed, winter wheat, winter and spring barley, oats, grass seed propagation	Rapeseed, winter wheat, winter and spring barley, field beans, oats, grass seed propagation
Other	–	Adoption of digitalised arable farming
Employees	6	9, including 2 apprentices

For Søren Bonde, the Heliodor with its wide, spring-loaded levelling tines is ideal for seedbed preparation after ploughing.



central Denmark, is cultivated without ploughing wherever possible. The two Danish farm managers are thrilled about the quality of work delivered by the Compact-Solitaire. "The machine places seeds precisely at the set depth on a reconsolidated horizon. It's always a joy to watch the seeds emerge evenly and reliably," say Bonde and Stentebjerg.

Like many other countries, Denmark has introduced regulations in order to reduce nitrate levels in ground water. That's why Bonde and his partner sow a catch crop of phacelia and oil radish on 35 percent of their fields once the main crop has been harvested. For this purpose, their Heliodor compact disc harrow is equipped with a small spreader to spread seeds during the pass. The two farmers are always on the lookout for solutions to current challenges. They searched for alternatives to sugar beets, for example, which they needed to eliminate from their crop rotation after a nearby processing facility closed. Instead, they now cultivate field beans because they need a sufficient volume of spring crops to be able to cultivate catch crops beforehand. One aspect that hasn't changed, though, is the propagation of pasture and lawn grass seeds.

Animal husbandry: the difference lies in the marketing

The changes in animal husbandry have been enormous. "When I started out as a farmer in 1987, prices for pork were the same as they're now, about €1.50 per kilo. However, we've been able to compensate this stagnation through

excellent feed conversion, low losses and, above all, successful marketing", says Bonde. That's why he joined the Pure Pork label. Pork can only be marketed under this label if it comes from pigs that haven't been treated with medication during the fattening period. These days, Bonde fattens the 37 piglets he rears annually per sow in a closed system on his farm. As a result, he attains a very high health standard. Eighty percent of his animals meet the requirements set by the label.

Agricultural technology will change

The business will need to adapt to conditions as they change. Bonde believes that the digitalisation of farming is one of the main trends for the future. "This year we have used biomass maps produced from satellite data for the first time to be able to apply fertiliser, growth regulators and fungicides to our crops with section-specific precision." Inspired by his robotic lawnmower, Bonde is certain that small autonomous machines will soon also be found in arable farming. Conversely, if machines need to be controlled and steered by qualified operators, they will need to be built larger and larger to keep the costs per operator low.

In any event, this Danish farmer continues to plan for a future with LEMKEN machines: "The machine quality is outstanding, our dealer is great, and the after-sales service is exemplary!"



The double disc coulters with trailing depth control roller in the Compact-Solitaire 9 HD guarantee precise seed placement with an even depth of soil cover.



Bonde says the Compact Solitaire 9 HD creates the ideal bed for rapeseed, with enough fine soil for speedy germination and coarser soil aggregates for good drainage.





FARM DEVELOPMENT
IN THE 21ST CENTURY
PART 2

Arable farming has changed in Czechia too. While Evzen Moc, Novotný's predecessor, was still strongly in favour of ploughing, the cooperative's current director pursues a more differentiated approach: "We still plough. But wherever the situation allows, deep loosening is perfectly sufficient." This applies mainly to primary soil tillage before growing sugar beets and maize, with rapeseed most likely to follow soon. A subsoiler is pulled by a tracked tractor, which converts its significant output gently into tractive force.



Director Vladimír Novotný (centre) relies on his long-standing LEMKEN partners Miloš Novák (left) and Kamil Fiala.

Diamant ploughs – the preferred choice

Whenever fields are ploughed, Novotný, like his predecessor, trusts the proven semi-mounted models of the Diamant series, which stand out through both the ease and economy of their operation. Moc's go-to implement was the Gigant system carrier. The system carrier has two hydraulic three-point linkages for mounting a LEMKEN compact disc harrow, disc cultivator or seedbed combination, depending on the work to be done. This multiple use saves double or even triple investment costs for

PROTECTING THE
SOIL IN FARMING

The Zemedelska Společnost Skalsko cooperative in Skalsko, Czechia, is one of the largest agricultural businesses in Bohemia. Its director, Vladimír Novotný, manages 2,533 hectares of arable land, among others. The cooperative also runs a cattle and pig live-stock business. Skalsko is 50 kilometres north-east of the Czech capital Prague, at an elevation of 300 metres above sea level. Local soils are predominantly medium loess with a silt content of 50 to 70 percent.

Comparison 2004 – 2020

	2004	2020
Arable land	2,800 ha	2,533 ha
Average yields per hectare	7.3 tonnes of winter wheat 70 tonnes of sugar beets 3.4 tonnes of rapeseed	8.2 tonnes of winter wheat 84 tonnes of sugar beets 4.3 tonnes of rapeseed
Core LEMKEN machines Tillage	2 Gigant system carriers with Rubin and System-Kompaktor tool sections, 8 m 4 ploughs, including 2 VariDiamant, 7 furrows, with VarioPack 2 Solitair 9 seed drills, 6 m System-Korund, 9 m	Heliodor 9 compact disc harrow, 6 m System-Kompaktor, 6 m 5 ploughs (4 VariDiamant and 1 Opal 140) with VarioPack 1 Solitair 9 seed drill, 6 m 2 Gigant system carriers with Rubin and System-Kompaktor tool sections, 8 m
Livestock	500 dairy cows Pig rearing	500 dairy cows Pig rearing
Land price	€4,600/ha	€12,300/ha
Leasing price	€80/ha	€200/ha
Other	–	Biogas plant
Employees	63	48

the carriage, brake system and hydraulic implement folding device. While Novotný still works with the system carrier, he prefers specialist machines that can be directly attached to tractors and utilised to their maximum capacity, given the size of his cooperative. One system carrier is permanently attached to a Rubin compact disc harrow and the other to a System-Kompaktor. A Heliodor compact disc harrow purchased in 2017 is also put to very good use, mainly in stubble tillage and seedbed preparation.

Increasing leasing prices and labour costs

The cooperative has lost land in recent years. This development is part of a trend affecting many large businesses in Czechia, in contrast to the continuing growth of agricultural businesses in many other countries. "Since 2004, we have reduced the size of our land by about one tenth", says Novotný. "These were lots that were either too far from our base or too small." Also, where land owners and prospective tenant farmers know each other well and farmers offer a good price, the cooperative often misses out. In this way, a number of small farms have grown from a mere 20 to 200 hectares in recent years.

Asked for an outlook for the future, Novotný says he believes this trend will continue. And he also states what this will mean: "We'll have to make do with fewer employees to reduce our costs. Apart from leasing prices, our labour costs have increased significantly in recent years." However, he'll do everything he can to retain his best employees. After all, he'll need them to successfully manage the ongoing transition towards precision farming.

Unpredictable conditions in the future

Novotný says that his main source of uncertainty are the political and legislative conditions of the future. He cites two

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examples to illustrate his concerns: "The EU-wide ban on glyphosate presents us with new challenges for dealing with volunteer rapeseed and weeds ahead of sowing maize. Also, the requirements formulated in our national agricultural policy are not always comprehensible. Where fields are larger than 30 hectares, they now need to be subdivided and planted with different crops to protect the soil and promote biodiversity." And unpredictable conditions are always difficult for business managers. However, he has reliable partners that he can continue to count on in LEMKEN agricultural technology, in Miloš Novák, LEMKEN's area sales manager for West Czechia, and in AGRIMA Žatec, the regional LEMKEN dealer represented by Kamil Fiala.



The agricultural cooperative uses its System-Kompaktor for preparing an optimally crumbly, reconsolidated seedbed.



The Gigant system carrier is attached to a Rubin 9 compact disc harrow with an 8-metre working width.

The Diamant ploughs continue to play a major role.





Each kilo of fertiliser counts:
Daniel Biedemann from Kevelaer
(North Rhine-Westphalia) has been fertilising his fields
with a Polaris 14 fertiliser spreader since 2020.

MORE LEMKEN BLUE FOR THE WORLD

A surprise at the Agritechnica 2019:

LEMKEN presented its first fertiliser spreaders in familiar LEMKEN Blue at its trade fair stand. The three series Spica, Tauri and Polaris feature compelling, sophisticated technology in superior LEMKEN quality. They constitute another milestone on the way towards more professional machinery for arable farming businesses.

For farmers, fertilisation has gradually moved into the spotlight in recent years. After all, arable farming businesses spend about a third of their farm input costs on fertilisation. At the same time, water protection efforts have an impact on crop nutrition. For example, many EU countries have imposed increasingly stringent conditions on the use of nitrogen and phosphate fertilisers. In the future, it will be more important than ever to use each and every kilo of fertiliser as efficiently as possible.

Cooperation with SULKY

All this was reason enough for LEMKEN to think about how farmers can best be supported in meeting this challenge by providing them with the high-quality products LEMKEN is known for. For the past year, this has been done by collaborating with the renowned French manufacturer SULKY. SULKY's core com-

petence is the production of high-quality fertiliser spreaders. The combination of a tight network of dealers and LEMKEN's outstanding quality of service has created a win-win situation for all involved. LEMKEN is very happy to have found a matching partner in SULKY. The companies are also a good match in their philosophies: Both are family-run businesses and share the same values and goals.

At the Agritechnica 2019, visitors were first able to inspect the new fertiliser spreaders in trusted LEMKEN Blue. The three series Spica, Tauri and Polaris offer the right solution for any needs. They range from the smallest Spica model with a tank volume of 900 litres, basic technology and easy handling to the 4,000-litre Polaris model with numerous sophisticated technological solutions. Important:

Daniel Biedemann: width section control and high service quality as decisive factors

This 31-year-old graduate agricultural manager has been the proud (co-)owner of a Polaris 14 fertiliser spreader since March 2020. Before the purchase, he and his neighbour researched the market thoroughly. Biedemann manages a farm with 130 hectares of arable land in Kevelaer in North Rhine-Westphalia, near the Dutch border. He also keeps sows and fattens pigs. Many of his fields are irregularly shaped with numerous wedge-shaped sections. His previous spreader was not able to fertilise these fields evenly. And because fertilisation regulations require him to reduce his nitrogen fertilisation by 20 percent next year, he intends to apply each kilo of fertiliser as effectively as possible. This was an incentive for him to look into new technology. His requirements: multiple width sections, ISOBUS compatibility, the ability to process application maps. Biedemann compared several manufacturers at the Agritechnica 2019 and inspected the new LEMKEN Blue fertiliser spreaders on the AgroFarm before choosing the Polaris 14

with automatic ECONOV section control. His excellent previous experience with LEMKEN was another plus for the brand. Biedemann already runs a Saphir 7 seed drill, a Zirkon 10 rotary harrow, a VariOpal plough and a Karat 9 cultivator on his farm. He intends to keep enjoying the high service quality and speedy supply of spare parts that LEMKEN is renowned for.

His initial experiences with the new implement were affected by the corona crisis, as he had to do the initial commissioning without the usual support by a technician due to the lockdown. But his combination of a CCI 1200 display and Polaris worked flawlessly within just a few steps, and the intuitive controls ensured a smooth start with the implement even without external support. Biedemann is now very familiar with the machine's many functions and appreciates the precision and convenience of working with it. His expectations have been fully met within only a few months of using the machine.



All fertiliser spreaders boast very high product quality and deliver excellent work.

ECONOV Section Control with 12 width sections

One particularity of these fertiliser spreaders is the ECONOV Section Control system, which was met with great interest among professionals visiting the Agritechnica. This system, which is available in the top Polaris 14 model, allows individual width sections to be switched on or off both from the outside towards the centre, and from the centre towards the outside. With GPS support, ECONOV switches the 12 width sections on and off automatically at headlands or in wedge-shaped fields to prevent any overlaps or untreated sections. This would be extremely difficult for operators to achieve. ECONOV thus ensures that there is neither over-fertilisation nor under-fertilisation in any field sections, and the system helps save at least 6 percent fertiliser.

Border spreading with Tribord

Another strength of the new LEMKEN spreaders is border spreading. With the TRIBORD 2D system, farmers are able to spread precisely to the field border. This system is available for

all models, including the smallest Spica. Operators are able to select one of two different spreading modes, i.e. full width or border spreading, from the cab. The TRIBORD 3D system offers environmentally friendly border spreading as a third mode. Here, fertiliser is applied 100 percent within the field borders, which is particularly important for adjacent bodies of water or roads. The technologies enabling all three modes are a variable drop point and a distinctive border spreading vane. These ensure that the fertiliser stream is not diverted towards areas already spread. Fertiliser granules remain intact and retain their spreading characteristics.

With large working widths above 27 metres, LEMKEN recommends the EPSILON spreader discs, which are specially designed for this purpose. The double spreader vanes, which are arranged in an epsilon shape, allow two fertiliser streams to be applied one above the other. This produces a fourfold overlap and thus even distribution.

CCI 1200 and CCI 800 – the terminals of choice

The universally usable ISOBUS terminal CCI-1200 is ideal for models from the Tauri 12 upwards. This terminal features a 12"

The Spica, Tauri and
Polaris in action:



widescreen display and is very intuitive to operate, similar to a smartphone. The display can be split to show two applications at the same time. Implement controls can, for example, be displayed together with a map for GPS-based width section control. Another good choice is the new ISOBUS terminal CCI 800. This terminal offers a similar range of functions as the CCI 1200, but is much more compact.

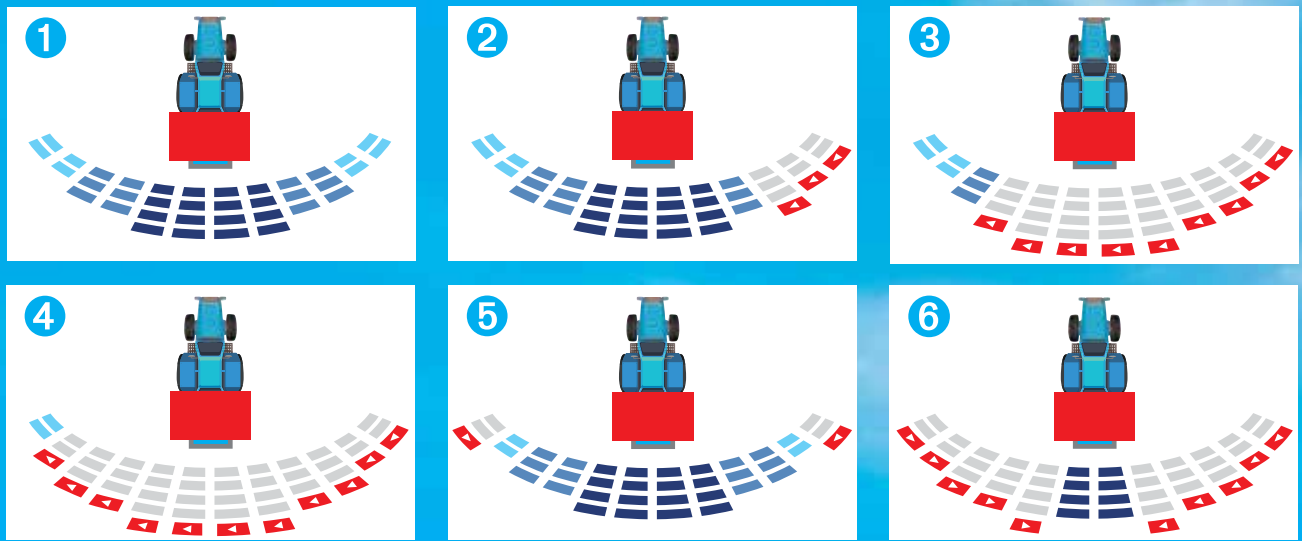
LEMKEN additionally offers a range of sophisticated technical details to make fertiliser spreading more convenient, user-friendly and precise. LEMKEN will continue to integrate ideas

into the development of these fertiliser spreaders to make them even better. With these new machines, LEMKEN rounds off its existing portfolio of tillage, sowing and crop care implements, adding a little more LEMKEN Blue to the world. And LEMKEN makes sure that its LEMKEN Blue implements are here to stay by coating any components exposed to corrosive fertiliser in durable paints. The company's quality standards are substantially higher than those in the automotive industry!

How does ECONOV control width sections?

All centrifugal spreaders apply spreader in a crescent-shaped pattern. That is, fertiliser is spread several metres immediately behind the spreader, but all the way up towards the level of the tractor at the edges of the spreader's working width. As a result, section control is more difficult to achieve than in a crop care sprayer, for example, which applies products in a straight line. This is

precisely where ECONOV comes in. The system is based on sophisticated, automatic controls of the drop point and valve positions. The 12 width sections can be switched on or off both from the outside towards the centre, and from the centre towards the outside. For width section-specific fertilisation, farmers and contractors can store application maps or combine the implement with a crop sensor.



- 1 ECONOV with ISOBUS switches 12 width sections independently of the working width (here with full spreading width and 12 open width sections).
- 2 As the working width gets smaller, e.g. during the last pass, width sections are automatically closed in keeping with the width that still needs to be spread (here: three closed width sections on the right-hand side).
- 3 The width sections on the right-hand side are closed, and those on the left-hand side are gradually closed from the centre towards the outside.
- 4 Towards the end of spreading work in wedge-shaped fields, only one width section on the very outside remains open.
- 5 When the machine reaches a straight headland, the width sections are gradually closed from the outside towards the centre to reflect the actual, CRESCENT-shaped spreading pattern.
- 6 On straight headlands, only the two width sections in the centre remain open before all sections are closed. This ensures maximum precision when spreading in a crescent pattern.



GENUINE SPARE PARTS FOR EVERYBODY

Procuring spare parts for a mixed fleet can easily turn into a maddeningly protracted search. A much faster alternative is the extended version of the agroparts multi-brand platform, where users can find LEMKEN with the company's latest machine and spare parts information.

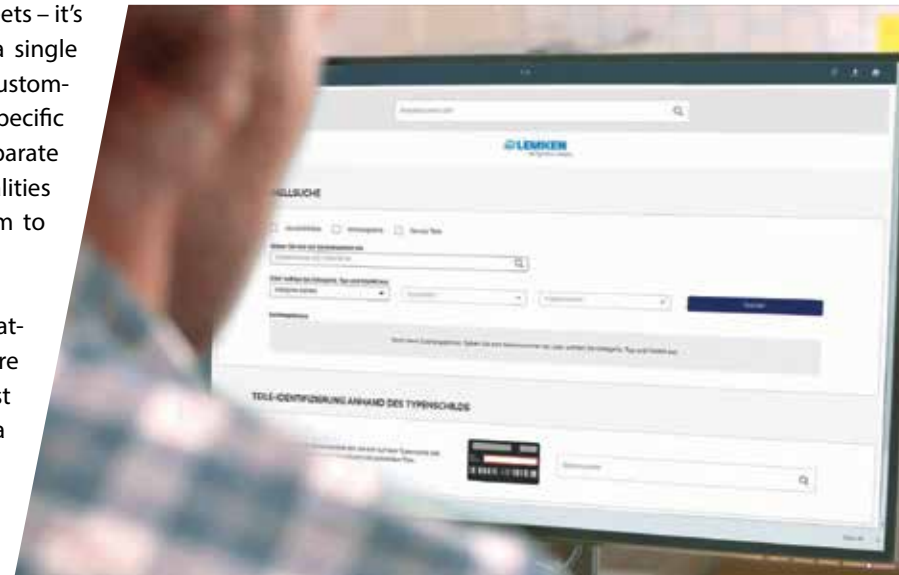
Whether dealers', contractors' or farmers' fleets – it's rare to have all machines sourced from a single manufacturer. That's why dealers and end customers often need to navigate various brand-specific portals when ordering spare parts, with separate registrations, user interfaces and functionalities in each of these portals. This causes them to lose valuable time.

This problem is solved by multi-brand platforms such as the agroparts online spare parts catalogue by the software specialist LexCom GmbH. The agroparts system, a one-stop shop for after-sales in the agricultural sector, has been established for years, but was only available to manufacturers and dealers until now.

Recent studies have shown that farmers and contractors do more and more of their research online and would also prefer to order online, without needing to switch between one online store and another.

A single platform for all

Dealers have recognised this trend. But to be able to offer the service to their customers, they would need to put a huge amount of effort into integrating and maintaining data – something that would often be beyond the means of any single dealer. After all, the process would need to include stock information, imports and exports of parts master data (weights, prices etc.), photo uploads of spare parts, machine data, payment and dispatch modes and lots more, all of



which would, above all, need to be kept up to date.

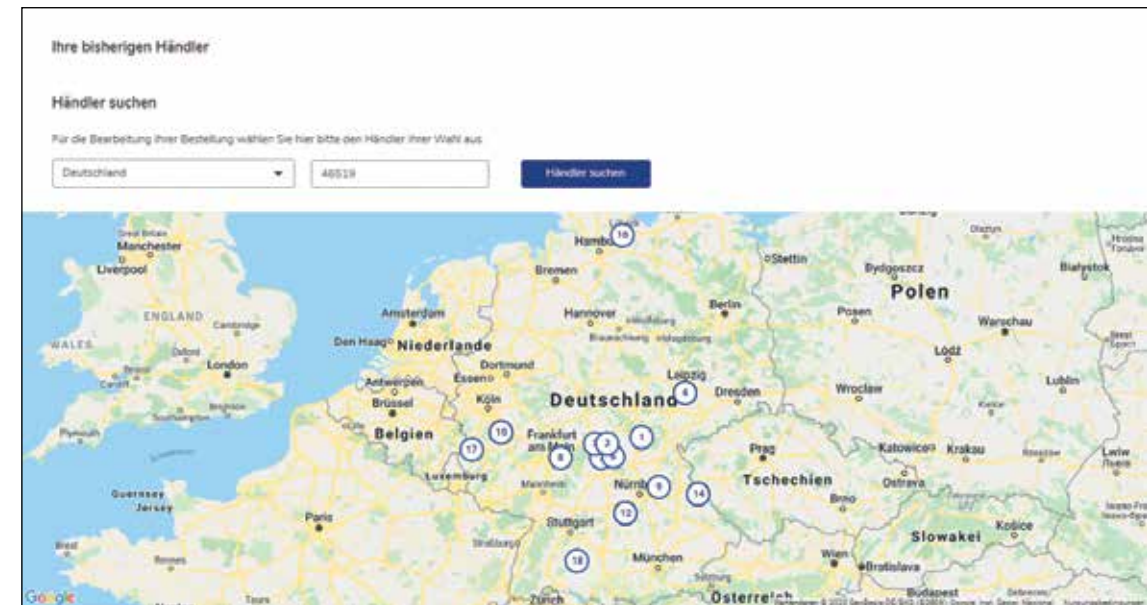
"The DealerShop is a true 24/7 product where you can order spare parts around the clock, seven days a week, without switching media."

Sebastian Ketzer, in charge of LEMKEN's after-sales.

End customers can now be integrated into the existing agroparts ordering system via a new distribution level, and they are therefore able to manage their entire needs for genuine LEMKEN spare parts

online with their preferred dealer. The DealerShop add-on ensures that both users and dealers are easily able to navigate any technical challenges.

All manufacturers supported by LexCom supply the necessary data for the DealerShop. LexCom bundles the data and makes them available in the system once they have been approved by the manufacturer. The online store can therefore integrate multiple brands. There is also the option for dealers to record additional spare parts individually and to upload sales campaign items autonomously, including prices, images and part numbers, for example. As a result, end customers are able to use manufacturers' online parts portfolios.



Current status of active DealerShops in Germany at the end of July 2020.

Custom store design

A dealer back-end system is provided, where LEMKEN cooperation partners can configure their entire online stores individually with just a few clicks, including popular payment methods such as payment in advance, purchase on account or payment via PayPal or credit card. The store setup is complemented by the ability to configure various dispatch and collection options, individual customer discounts, terms and conditions, logos and workflows for managing orders as seamlessly as possible.

Farmers and contractors are thus given various options for ordering parts – regardless of whether they search for them via search engines such as Google, via the LEMKEN homepage, as registered users via the agroparts spare parts catalogue or via the new mobile app (available for iOS and Android). Orders are ultimately always handled by customers' preferred dealers via the agroparts DealerShop, and parts searches always return up-to-date information from LEMKEN. This means that parts can be identified smartly, for example by using the unique serial number and parts list or a combination of various parts categories such as wear parts and maintenance parts. The process is additionally supported by photos of spare parts.

Searching for parts on the go

The DealerShop is complemented by the new agroparts Mobile app. This app is mainly designed for end customers, but also offers numerous benefits for service staff working with manufacturers or dealers. The mobile version allows each user to define and download their individual fleet or selected machine catalogues. The information is then available offline at any time and ready to be used when it is needed most urgently, for example if service is needed in the field and there is no internet connection.

"The DealerShop is a digital marketplace for manufacturers, cooperation partners and customers."

In case of a defect, users can, for example, identify where the problem occurs in a machine, find the relevant spare part and place it straight into their shopping basket. As soon as they are connected to the internet again, the shopping basket can be transmitted to an online dealer store, where they can request information on prices and availability and place the order electronically.

Service staff can also transmit the shopping basket directly to the competent purchasing manager. This saves time and takes end customers' workflows into account, as the search and ordering functions can be initiated without being online.

Both modules, i.e. the DealerShop and the associated app, were launched at the Agritechnica 2019. LEMKEN joined the system in June this year. It currently includes eight pilot dealers each in Germany and Austria. The store will soon also be available to end customers in France, and an expansion to the UK is being planned. It is LEMKEN's stated goal to offer this service worldwide.



RUBIN 10 ASSEMBLY: INSPIRED BY TOYOTA AND LEGO BLOCKS

The Rubin 10 is LEMKEN's flagship compact disc harrow. As this machine went into production in early 2019, LEMKEN first moved into continuous line assembly according to Lean management principles. The goal was to reduce production costs, maximise quality and consistently deliver on time.

The Rubin 10
in action:



"The launch of the Rubin 10 assembly in Alpen was a very special moment for all of us. After extensive preparations, we first produced LEMKEN machines in a continuous line assembly", explains Achim Brall, LEMKEN's Head of Assembly at the Alpen factory. "First of all, the frame is fixed in a load lifting and turning unit. Movers then shift the frame from one station to the next as components are added to it. Shafts or overload components might be attached, for example, or hydraulic functions checked."

A whole of 4,660 parts

The assembly line comprises seven stations and 23 employees. The frame is held for 75 minutes at each station. The full assembly of a complete Rubin 10 with 6 metres working width from 4,660 individual parts, including bolts and screws, takes just under 9 hours. Workplaces are ergonomically designed, and assembly aids are provided to reduce physical strain. The concave discs, which have a diameter of 645 millimetres and weigh 14 kilos, for example, are raised and moved into place by lifters fitted with suction caps. Machines tighten several screws at once to the optimal torque.

The Toyota production system

The Toyota production system is considered the global benchmark in terms of maximal product quality, timely delivery and continuous improvement. More and more companies have adopted the system since the 1980s. Lean Management aims to achieve production without "waste". Excess production, large stocks of materials, long pathways and waiting times during assembly, or rework on products are to be avoided. This is how the system results in lean processes without excess.

Optimised assembly

"Our inspiration for this change was the Toyota production system. One of the core ideas in that system is that employees only perform value-adding tasks as far as possible. For our highly qualified assembly staff this means that they focus on their main task and are able to identify any potential for improvement. What we want to avoid are long distances, laborious processes, time-consuming procurement of materials and unnecessary downtimes," explains Brall, a graduate mechanical engineer. Assembly is kept strictly separate from Logistics. Other employees make sure that assembly staff always have the right bolts, screws and struts right there at their workplaces.

Toyota's production system is now renowned as Lean Management all around the world. For Brall, the challenge was to

adapt the system to the needs of a medium-sized agricultural machinery manufacturer who produces much smaller numbers of machines compared to Toyota. It was important to keep the investments for continuous line assembly within limits. That's why the use of custom robots was not an option.

Process simulation using Lego blocks

"We worked with a team of experts to find solutions and also involved our Production team right from the start. We designed business games to simulate the processes using Lego blocks," says Brall. The technical aids that are now in place were already available on the market and did not need to be developed. The change has brought measurable effects. The Head of Assembly explains: "With our current continuous line assembly, we've increased our efficiency by about 10 percent compared to standalone assembly stations used for the Rubin 9. Our goal is to reach 20 percent."

Numerous advantages for customers

This increased efficiency has an effect on pricing and therefore benefits customers, as does the ongoing effort to maximise product quality and deliver Rubin 10 implements consistently on time. With the new system, production processes have become more predictable and verifiable.

For Brall, the continuous line assembly of the Rubin 10 constitutes a pilot project that allows further insights to be drawn for ongoing change in Production. "In the medium term, we'll also extend the system to the assembly of other machines."



↑ Ergonomic workstations: A lifter ensures that concave discs can be moved without back strain.

↓ Overload elements are also produced according to Lean principles.



↓ Head of Assembly Achim Brall is proud of the continuous line assembly of the Rubin 10.



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