UK Capability in Agri-Tech Engineering

INNOVATION IS GREAT
BRITAIN & NORTHERN IRELAND

Department for International Trade

HERITAGE, QUALITY AND INNOVATION

The iconic British countryside is home to farming practices that have evolved over the centuries, meeting changing conditions through the ages with new innovations and techniques.

Today, those challenges are intensified with the pressing need to produce food more efficiently, whilst protecting the environment.

In addition to a long heritage in the design and manufacturing of agricultural machinery, the UK is home to some of the most innovative research in the agri-tech engineering sector – much of which is exported around the world

The Agricultural Engineers Association (AEA) has been representing the interests of British farm machinery manufacturers since its formation in 1875.

We are delighted to have been asked to produce this brochure which showcases many of the new ideas and innovations from both long-established and new UK companies in support of efficient and timely food production across the globe.

Ruth Bailey
Chief Executive
Agricultural Engineers Association
www.aea.uk.com

AEA

FOREWARD BY:
Dr Elizabeth Warham FRSB
Lead, Agri-Tech Team
Department for International Trade

UK's extraordinary capability in **Agri-Tech Engineering**

A rapidly growing global population with changing demands on diets and more variable climate conditions means new food production systems with less impact on the environment will be required.

To meet this challenge, the UK has much to offer: 1) as home to world-class science with some of the world's leading Agri-Tech engineering companies; 2) with a progressive farming industry where farmers are drawing on new precision engineering to improve farming systems by reducing inputs and maximising yields to meet consumer demand with more profit; and 3) a dynamic business environment encouraging investment in science and innovation through Intellectual Property (IP), Patent Box and measurements/standards.

This publication highlights the extraordinary capability that exists in the UK's Agri-Tech engineering industry and how this is influencing sustainable farming worldwide from light tractors for minimum soil compaction, to strip tillage only in the rows where crops are sown, to smart cameras to speed cultivation and weeding, and small robots for monitoring, seeding, weeding and feeding. These are just a few of the many innovations described.

UK Agri-Tech engineers are at the forefront of the drive to use autonomous technology for future crop production and have recently sown, nurtured and harvested the first hectares of barley and wheat 'hands free' using innovative technologies remotely.

The industry has a long heritage in the design and manufacturing of agricultural machinery and is viewed as scientifically progressive, technically advanced and environmentally responsible. The industry is helping to introduce new pioneering technologies into crop and livestock production systems in the UK, and which is exported worldwide and ultimately helps produce the food products that consumers want and need, with strong quality and animal welfare standards.

Many of the companies profiled in the Directory are already exporting to overseas markets and looking at new markets or expanding in existing markets.

If you are interested in learning more about the UK Capability in Agri-Tech Engineering, please do get in touch with the Agri-Tech team in the Department for International Trade (DIT) or the Agricultural Engineers Association (AEA).

Agri-Tech Team, Department for International Trade

The Agri-Tech team for the UK Department for International Trade is the centre of excellence and first port of call for overseas companies looking for investment opportunities in the UK and for UK-based companies seeking to expand their international business.

The team champions the role of Agri-Tech in strengthening agri-business success in both UK exports and investment and helps drive sustainable intensification of agriculture to provide global access to sufficient, safe, healthy food. The unique hybrid team of private sector specialists and civil servants has experience and knowledge in business, academia and government across the UK global Agri-Tech sector. Key areas of focus are plant sciences, animal health and genetics, aquaculture and precision agriculture, but other value opportunities are supported on request.

The DIT Agri-Tech team leverages Government support to address barriers to trade and accelerate routes to market for companies looking to export new products in new markets.

Also, as part of the UK Department for International Trade, the Agri-Tech team draws on the expertise of DIT's global network of in-country experts in over 100 markets.

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About the **Agricultural** Engineers Association

The Agricultural Engineers Association (AEA) has been representing the interests of British farm machinery and equipment manufacturers since its formation in 1875.

Throughout its history, the AEA has been at the forefront of the development of technical standards, regulation and political change.

We ensure that the needs of the agri-tech engineering sector and its supply chain are fully represented particularly in respect of productivity, sustainability and environmental responsibilities.

In offering a wide array of services through our network of Councils, Committees and Special Interest Groups, the AEA supports its members by providing comprehensive market information and guidance on standards and regulations and though training and skills development.

Representation to Government is a key element of the AEA's role, as is the facilitation of access to export markets through its membership of European and global associations.

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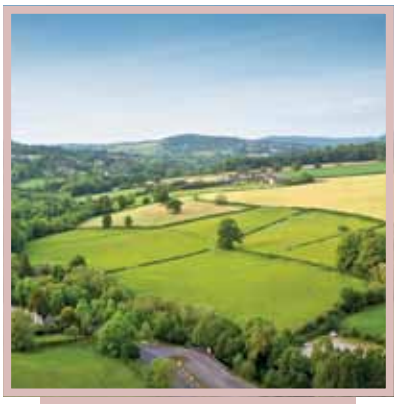
SUMMARY OF SERVICES

Statistics and Market Information
Economic Newsletters
Events: (Tillage Live/Scotgrass)
Technical Standards: through +100 committees including BSI, ISO, CEN
Tradeshow Access Programme
DIT Agri-Tech representation
National Sprayer Testing Scheme
Training for Business programme
Association Member of MAKE UK
Member of:

- Agri-Brexit Coalition
- CEMA (European Agricultural Machinery Association)
- EAMA (Engineering and Machinery Alliance)
- EEF (The manufacturers' association)
- Farm Safety Partnership
- IAgrE (Institution of Agricultural Engineers)
- . . . and many more

UK Agri-Tech:
contributes to:



Over **70%** of land in the **UK** is used for agriculture

The industry is valued at **£26 billion**, and represents over **7%** of Europe's total agricultural market

Agri-Tech Strategy has invested £160 million in R&D and Innovation

Exports of **agricultural machinery** exceed **£480 million** (2018 data)

The **UK exports** over **£1.12 billion** worth of tractors each year, considerably higher than tractor imports at **£785 million** (2018 data)

The **UK** agri-tech sector contributes to the UK agricultural sector worth more than **£14 billion**, and employing more than 500,000 people

The **UK** is home to **100** science parks

UK: Global Leader in **Agri-Tech**

Where experience meets innovation - and new technology comes to life

The UK is no stranger to agricultural innovation (Agri-Tech). The country led the agricultural revolution of the 18th century, introducing innovative farming practices such as crop rotations and new equipment such as seed presses to other parts of the world.

The UK still takes its place at the forefront of technology, taking great advantage from its roots in:

- A tradition of innovation and engineering excellence
- World-leading farmers, veterinarians and agronomists
- A business environment that allows new and established companies to thrive
- A scientific and educational base which provides highly skilled talent and world-class research and development

LEADERS IN INNOVATION AND AGRI-TECH EXPERTISE

Combined with decades, sometimes centuries of experience, the UK still has many innovative and high-quality machinery manufacturers who continue to export new ideas to the world today. Some are featured in this brochure.

Over 70% of land in the UK is used for agriculture. An industry valued at £26 billion, it achieves some of the world's highest crop yields and is home to some of the most efficient producers across a wide range of agricultural outputs.

In no small part, the success of UK agriculture is due to the UK's agri-tech expertise. With highly skilled talent in many disciplines from engineering, to animal and plant sciences to land management, the UK has a proven ability to develop and market new technologies and products with commercial partners. UK producers are increasingly embracing these new technologies to drive efficiency, maximise yields, protect the environment and increase profitability.

STRONG, FLOURISHING ENGINEERING AND MANUFACTURING BASE

The UK's machinery manufacturers have a vast experience of supplying their innovative equipment to farmers around the world. In 2018, UK businesses exported machinery worth over £1.7 billion to around 170 countries around the world. This has allowed producers across to globe to benefit from the technology which has allowed UK farmers to remain efficient, sustainable and productive in an ever more competitive global economy.

The UK's agricultural equipment manufacturing base is home to many well-known established brands and emerging agri-tech companies. Names such as JCB, Teagle, Alvan Blanch, Household, Knight, Shelbourne, Garford and many others have a well-established and successful record in meeting the needs of customers around the world. They are backed up by many new and emerging businesses, notably in fields such as robotics and digital technologies.

The country's start-up ecosystem is also developing rapidly; the UK was the third most active country for agri-food tech start-up funding in 2017, raising over $500 million across 69 deals. According to World Bank rankings, it is easier to do business in the UK than in any other major economy in Europe apart from Denmark. The UK government greatly incentivises collaboration between industry and science, through R&D tax credits and tax incentives on patents and strong IP regulations

compared to many nations globally, also adds great strength to the UK's business environment.

DYNAMIC BUSINESS ENVRONMENT

In support of this, the UK government has placed a strong and clear emphasis on the development and adoption of on-farm agri-tech strategies and practice to increase its productivity, against a global backdrop of decreasing land availability, a diminishing labour force and growing concerns about the environmental impact of farming.

With the EU exit on the horizon, and an opportunity for the UK to shape a new agricultural policy for the first time in almost 50 years, the door is wide open for manufacturers and farmers to embrace agri-tech, to become innovative and to transform the agriculture, horticulture and forestry sectors. The recent Agriculture Bill sets an ambitious future for domestic agriculture policy, helping deliver a cleaner and healthier environment for future generations, underpinned by increased productivity and investment in the latest technology.

This new policy environment will drive even more innovation in the thriving and sustainable UK manufacturing base. An infrastructure for research and innovation, will result in market-driven opportunities to solve food production challenges in virtually every market sector. The country is home to some of the most established agricultural research institutions in the world and the four new Agri-Tech Innovation Centres build on this experience, with a unique collaboration between the UK government, academia and industry.

WORLD CLASS INFRASTUCTURE FOR RESEARCH AND INNOVATION

The UK agri-tech sector contributes to an agricultural sector worth £14 billion, employing over 500,000 people. Government investments such as the Strategy for Agricultural Technologies (£160 million over five years) which included the Agri-Tech Catalyst and four Agri-Tech Innovation Centres, aims to improve the flow of ideas and solutions from laboratory to farm.

The Industrial Strategy Challenge Fund aims to enable greatly improved take-up of innovation on farms. A £90 million investment from the UK's strategic innovation agency, Innovate UK, enables the four centres to harness leading UK research and expertise as well as build new infrastructure and innovation:

Agrimetrics

Opened in October 2015, it is focused on agricultural informatics and metrics of sustainability. Agrimetrics uses data science and modelling to build a more productive, sustainable and efficient food system.

Centre for Crop Health and Protection (CHAP)

CHAP will revolutionise how farmers manage crop threats including pests and disease, both in the UK and overseas.

Centre for Innovation Excellence in Livestock (CIEL)

CIEL will create new livestock technology and products to boost the profitability and productivity of livestock farming.

Agricultural Engineering Precision Innovation Centre (AGRI-EPI)

AGRI-EPI operates in the new, fast- moving market of precision agriculture to help the UK's agri-food sector develop advanced technologies that will increase productivity and sustainability in UK agriculture. Universities such as Harper Adams University are providing the infrastructure for agricultural innovation. Close to 60% of the research by Harper Adams in Agriculture, Veterinary and Food Science is deemed to be "internationally excellent or world-leading," according to the UK's Research Excellence Framework (REF).

Government support for International Agri-Tech Companies

The investment opportunity in UK agri-tech is underpinned by a government support structure at national and local levels. As well as offering specialist guidance on skills, visas and migration, the UK government can also provide support with recruitment advice, access to funding and introductions to local academic institutions.

*According to Agfunder data

TRACTOR PRODUCTION in the UK

Heritage and award-winning engineering

The UK has a long-tradition for tractor production dating back to the late 1890s. Today, world class manufacturing facilities result in the UK exporting over £1 billion worth of tractors, almost twice the value of its imports of tractors. Two major companies, JCB and New Holland make up the bulk of UK tractor output.

JCB, the world's third largest construction equipment brand, has 22 plants on four continents, 11 are in the UK and employ more than 15,000 people worldwide.

The company is privately-owned by the Bamford family and was founded on 23 October 1945, by the late Joseph Cyril Bamford CBE.

JCB has been producing farm machinery since 1945, when Mr Bamford built his first farm trailer. Since those early days, JCB has always understood that, when it comes to agricultural machinery, only the very greatest levels of performance and productivity will do.

The ongoing development of specialised farm machinery has been a constant. Agricultural Loadalls were introduced in 1977, agricultural wheeled loaders in 1983, and the Fastrac tractors in 1991.

The Fastrac is the result of 25 years of innovation and is unique in offering full front and rear suspension for unparalleled ride, comfort and traction. External disc brakes provide excellent heat dissipation whilst JCB tractors' unique full chassis construction is designed for strength, stability and load carrying ability. The Fastrac's centre-mounted cab reduces any jolts and helps to achieve near-50/50 weight distribution, making the operator more comfortable and more productive.

JCB believe in using innovation and technology to make its agricultural equipment as efficient as possible.

In 2006, TorqueLock was introduced to reduce fuel consumption and increase top speeds. In 2010, the company patented Adaptive Load Control to improve safety and stability on telescopic machines and has recently introduced LiveLink, a telematics system.

Recent research shows that JCB supports 24,000 jobs in the UK and generates £1.4 billion of GDP. The analysis confirmed that for every full-time JCB employee in the UK (6,000 in total), another three employees (18,000 in total) are engaged in the UK supply chain to support JCB's activities.

In 2013 the company celebrated the production of its one millionth machine, enough machines to stretch from the UK to Australia.

One millionth machine, enough machines to stretch from the UK to Australia

Since 2004 JCB has gone from a new entrant in engine manufacturing to a major global producer with a fast-growing reputation for delivering fuel efficient new product. One of the biggest investments in its history was the development of the JCB Ecomax T4 engine in readiness for incoming Tier 4 interim emissions legislation for mid-range machines. Around £80 million was spent researching and developing a new combustion system for this latest generation JCB Dieselmax engine.

JCB manufactures more than 300 different machines and has won more than 50 major awards for engineering excellence, exports, design, marketing, management and for its care for the environment. Among them are 30 Queen's Awards for honouring innovation and exports.

Tim Burnhope, JCB Chief Innovation and Growth Officer says "Innovation is the lifeblood of JCB. We don't acquire many businesses, instead we concentrate on organic growth. We started with one product and we found our markets. And so on. We create new models and take them to more and more new markets, growing the market share rapidly."

The main production facilities at Rocester site has a purpose-built innovation centre where engineers can share ideas. "We are not buying innovation" says Tim Burnhope "we are providing the right environment and tools to enable it." adds Mr Burnhope.

www.jcb.com

The CNH Group Basildon plant, close to London, proudly builds on a worldwide reputation for manufacturing excellence since it was built in 1964. The 40-hectare site is a key assembly plant for New Holland tractors ranging from just over 100hp up to the New Holland T7 Heavy Duty series which tops out at over 300hp.

Annual production numbers average 23,000 tractors, over 90% of which are exported. Such are the vagaries of the tractor market however, that flexibility is the key as worldwide demand fluctuates. Full production capacity of the plant is around 30,000 tractors a year.

That makes New Holland one of the top 15 export companies in Britain with its 14 tractor ranges being sold in 120 countries.

The Basildon plant has proved a beacon of manufacturing success in the UK, recognised by business leaders and by the UK Prime Minster who has used the plant for important policy announcements. But the company has to have its finger on the pulse of the market, and over the years the plant has introduced new manufacturing disciplines to reinforce its long-term efficiency, flexibility and viability to meet market changes.

The Basildon plant was an early adopter of the 10-pillar World Class Manufacturing (WCM) set of performance criteria which it introduced in 2008. Each pillar touches every aspect of the manufacturing process and include Safety, Cost, Improvement, Quality Control, Logistics, People Development and Environment. All pillars are treated with equal importance.

Over 90% of which are exported

In the plant, the total focus is on seamless logistics. From the straight-line design of the assembly line where corners and bends can add seconds, to the bare minimal stock-holding of parts at each stage of production and the elimination of unnecessary physical effort by the operator – all are monitored precisely to fit the WCM criteria.

In the first three years of its introduction, the company made savings of more than £4 million. The company's aim for at least an 8% year-on-year saving on manufacturing costs which it has consistently achieved.

The strategy was brought the success, the Basildon plant was voted Manufacturer of the Year in 2012, having been runner-up the previous year in the competition amongst all UK manufacturing sectors.

Basildon adds something else to cutting edge manufacturing techniques – heritage. Farmers appreciate heritage – and although the names and the ownership has changed, they associate Basildon, and Dagenham before it, as an important part of British tractor making.

www.agriculture.newholland.com/eu/en-uk

BEST of Both Worlds

JCB transform materials handling

JCB's revolutionary transmission fitted to Agri Pro Loadall telescopic handlers is said 'to transform the way materials are handled by farming customers'

According to research, telehandlers average 60 per cent of their time for handling work and 35 per cent for towing and road work - and idle for the remaining 5 per cent of the time. This provides the biggest issue for users. Do they go for a torque convertor or powershift machine which provides good speed and towing capacity, or for a hydrostatic machine which gives good pushing ability at slow speeds and precise speed control?

Either option nearly always results in compromise. This is particularly true for spread-out farms that have grown into several units and who want a good road machine and a good materials handling unit.

JCB's DualTech VT is the culmination of a 6-year development programme and 10,000 hours of 'real world' testing in various conditions, and is two transmissions in one, combining hydrostatic with power shift – and has been included with a new three-model range of seven metre JCB Loadall AGRIPro telescopic handlers.

DualTech VT is two transmissions in one; a hydrostatic module, which offers infinitely variable speed selection from 0-19kph, taking care of low speed handling work, after which, a three-speed powershift module takes over to propel the AgriPro up to 40kph.

Everything is done automatically, from the transition between hydro and powershift modules to the powershift changes. No torque convertor is used in the powershift portion of the transmission, using clutch packs-only to change gears, providing direct drive to the wheels.

The new Agri Pro Loadalls offer unique features and driving characteristics making them perfect for farmyard, field and road.

All three JCB Loadall AGRI Pro handlers are powered by the 4.8-litre version of JCB's EcoMAX diesel engine, developing 145hp (108kW) at 2200rpm and 560Nm (413lbf ft) of torque at just 1500rpm. By optimising the drivetrain to utilise the EcoMAX engine's torque characteristics for different work and travelling situations.

JCB Chief Innovation and Growth Officer Tim Burnhope says "DualTech VT truly provides the best of both worlds. As farming businesses become bigger and they operate on land distributed over a wider area, so the ability to travel quickly and efficiently between sites has become increasingly important whilst still delivering excellent performance when material handling in yards. The DualTech VT transmission is a prime example of JCB's innovation and engineering strengths coming together to create the best of both worlds".

www.jcb.com

STUBBLE Management

Increased combine efficiency and faster decomposition

It is now more than 10 years since Spearhead developed the first rotary mulcher designed to chop stubble residue after harvest. Following the creation of this machine, the Stubble Management principles were established in an attempt to promote better field-hygiene.

Stubble Management is a process of increasing the decomposition pace of stubble residues that remain on the field following harvest. With the correct approach Stubble Management will support the development of optimum soil conditions for the following season's crop.

Research shows clearly that stubble height has a dramatic impact on a combine harvester's operational performance.

By setting the cutter bar higher, less straw is processed by the combine which in turn increases its capacity to thresh. Reported output was increased by as much as 20% after raising the cutting height by just 10cm.

Stubble Management is carried out using the Spearhead Stubble Master 500 or 730 with respective 5.0 and 7.3 metre working widths. The patented knife system ***Star Cut*** performs a precise pulverization of the stubbles whilst benefiting from a very low power requirement. The suction power of the specialist blade system will mix the chopped and mulched stubble residues with dust which helps start the decomposition process immediately.

DECOMPOSITION

Faster decomposition reduces the transfer of fungus and disease whilst at the same time as controlling the release of nutrients back in to the soil. Furthermore pesticide consumption is also reduced as better nitrogen utilization is maintained.

The decomposition of crop stubble residues is accelerated when chopped stubble is mixed with dust and soils, encouraging microorganisms to flourish. Faster decomposition results in the controlled release of nutrients from the decaying organic material which in turn reduces the transfer of fungus and disease.

Stubble Management is especially effective in rapeseed for the activation of waste seeds. By chopping the stubble, a productive carpet is formed that retains the exact moisture that the spilled rapeseeds need to become active and therefore benefitting the development of crops in the following season.

Where straw and stubble residues are left lying on the field after combine, crossing the area with the Stubble Master will give a far superior chop, mulch and spread. By raising the header of the combine by 10 centimetres the capacity of the machine is increased by 20% which can be advantageous in years where a lot of rainfall is experienced.

The patented knife system, ***Star Cut***, is highly regarded for the pulverisation and distribution of the chopped material. With a forward speed of approximately 15 km per hour there is a huge capacity and a major time saving during the harvest process. Diesel use is approximately 2.5 litres per hectare for a normal stubble management process.

In field trials in Germany, farmers reported increased output by as much as 20% after raising the cutter bar height by 10cm. This resulted in 50% less straw going through the combine, thereby increasing the speed of harvest whilst decreasing fuel consumption.

www.spearheadmachinery.com

SPEARHEAD

Spearhead is firmly established as one of Europe's leading producers of wide area rotary mowers; marketing its products globally and helping customers maintain everything from avocado farms to airports and park land to prairie.

Whilst many manufacturers simply act as assembly shops, Spearhead machines are designed, developed and manufactured from the ground up at the company's modern UK production facility.

Transforming the **Tractor**

Multi-purpose machine with a light footprint

The first prototypes of the Lite-Trac Tool Carrier were designed and built in 2004 at the company's UK base in Peterborough. The Lite-Trac name comes from "lite tractor", due to the patented chassis design enabling the inherently very heavy machines manufactured by the company to have a light footprint for minimum soil compaction. Following the success of initial testing, in 2017 the company began to develop and manufacture the LT350 Tool Carrier with its unique, patented chassis layout with a demount platform of 5.5M long and 21 ton capacity.

The Lite-Trac LT350 is a tool carrier with up to 21 tonne payload capacity for gross vehicke weight of 32 tonne. The patented chassis layout with its mid-mounted driveline gives equal weight distribution on all four wheels, producing exceptional traction and a light footprint for minimal compaction. The innovative design provides the operator exceptional access to difficult or previously unreachable areas of land.

The fully mechanical driveline is particularly suited to heavy work in hilly conditions and includes a Allison 6 speed automatic gearbox with locking torque convertor including high/low range for road and offroad speeds of upto 75KPH. The 320 horse power (235 kW) engine has plenty of reserve for the most demanding of applications.

The self-levelling Air suspension and anti-roll bars provide an outstanding ride for both the operator and the payload.

Other features include a forward mounted cab for high visibility and tried and tested demountable equipment for slurry, manuring and mollasses, wet spraying, suspension fertilizer application, lime and fertilizer spreading, and precision granular application.

CROP SPRAYER

The Lite-Trac crop sprayer mounts onto the LT350 multipurpose tool carrier to create the UK's highest capacity self–propelled sprayer. Stainless steel tanks are available in capacities of up to 16,000 litres up to 2 high capacity pumps, whilst Pommier aluminium booms of up to 52 meters can be fitted, making these Europe's largest four-wheeled self-propelled agricultural sprayers.

The tank is mounted centrally between both axles to maintain equal weight distribution on all four wheels and a low centre of gravity whether empty or full. This complements the LT350's light footprint, minimizing compaction whilst maintaining excellent traction and stability.

Auto boom levelling is a standard feature and makes use of the variable geometry boom and ultrasonic sensing to ensure the spray nozzles are always at the optimum height above the target whatever the terrain. Most GPS spray controllers i.e. Trimble, TopCon and Farmscan GPS spray controllers with rate control, auto section shut off and automatic steering are also an option.

SPREADER

The spreader is capable of spreading a wide range of materials including manure, slurry fertiliser, fibre foss, lime and poultry waste. The standard hopper can hold up to 14t lime, or fertiliser, and extension sides are available for lighter materials. Spreading widths of 24m and above are achievable at variable depending on product.

Moving on from Agriculture the flexibility of the LT350 means that it can be used through other industries such as Rail, Construction, Utilities and Airport Services.

LITE TRAC

www.lite-trac.com

Tackling **tough** conditions

Remote control land clearance

THE highly respected British manufacturer, McConnel has long had a firm reputation for quality- built innovative machinery bristling with new technology. More than 75 years since the world's first tractor-mounted hedge cutter left the McConnel workshop, the company is justifiably proud of its status as the world's largest producer of Power Arm reach mowers and a leader in its field.

To demonstrate its commitment to innovation and new technology, McConnel launched a range of remote control scrub clearance machines in 2010, and in 2018 introduced the ultimate in remote controlled machinery with its new generation ROBOCUT range.

The McConnel ROBOCUT is a high performance, versatile tracked mower. Suited best to harsh environments and where the terrain is deemed challenging or too dangerous for normal machinery. Forestry areas, riverbanks, and steep slopes can be taken care of safely and quickly without the risk of damage and most importantly, injury.

STEEP GRADIENTS

The all new ROBOCUT is a significant improvement with the introduction of two new models, ROBOCUT RC56 and RC75. The new models boast more power, advanced features and GPS Autosteer option for greater output, safety and control. They are available with two new engine choices, 56hp and 75hp designed specifically for working on steep gradients of 55 degrees. Fuel efficiency has also improved by 20%, coupled with twice the fuel capacity thus enabling up to eight hours of operation between refills.

A new common chassis design provides a lower centre of gravity and perfect 50/50 weight distribution for maximum stability and control in challenging terrain. Fully integrated, dual roll-over protection bars, quick access lifting points and dedicated

accessory mounting points also come as standard.

There is an on-machine activation digital display for customisation of machine settings together with keyless start technology for improved safety, daytime running lighting, high intensity LED work lights and four integrated LED strobe lights.

The new remote control unit features an informative, high visibility digital display providing valuable feedback to the operator including machine engine RPM (Revs per Minute), engine temperature and signal strength.

The introduction of fully enclosed body panels protects the power unit from damage when working in harsh environments whilst preventing grass and debris accumulating around the engine bay. The stylised design also incorporates gull-wing style side panels that provided quick and easy access to the engine bay.

For the first time GPS Autosteer is available, developed in conjunction with Trimble, allowing operators to control precise cutting to an accuracy of 25mm from up to 150 metres away.

The increase in horsepower to 56hp and 75hp enables wider 1.6m and 1.9m flailheads to be fitted for greater output.

www.mcconnel.com

Chipper Technology

UK specialist manufacturer exports 75% of its production

Meeting the performance needs of large timber clearance projects is one thing, but if customers need 'go-anywhere' performance from a chipper that is designed for traction in difficult terrains, then the Greenmech ArbTrak 200 is just the machine *(illustrated above*). Powered by a 45hp diesel engine and with a twin track drive system that enables self-propelled access to chipping sites, this is a serious machine that is proving itself in high-output clearance projects. A 200mm x 280mm letterbox opening handles some of the largest material volumes and makes it easy for loading limbs and brush without restriction and a massive under-body clearance of 274mm means it can straddle tree stumps and boulders with ease.

The makers, GreenMech are proudly the UK's largest chipper manufacturer, not only at home but also abroad. They put their success down to the quality and effectiveness of their products - all of which are produced in-house at their modern factory in the heart of England.

They are passionate supporters of British Manufacturing which has been at the heart of the GreenMech brand since its inception.

Manufacturing has taken place on its present site for over 50 years, when Turner Engineering began the design, development and building of flail mowers and agricultural machinery.

GreenMech was founded in 1993 and since then Chairman Tony Turner, assisted by his son Jonathan since 2002, has invested heavily in creating the factory which exists today.

Recent investments have seen the factory site expand by over 50%, with new state of the art equipment in the areas of steel cutting and folding, as well as the ShoPaint and ShoFab in-house shot blast and powder coating systems.

They have introduced 'Lean' processing in fabrication and production which has successfully reduced lead times to nearly half, from 13 weeks to just 6-8 weeks.

Producing the vast majority of component parts and manufacturing the units 'in-house' gives Greenmech ultimate control over the quality of output as well as over every cost incurred along the way.

This provides for flexibility and incorporates customer feedback into functional reality.

3-YEAR WARRANTY

"The control we have over the manufacturing process, and our confidence in product quality, is reflected in GreenMech's ability to offer customers a 3 year warranty as standard, across the product range." Says sales director Martin Lucas.

"Our innovative range is now available in over 30 countries worldwide, with exports making up 75% of our total business. Globally, we are now working with dealers in Scandinavia, Russia, Fiji, New Zealand and the Baltic States to mention just a few.

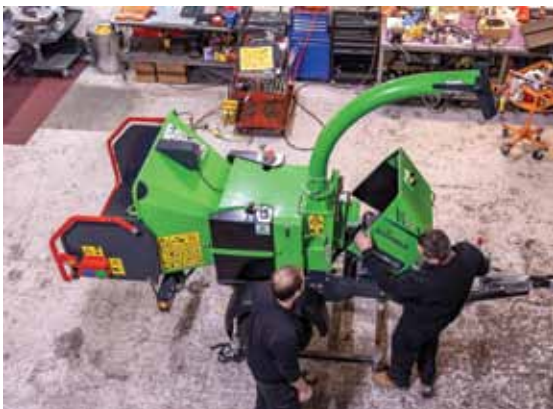
Most recently, we commenced a tie-up with the Toro network in Australia. We also have our own dedicated sub-divisions in both France and Germany. In the UK we are committed to the dealer route to market and currently have 22 dealers with 44 depots nationwide, providing the all-important back-up support to customers past and present"

The GreenMech woodchipper range now spans over 16 units, offering a range of unique features and chipping capacities from 100mm up to 220mm. The in-built quality of the range reflects the demands and expectations of a wide array of customers and end-users ranging from landscapers, local authorities, educational facilities, sports surfaces managers and many more.

The GreenMech range also has a number of unique features, such as a patented Disc Blade chipping technology, applicable across the whole hydraulic feed range. Compared to conventional straight blades, only 30% of the round disc-blades are in contact with the woody material at any one time. This can equate to 600% more blade life and provide up to 150 hours of chipping before requiring re-sharpening.

Other innovative features include our patented SAFE-Trak extension system and the recently launched, independent pivoting, SURE-Trak system (patent pending), which ensures maintained ground contact, to provide a surer footprint and improved stability.

GreenMech
www.greenmech.co.uk



Simple, efficient and cost-effective **straw spreading**

University of Liverpool farm unit evaluation

Spread-a-Bale is providing all livestock farmers with a cost-effective solution to one of the most laborious tasks – spreading bedding straw.

Spread-a-Bale was invented, developed and patented over 15 years ago by former dairy farmer, Michael Hughes. Today, he heads up the company which has a British manufacturing base and exclusive UK and Ireland dealerships. Award winning Spread-a-Bale also trades in over 20 countries and within five Continents.

Specialising in the production of simple and efficient machines for the purpose of spreading bedding straw, Spread-a-Bale provides an efficient operation for a comprehensive range of livestock - farmers beef, dairy, sheep, pig and poultry. The system is truly self-loading from the stack. In contrast to standard bale processors that literally chop and blow the straw into the livestock pen using pneumatic force, Spread-a-Bale's spreading rotors accelerate a mass of straw in order to throw it the full width of the pen with minimal dust generation.

Longer straw makes for a longer lasting bed, consequently Spread-a-Bale customers are reporting reductions in straw usage of up to 50% together with time and labour savings of up to 75%; one 600kg rectangular bale can be spread in 45 seconds.

UNIVERSITY VETERINARY UNIT

Seeking to reduce the amount of straw bedding and subsequent costs whilst maintaining the high performance of its 220-cow herd in terms of low mastitis incidence and somatic cell counts, the University of Liverpool School of Veterinary farm unit evaluated Spread-a-Bale in its straw bedded dry cow and youngstock accommodation.

Compared to its previous operations using a grab to shake out the straw, Spread-a-Bale proved to be more effective and efficient; the number of bales used was reduced by 50%, making savings sufficient to cover over 100% return on capital investment in under a 12-month period. At the same time, quality of the bed remained the same, and the low level of mastitis cases was maintained.

SPREAD-A-BALE M RANGE is available in four models, Maxi, Midi, Mini and Super Mini, which are end mounted for front discharge and also can be side mounted for side discharge requiring a two-tonne loader.

Feed-a-Bale, introduced in 2018, is a simple attachment enabling baled straw to be distributed straight in to TMR mixer wagons thereby significantly reducing mixing times and running costs, along with wear and tear. The equipment can also distribute baled straw, hay, haylage and alfalfa / Lucerne along feed fences.

Spread-a-Bale has recently introduced the 500kg Midi Lite for rectangular bales; it requires one tonne lift capacity and is suitable for most tractor fore-end loaders as well as skidsteers and Hof loaders.

DIVERSIFICATION

Spread-a-Bale is diversifying and is currently entering the waste-to-energy marketplace with Shred-a-Bale. The company realised it was in a prime position to recognize opportunities to efficiently de-bale shredded recycled waste and also biomass material and is currently working on numerous projects which involve further exploring this opportunity.

Spread-a-Bale®

www.straw-spreading-machines.com

From talented inventor to Global Player

Today, Teagle leads the way in bale processing

Cornwall, in the south west of England is located far from the traditional manufacturing centres in the UK. Bordered to north, west and south by sea, it is a region strong on farming and maritime industries and long-established family enterprises.

One such is Teagle Machinery, founded in 1937, a manufacturer of inspiring and innovative agricultural machinery, and best known for its extensive range of Bale Processors. With over 200 employees, the company is one of the largest employers in the region.

Tom Teagle was one of Cornwall's foremost inventors whose natural talent started the company. Creating machines such as carts, potato planters, fertiliser spreaders, hedge trimmers and concrete mixers. Teagle has always been a family business with core values, strong links within the community.

Advances in technology have transformed how the agricultural sector operates today. Precision farming from touchscreen GPS satellite systems and the Bluetooth wireless control box connection between operator and machine are just a couple of examples of how Teagle have embraced digital technologies in tackling the daily trials of the farming community. In 2017 they developed their most sophisticated machine yet, the Tomahawk C12 Calibrator, capable of processing straw to a consistent chop length at 11tons/hr on a rotor running at 2000rpm (a first in the UK market).

It's due to this ingenuity and continual thirst to improve and evolve their product range that Teagle has cemented their position as the specialist within the bale processing market.

A facility to accommodate the expansion of Research and Development within the company was completed in 2018.

Over recent years, Teagle has embarked on an ambitious growth strategy, which is focussed on developing Export markets and they now have clients in more than 50 countries. Whilst the head office and manufacturing facilities are based in Cornwall, they now have a truly international team, based across the globe. The success of this strategy has seen their sales double over the last 3-5 years and exports now represent almost 50% of their orders.

MOST SOPHISTICATED PROJECT

Teagle has long established itself as a strong player in the straw processing market, having first introduced its Tomahawk range 32 years ago. The newest member of the 17-model line-up is the C12, which is aimed at massive 1,000-cow dairy units and large-scale straw-processing contractors.

At present, Tomahawks make up over 50% of Teagle's sales and primarily find homes feeding dairy and beef cattle, spreading loose housing for livestock and processing straw as a biofuel.

The family-run firm has invested heavily in the new machine, which it claims is the most sophisticated project it has ever undertaken.

The brief given to the in-house design team three years ago was for a top-loaded machine that could process both round and square bales with simple chop length control.

It also needed to be suitable for a 180hp tractor and able to slot into a shipping container for easy export. The end result is a larger unit than most UK bale processors.

The giant 2,000rpm spinning rotor is centrally mounted at the base of the bale chamber and houses 56 hardened rectangular steel hammers with tungsten carbide faces, giving four wearing edges from one reversible hammer.

The C12 is controlled via a Bluetooth unit with a 50m range. It can stop, pause or reverse the bale chamber rotation, as well as tweaking the power loading speed.

Quoted outputs are up to 25 dry quadrant bales per hour, although anything above 20% moisture content will slow the processor down and reduce quality, the company says.

A tractor of at least 180hp is compulsory but Teagle says more power at the front equates to more output at the rear.

The company expects demand to come from a number of overseas markets, and the machine complies with new type approval laws, including brakes, tyres, axles and hitches

Robotic milking and remote monitoring

Swift and smart dairy solutions

The Fullwood name has long been synonymous with quality and innovation in the UK dairy equipment industry. In September 2018, Fullwood launched a new corporate identity, The Fullwood Packo Group. This new identity reflects the integration of the Fullwood (milking parlours, robots and herd management) and Packo (milk cooling) brands. Fullwood has been designing and manufacturing milking and cooling solutions, from conventional herringbone, parallel and rotary parlours to the very latest automated milking robots for 90 years, supplying over 50,000 farms across 80 countries.

After previously importing milking machines, the company turned its interests to manufacturing and, in 1940 completed the first milking machine made completely in Great Britain. Following this, in 1969 the first rotary parlour was installed in Britain.

In 1990, the company was granted the Royal Warrant after installing a direct to line parlour for Her Majesty The Queen at Prince Consort Farm, Windsor Great Park. A second parlour was subsequently installed in 2005 and upgraded during 2012.

Leading the product line-up today is Fullwood Packo's robotic milking machine, the M²erlin, a machine, redesigned from the ground up to deliver significant benefits in terms of milking efficiency, cow flow and milk integrity.

It features a unique twin-exit gate configuration which enables the milking machine to act as a segregation gate: the robot's herd management software controls where each individual animal is directed after being milked, with cows exiting via either a side gate or straight ahead once the feed manger has automatically lifted out of the way.

By eliminating the need for additional segregation gates, the Fullwood Packo M²erlin requires less space and is more cost-effective to install than more traditional, modular systems. It is also available in either a side or straight entry configuration to further add to its flexibility and space-saving credentials.

The M²erlin also features an all-electric milking arm that significantly reduces energy usage for teat cup attachment compared to previous robots and has fewer parts for improved reliability and serviceability.

The new machine has been designed in-house by Fullwood Packo's mechanical and electrical engineers and is fully manufactured at Fullwood's Grange Road premises in Ellesmere, Shropshire.

As well as an all-new physical design, the new M²erlin also features several key operating software upgrades which improve and simplify herd management protocols. These include the installation of Fullwood Packo's recently launched MerlinView software, which simplifies the data available to herd managers by collating a series of key performance indicators (KPIs). Information such as individual cow milking data, cow activity, milk components, overall herd performance, bulk tank capacity and cleaning parameters are summarised and displayed in an easy to view format on a single computer display screen.

SMARTPHONE APP

A smartphone app which enables dairy farmers to remotely monitor the performance and functionality of their M²erlin automatic milking systems has recently been launched by the company, thus enabling them to make swifter and smarter management decisions to the benefit of herd productivity and their own work-life balance.

The M²erlinInfo app enables users to view real-time and historical data of each cow's milking records, or for the herd as a whole, from any location and at any time via a Wi-Fi or mobile data connection. Parameters such as milk yield, number and duration of milkings per day and time of last milking are easily accessible, with users also able to compare 10-day and 24-hour yield averages, thereby allowing them to measure productivity and make informed management decisions on a cow-by-cow or whole herd basis.

The app also delivers a series of alarms and warnings to alert the farmer/herd manager of potential problems – either with the milking machine or an individual cow. This gives users easy access to the robot's cleaning records and maintenance schedules, thus ensuring each M²erlin is working as efficiently and hygienically as possible to safeguard milk quality and integrity.

– from conventional herringbone, parallel and rotary parlours to the very latest automated milking robots. The M²erlinInfo app is fully customisable, with users able to select what type of notifications to receive and when. The app can also be configured to remain silent during hours defined by the user, therefore ensuring uninterrupted sleep for off-duty staff.

The M²erlinInfo app is available in Czech, Dutch, English, French and German and is free to download from Google Play and the Apple App Store.

Fullwood Packo

www.fullwoodpacko.com

SILSOE SPRAY APPLICATIONS UNIT

World-leading research into pesticide application

Application technology is a key part of crop protection. With environmental pressures increasing, the number of agrochemical products reducing, and those products being used at very low doses, it is essential to deliver agrochemicals to the target accurately and uniformly. Developments in engineering are crucial to maintaining the UK's ability to grow crops sustainably, reducing the quantities of pesticides used and minimising off-target impacts.

Silsoe Spray Application Unit Ltd (SSAU) is a world-leading facility for research and development in pesticide application. It has a team of specialists with established research experience in spray generation, transport and deposition. This includes conducting field experiments, laboratory work, the use of a specialised wind tunnel, and the development of mathematical models.

The SSAU team, lead by Dr Clare Butler Ellis, focus on the key areas of quantifying and minimising off-target contamination and maximising product performance. This includes work on

SPRAY DRIFT

- Through a combination of field, wind tunnel measurements and modelling, the unit can provide cost-effective investigations of methods to control losses of pesticides through spray drift.
- SSAU is the sole organisation accredited by the Chemicals Regulation Division of the Health and Safety Directorate for determining 'star-ratings' for drift reducing equipment

EXPOSURE ASSESSMENTS

SSAU has developed models of bystander and resident exposure, the first of which has been adopted across Europe for pesticide approvals. Further developments have continued and are being considered by the regulatory authorities.

Human exposure to airborne droplets is also relevant to biological or chemical agents in warfare, resulting in a collaboration between SSAU and dstl (Porton Down) to develop a method of testing protective clothing for military and civilian emergency services, for which the SSAU wind tunnel facility is now key.

Exposure of other non-target species (aquatic and terrestrial) to pesticides can also be quantified and modelled, and work is continuing to improve models specifically for aquatic species.

PRODUCT PERFORMANCE

SSAU work with manufacturers to select application equipment to deliver optimum performance of plant protection products, support the development of new application methods and provide independent testing of equipment and products.

In a collaborative project funded by AHDB with Warwick University and ADAS (the Amber project), SSAU is exploring the application requirement for biopesticides, which is seen to be crucial to improving biopesticide performance and technically challenging. This has identified the need for investment and R&D into application of all types plant protection products to protected horticultural crops.

In another collaborative project with dstl, SSAU's agricultural expertise is being used to develop rapid and effective methods of decontamination of land following a malicious release of a biological agent.

FUTURE

As the use of pesticides continues to be under pressure from both regulations and a negative public perception, there are efforts to develop alternatives to chemical controls. Integrated Pest Management, which is mandatory under the European sustainable use regulation, should encourage movement towards combining all these alternative techniques so that conventional chemicals are the last resort and used in the lowest possible quantities.

But they will remain a key part of protecting crops for both yield and quality for the foreseeable future and we are unlikely to see crop sprayers disappearing from our fields. Recent developments in the use of drones and robots in agriculture are likely to provide advantages for crop protection in niche areas, but will need proper consideration of the spraying technology.

Timeliness of treatment will continue to be a major plank in any strategy aimed at minimised plant protection product use for which high work rates will have to be maintained. Conventional spraying equipment will prove to be difficult to better in terms of work rates, SSAU has the skills and facilities to ensure that whatever the delivery vehicle that is used for pesticide application, the spray technology employed is optimised to maximise product performance and minimise off-target impacts.

www.ssau.co.uk

BESPOKE SPRAYING SOLUTIONS

Air-Ride the complete answer for crops from sunflowers to cotton

Leading UK manufacturer, Household Sprayers has been representing the very best of British design and engineering since its formation in the 1970's. The company operates in close collaboration with customers and partners, not just in the UK, but across international markets.

Household's Advanced Engineering Division is responsible for the R&D, technology and engineering services function and is the backbone of the group, providing world class technical innovation, research and development, testing and manufacturing services to deliver exciting, effective and efficient concepts for global customers.

Working in close collaboration with customers and partners, Household Advanced Engineering creates not just industry leading design and technology but efficient performance and delivery to meet the sustainability challenges of the 21st century.

This dedication to detail and collaborative approach has resulted in a substantial increase in sales to overseas markets with export sales now accounting for 40% of the company's business.

AIR-RIDE VERSATILITY

One of the most successful machines for international markets is the Air-Ride which is a well proven and established machine, lending itself to bespoke manufacture for different markets

Household Sales Director Jim Dickinson says "Our success has come from adapting the product to suit the different countries needs and technology requirements. The high-clearance version of the Air-Ride has been extremely well received in Eastern Europe as well as Australia and Israel, especially for tall crops such as sunflower, maize and cotton. We also have had success building specific machines for the Australian vegetable growers market"

The Air-Ride's four-wheel steer reduces crop damage and keeps headland size to a minimum. Power is provided by an ultra-reliable and fuel efficient CAT engine and, in conjunction with users, the Household Advanced Engineering team has designed and developed its own dedicated electronic rate controller.

The TMC (Total Machine Control) integrates many functions into one simple-to-use touch screen console. Add this to our FieldMaster GPS system, which was also designed and developed in-house.

Air-Ride tank capacities of 3000, 3500 or 4000 litres and boom widths ranging from a 24 metre twin-fold to a 36metre triple-fold can be specified. In addition, a triple-fold boom arrangement is available from 28metres. Both boom arrangements have been engineered to ensure that the centre of gravity of the machine is as low as possible.

The impressive list of standard equipment on the Air-Ride is so advanced that it literally takes the hard work out of crop spraying. The superb panoramic cab offers the best operator visibility of any similar machine on the market today. The machine is also available with hydraulically adjustable axles as an option.

HOUSEHAM

Household has completed work on a six-figure investment on its new factory in Woodhall Spa, Lincolnshire.
The new facility increases the factory's footprint by 30% and production capacity by 50%, with double the number of construction bays for Household's latest state of the art self-propelled sprayers.
The expansion comes after a successful 12 months for Household which saw the company grow its exports by 25 per cent.
The factory also houses a second hand workshop, offering servicing and parts to its diverse, global customer base.
The company has also built the new Household Academy, a specialist training space for customers and staff.

www.househamsprayers.co.uk

FOCUS ON THE FUTURE

Design changes make in-field maintenance quicker and simpler

Knight Farm Machinery - based in the UK's smallest county, Rutland – has a long history of innovation, which has helped it build a healthy market both in the UK and across many export markets.

The company's ethos has always been to build strong, durable machines featuring the best equipment available so they can perform to the highest standards while being easy to both operate and maintain.

That approach is apparent in the new ranges of self-propelled and trailed machines that the company has launched in the last year.

Its latest self-propelled offering includes a lower positioned cab that gives the it a lower centre of gravity and means purchasers can choose from a greater range of boom designs.

Under the re-design, the Ad-Blue tank is moved to the side of the machine near the main sprayer controls, with a new tool box and storage area being added.

David Main, Knight's Sales Manager, says the changes continue the company's policy of continuous improvement designed to help operators:

"They can now carry all the tools and spare/replacement parts they need with them, making in-field maintenance quicker and simpler.

"The lower cab position means the machines can use wider two-fold booms, which will speed up folding and reduce the machine's overall weight – an important consideration for some customers".

SIMPLER PLUMBING

New Trailblazer trailed machines now feature simpler plumbing that helps achieve optimum spraying performance and comply with environmental regulations.

The machine's hydraulically driven sprayer pump has been moved to the rear of the chassis, which removes several metres of pipework and reduces the amount of spray material left in the machine at the end of work.

Knight is also fitting an air purge system that reduces spill risks, enabling operators to return liquid from the suction hose back to the storage tank, and – at the end of work – discharge solution in the boom onto the cropped area.

This minimises the risk of accidental discharges and the volume of clean water needed to flush out the machine.

A new higher capacity circular induction hopper is also fitted, which improves mixing efficiency and is easier to clean. The can-wash and draining tray ensure total cleaning, with resulting solution being incorporated in the mixing hopper and then into the spray solution.

Another example of the company's approach is the boom-mounted nozzle check kit it now offers as original- or retro fit equipment.

This includes boom-mounted tool boxes that contain components like nozzles, o-rings, caps and maintenance tools, and essential protective gear for the operator.

A pneumatic system enables operator to clean blocked nozzles efficiently, and then use a 'push button' system to test them without having to return to the sprayer cab.

"That will save a lot of time and ensure that essential routine tasks like this are completed more efficiently, as well as minimising the amount of liquid discharged in the yard or on the headland during the checking process".

KNIGHT

www.knight-ltd.co.uk

EVERY **FARMER** IS DIFFERENT

UK sprayer company specialises in meeting individual requirements around the world

In 1975, Neal Sands ran a successful chemical supply and contract spray company operating across the agricultural heartland of the East of England. Unable to find machinery to suit his precise requirements, he set about designing his own self-propelled sprayer initially adapting a David Brown Tractor to carry a 2000 litre tank and an 18m boom.

Within a couple of years, he decided that his future focus should lie in designing and building sprayers to meet the demands of individual customers – and the chemical business was sold.

More than 40 years on, Sands Agricultural Machinery has become a leading UK manufacturer of self-propelled sprayers, exported widely, all of which are built to the same principal of providing a bespoke machine to suit a purchaser's exact requirements.

"That has been the root of our success over the years" says Neal's son, Director Thomas Sands "and is crucial in meeting different requirements in overseas markets. For instance in the UK, operators tend to use up to 2.3 metre wheel tracking, whilst in Australasian markets for instance, 3.5 metre is more common"

Today, Sands has a network of dealers and distributors around the world, and are seeking to expand into untapped markets. Rather than exhibit at international exhibitions, they prefer to take space at farm shows in specific countries in order to better understand local and regional needs.

NEW RANGE

The Sands range has evolved over the years, starting with the model FCH machines introduced in 1981 which were one of the first hydrostatic sprayers in the UK. These were followed by the SL and SLC series which incorporated ever increasing engine power, larger tanks, improved cabs and wider booms and also included a Lowline series.

In 2009, the Sands Vision series was introduced, and after many improvements the company launched the current Horizon sprayer range, available in 3000, 4000, 5500 and 6000 litre options.

The Horizon 3000 is the lightest and the most compact model in the range but still offers high spraying outputs with exceptional build quality and reliability. The 3000 model is fitted with Sands unique Panoramic cab, designed in house, which features the latest Category 4 filtration.

Comfort, visibility, build quality and ergonomics are to the highest standard and the low noise levels take into account operator wellbeing.

The Horizon 3000's low overall weight, allows it to tread lightly in damper conditions whilst still giving the performance required when spraying demands are at their highest.

Power is from the latest Deutz Tier 5 engine, 6-cylinder turbocharged engine driving through Poclain Boosted Braking wheel motors. These are now fitted with Dynamic and Boosted brakes on the front axle for improved stopping capabilities when travelling at higher road speeds.

Sands manufactured steel 3-fold boom sprays are available at any widths to suit customer's need.

The top of the range Horizon 6000 is the company's largest sprayer available with a range of booms widths that can extend to 40m

Thomas Sands says "I believe that farmers around the world recognise the traditions and heritage of UK agriculture and UK agricultural engineering. At Sands, we reflect that in the reliability, versatility and manufacturing quality built-in to all our products"

SAM CROP SPRAYERS
www.samltd.co.uk

Smart **cameras** speed cultivation and weeding

Award winning video analysis technology from Garford selectively differentiates between weeds and plants

Many of the innovations in agriculture come from the practical experience of farmers themselves. Prior to establishing Garford Farm Machinery Norman Garford and his sons were all in farming, but were constantly looking to improve and adapt machinery to suit their particular needs.

In the 1980's Garford's designed and developed a Skew Bar topper to retrofit to different models of sugar beet harvester. The Skew Bar topper was designed in such a way that it will remove the leaves from the top of the sugar beet without actually taking the top off the sugar beet itself, thus enabling the farmers to collect a higher tonnage from their crop. This resulted in the development of a complete sugar beet harvester which was successfully sold in the UK and overseas markets

In 1997, the UK's Silsoe Research Institute approached Garford to see if they would be interested in collaborating on a project to develop precision guidance for inter row hoes.

A 4 year development programme followed, which started on organic cereal crops, then sugar beet and finally resulted in Garford launching the system in 2001 with 3 production machines, one for cereals, one for sugar beet and one for vegetables.

FASTER WORKING

The main benefit of the Robocrop system is improvement in performance with travelling speeds of up to 12 kph or even more. The hoes are equipped with a camera that looks at the crop rows and sends the images back to the Robocrop console in the tractor cab which is then able to guide the hoe along the crop row allowing the tractor operator to travel at a much faster pace than would be possible if he was having to guide the hoe manually himself.

The Robocrop Precision Guided Hoe has gone from strength to strength since its launch in 2001. A major factor in this is that many chemicals that were available to farmers for weed control have been, and are continuing to be, withdrawn from the market. The Robocrop Precision Guided Hoe is now available for use on most crops, including vegetables, cereals and sugar beet. It has also been used on herbs, flowers and this year is being sold worldwide.

VIDEO IMAGE ANALYSIS

The latest development in the Robocrop range is the Robocrop InRow Weeder.

The camera identifies the individual plants and controls a weeding rotor to take out the weeds not only between the rows but also between the plants.

Video image analysis techniques are used to locate individual plants in order to mechanically remove weeds from the inter row and importantly within the crop row between the plants.

Developed for use on transplanted crops such as lettuce, cabbage and celery, Robocrop InRow can however be used on most crops that are planted with regular plant and row spacing where the plant foliage is clearly separated from the next plant.

Forward speeds of up to 3 plant spacings per second are possible. Systems of up to 18 rows and 6mtr working width can be supplied.

The firm expects demand to keep on rising both in the UK and overseas and it is hoped further development of the technology will improve differentiation between crop and weed, allowing mechanisms to get closer to the crop to remove them without losses.

garford

www.garford.com

Strip-till specialists

Reduced soil movement, erosion and disturbance of biological life

Seeking a direct method of establishing combinable crops on his Suffolk farm, Jeff Claydon developed a strip tillage drill designed to till the soil only in the rows in which the crop is to be sown.

In 2002, the drill was put into commercial production as the Claydon V Drill.

Since then the company has introduced a series of evolutions of the product, and by way of the V and SR models this has culminated in today's Claydon Hybrid drills, which blend the best design aspects of the earlier two series.

While they have been developed significantly over time, the drills retain their original patent-protected basis of a leading tine for ground-breaking followed by an A-share down the back of which the seed is placed. Minimal soil disturbance means reduced fuel use, less weed growth requiring fewer herbicide applications, and land which retains its structure, leading to less disturbance of biological life and reduced soil erosion and water run-off.

Recognising that farms and farming systems span a wide variety of circumstances, Claydon has developed a range of complementary equipment for its drill line, marketing the total package as the Claydon System.

This includes straw harrows to redistribute chopped straw and aid slug control before drilling, and the TerraStar light surface cultivators to aid drainage and manure incorporation and to create a shallow tilth to encourage germination of volunteers and weeds for destruction before drilling.

Claydon also offers rolls to ensure good seed-to-soil contact, retain moisture, reduce erosion, improve pre-emergence herbicide efficacy and minimise slug activity.

Its most recent introduction is the TerraBlade inter-row weeder, a tool for front-mounting on a tractor and designed to mechanically remove weeds in the 150mm spacings between the 150mm sown crop strips.

Today, Claydon employs more than 50 staff at the factory and offices it has developed at its base in Wickhambrook, Suffolk, where it has recently invested significant sums in new paint facilities and offices.

The site, and the Claydon farm that surrounds it, regularly hosts open days for farmers, dealers and importers for training, discussion and the exchange of ideas, as well as offering the opportunity to see how the products are made and the Claydon system of equipment works in practice.

The company now has more than 1,000 machines working in over 30 countries around the world, from Europe to South America to New Zealand, and is actively seeking to open up new markets with the aid of distributors and dealers. Drills for export are making up an increasing proportion of output from the factory's annual production.

CLAYDON DRILLS

Long-established as a family farming concern, Claydon entered the agricultural equipment design and manufacturing business in 1980, when Jeff Claydon launched the Claydon's Yield-O-Meter combine-mounted yield monitor. The device was fitted to machines on farms throughout the UK and beyond, achieving significant sales success at a time when few other low-cost methods of accurately assessing crop output were available.

Claydon went on to enter new sectors of the agricultural equipment business, in particular by introducing the plough-mounted Furrow Cracker, designed to speed up natural post-ploughing soil breakdown, to the UK market.

Since 2002 the company has focused on the production and marketing of strip-till drills and associated equipment designed for arable farmers seeking to practise non-inversion crop establishment, a system attracting increasing interest for its cost-of-production and environmental benefits.

With agricultural policy in many countries becoming increasingly focused on the latter, interest in the concept of strip-till drilling is continuing to grow.

CLAYDON

www.claydondrills.com

Cost saving cultivation and seeding

Innovative and durable machines from Sumo provide one pass cultivating and combined seed and fertiliser application

The Sumo name has long been associated with high quality British design and manufacture of cultivation and seeding equipment. Its innovative and durable machinery is built to last by an experienced and highly skilled production team.

Many of the Sumo team come from agricultural backgrounds and have extensive knowledge of farming practices and the industry as a whole. Sumo offers a wide range of agricultural machinery that fits directly into minimum and no-till farming methods with cultivation, disc harrow and drilling machinery.

TRIO CULTIVATOR

The Trio has gained the reputation as the UK's number 1 one-pass stubble cultivator. As the name suggests, the Trio comprises of three parts, each of these finely tuned to create a seedbed from stubble in one pass, an objective achieved by the vast majority of users.

Initial cultivations, to a depth of 400mm, is by shearpin-protected or auto-reset ultra-low draught subsoiler legs with Tungsten-tipped Concord quick-change points mounted in a staggered pattern on a heavy-duty toolbar with a 350mm forward stagger.

These are followed by a double row of 500mm diameter concave cultivating and mixing discs mounted in pairs on independently suspended arms in a dedicated frame, the finished seedbed created by a patented Multipacka roller: a 509 x 10mm barrel with shouldered rings and drive lugs provides a total diameter of 760mm. Tried and tested ring shoulders have a convex shape next to the barrel, creating consolidation and cracking even on top of the ridge.

DEEP TILLAGE SEEDER (DTS)

The DTS is specifically designed to enable farmers and contractors to exploit the advantages of strip-tillage, but with the versatility to be equally effective in plough-based and minimal tillage systems.

Strip-Tillage is a one-pass establishment system that combines the soil drying and warming benefits of minimal tillage with the soil protecting advantages of direct (no-till) drilling, by creating a seedbed only where the seed is to be planted leaving the soil in-between the bands undisturbed.

Potential benefits of the system also include improved timeliness of establishment through speed and high outputs, and improved soil structure (with a higher organic content, better drainage and less erosion). In most instances, there are also significant savings in cost and time over minimal tillage: up to 32% and 39%, respectively.

On the Sumo DTS, on each coulter unit, a leading opener disc cuts through the trash and is followed by a deep-loosening tine that relieves compaction below the seedlings to provide a friable, well aerated and drained environment for excellent germination. Covering disc channel loosend earth over the seed, placed in the loosened strip by an opener boot, and excellent seed-to-soil contact is provided by a foam-filled press wheel that also governs drilling depth.

To further extend the DTS's suitability to operate in all types of establishment regimes, the drill is available in a seed and fertiliser configuration. The optional fertiliser kit includes a 50/50 split seed hopper (3000ltrs total capacity for 4.0m and 4.8m models, 3600ltrs 6.0m – 9m versions), separate stainless steel ORGA metering unit, transfer pipes, upstack, metering head and application nozzles.

Dual products drilled and applied in one pass greatly reduces input costs and time. The targeted application of fertiliser into the rooting zone also means the potential reduction in product applied as nutrients are more readily available to the plant roots, reducing the potential for nutrient leaching and wastage.

SUMO

improving farm productivity

www.sumo1.com

CROP DRIERS for world markets

Innovative engineering of market-appropriate grain processing solutions

Alvan Blanch have been designing and manufacturing grain driers for over 65 years. It's range of highly efficient, versatile and environmentally-friendly driers have been radically re-engineered over recent years. They are suitable for an extensive range of crops including soya beans, wheat, barley, grass seed, oats, rice, rapeseed, linseed, maize, hemp, Lucerne, wood chip, digestate and seaweed.

Exporting driers has been a key activity for Alvan Blanch from the earliest days and now extends to over 100 countries worldwide.

The company prides itself on matching equipment design to the specific needs of clients and taking careful account of local factors such as climate, crop types, traditions and economic pressures which are all an important part of the process to enable our driers to be used to their full capacity.

Two recent examples of close co-operation with farming enterprises come from Australia.

When farmer Dan Coulthard and family decided to go cropping in summer and winter, they needed a grain drier to ensure they could make it work and chose the British-made Alvan Blanch DF22000.

"They quoted that it would use a litre of diesel per cent of moisture removed from each tonne," he said. "So if you were taking out 10 per cent of moisture from a tonne of grain you would use 10 litres per tonne.

"We've put 1000 tonnes of corn through it so far and we've found that with a 150 kVA generator running from the same fuel source for additional requirements, it's still using just under that litre per tonne."

He said the drier's ability to handle all crops was another appealing factor, with the family growing wheat or canola during winter and corn in summer.

Olam Orchards Australia is one of the southern hemisphere's largest almond producers and processors. When the Alvan Blanch Double Flow Grain Drier DF48000 landed into the country it took a huge effort from Alvan Blanch, as well as local contractors to get the drier in place and the pre-cleaning system operational in time for the season.

Following the successful commissioning, the Olam Orchards site was abuzz with harvest operations – handling well over 100,000 Tonnes of in-shell almonds per year.

Alvan Blanch's customer, Olam International is a leading agri-business operating from seed to shelf in 70 countries, supplying food and industrial raw materials to over 16,200 customers worldwide. It's team of 62,500 employees has built a leading market position in cocoa, coffee, cashew, rice and cotton.

www.alvanblanchgroup.com

THE QUEEN'S AWARDS FOR ENTERPRISE: INTERNATIONAL TRADE 2019

Alvan Blanch, has been awarded the **Queen's Award for Enterprise 2019** in the **'International Trade – Outstanding Achievement**' category.

The awards are the most prestigious business accolades within the UK.

This is the third time that the company has received the award – having won previously in 2005 and 2012. Understanding the challenges and changes of fast-moving markets has been crucial for Alvan Blanch to achieve its international success. In addition to the drier business, Alvan Blanch engineers complete post-harvest processing systems for export to the Middle East, Africa and Caribbean. Exports have expanded in the last five years to over 85% of turnover for the Wiltshire-based manufacturer.

The company has opened sales offices and service centres in several markets in Asia, Australia, Africa and Europe, benefitting customer and dealer relationships.

AB ALVAN BLANCH
Processing the World's Crops - Since 1952

High Capacity Grain Handling

Applications to meet needs of farm and industrial

With over 70 years of experience, Perry of Oakley Ltd. are the UK's most experienced manufacturer of grain driers and grain handling equipment. Perry driers have been tested and proven on a variety of crops meaning are almost certainly to have a drier that will suit the requirements of customers around the world

The company provides a range of high quality machinery to a wide variety of industries, including farms, commercial grain stores, waste and aggregate industries, feed and pet food, pharmaceutical and biomass industries, and many others. Over the years Perry have supplied machines to over 25 different countries across 4 continents and in 2017 were awarded the accolade of the SHAPA (Solids Handling and Processing Association) Exporter of the Year Award due to the high level of service they provide to all of their overseas customers.

Perry specialise in the manufacture of chain and flight conveyors, aspirator pre-cleaners, belt and bucket elevators, belt conveyors, augers and screw conveyors along with their range of grain driers and belt driers. Perry can also source products such as rotary cleaners, colour sorters, destoning equipment and full feed mill/flaking mill equipment, meaning they can provide solutions to a wide variety of industries.

All of Perry's machines are designed and manufactured in the UK based factory from high quality galvanised steel. Their range of handling equipment is available in capacities from 10tph to 1000tph and can convey lengths of up to 150m and elevate to 40m. With a full range of accessories available, Perry's products become a versatile option for handling a wide variety of materials.

They have 3 main ranges of equipment, agricultural (8-60tph), light-industrial (60-150tph) and industrial machines (150-1000tph). Each range has been specifically designed for its application, this helps ensure Perry's machines stand the test of time.

SAVANNAH SERIES

Their latest grain driers, the Savannah series, have significant improvements from their popular 'M' Series.

The operation of the fans is controlled by an inverter so there is the potential to save power and crop lift off by running the fans at reduced speed. The unique crop set up page automatically selects the initial fan speed best suited to the crop.

The overall drier width has been reduced by 500mm which will help when fitting the drier into existing buildings.

The Savannah Series driers still have Perry's own advanced PLC panel, which is designed and programmed in house, and the auto control, which uses both the exhaust air temperature and hot grain temperature to give advanced control of the drier with feedback, to maintain a consistent moisture content of the discharged grain.

To ensure drier longevity they are built with a 2mm thick grain column, and 3mm thick top ducts in the to help prevent deformation and wear.

To promote consistent movement of the grain down the grain column, even in very wet conditions, all Savannah Series Driers are fitted with our pneumatically controlled Shutter discharge.

These improvements, and the other key features of the Savannah range, provide a truly commercial specification grain drier for use on farms and commercial grain stores.

PERRY ENGINEERING EXCELLENCE

Perry of Oakley was founded in 1947 by Tom Perry, a farmer's son, who offered a mobile repair and manufacturing service to local farmers and businesses. In 1949 Tom Perry designed and built our very first belt and bucket elevator with a capacity of 5 tph and the company's very first grain drier.
Today, Perry of Oakley equipment is used across the world. All of our products are designed and manufactured by a team of experienced engineers in a purpose-built factory in the south west of England. We have designed full solutions for many industries and products all over the world, including; standard cereals handling, drying and storage, flaking mills, feed mills, woodchip delivery, drying and storage, seed plants and many more.

www.perryofoakley.co.uk

Stripper Headers

UK innovation aids harvesting and moisture retention in a wide variety of crops worldwide

The stripper header was originally conceived by UK Agri-Tech engineer Keith Shelbourne in the 1980s as a derivative of the rotary head fitted to the company's pea harvesters. The first models were put on the market in the UK in 1989 and continual design enhancements have resulted in substantial sales growth. A stripper header goes on the front of a combine. Instead of cutting the whole plant off as a traditional header does, the stripper header catches the heads of the grain and strips the kernels off, throwing them into the auger. Why is this important? It leaves more residue standing in the field, which cuts wind speeds and shades the soil. This reduces temperatures for the next crop's seedlings, and conserves soil water by reducing moisture lost to evaporation and transpiration.

After the grain has been stripped, a series of deflectors within the header deflect the grain back into a conventional auger and pan.

85% of the grain is threshed by the header meaning that the material entering the combine is predominantly grain, chaff, leaf and minimal straw. The benefit of this reduced bulk entering the combine is significantly improved capacity and efficiency.

Other benefits include improved performance in flattened or damaged crops, both in terms of recovery and speed as well as improved performance in green, high moisture and weed infested crops.

Many farmers in low rainfall areas have utilised the moisture retention benefits of stripped straw in no-till farming systems.

The Shelbourne stripper header has evolved considerably over the last 20 years, crops have been stripped ranging from grass to chilli peppers all over the world. The current range of stripper headers ranges from 2.4m wide to 12.6m wide.

HEMP HARVESTING

There has been considerable interest in harvesting hemp both in Europe and the USA. Research and experimentation over the last couple of years have demonstrated that stripper headers are a successful way of stripping the upper portion of leaf and bud from a green hemp plant.

The advantage of the stripper header is that it just strips off the upper leaves, flower buds and seeds which is the part of the plant with the highest oil concentration. The stem is left behind. This makes the oil extraction process much more efficient. The CBD oil is located on the surface of the leaf so the less the leaf is handled the better.

Shelbourne Reynolds are developing a simple economic harvesting solution that can be fitted to most tractors with a front-end loader. The crop is stripped by a rearward rotating rotor incorporating 8 rows of stripping fingers, the stripped hemp is then carried to the right side of the header where it is delivered to either a trailer driven alongside or pulled behind. The header is hydraulically powered by the tractor.

SHELBOURNE REYNOLDS

Shelbourne Reynolds Engineering Ltd, Shelbourne Reynolds has been designing and manufacturing farm machinery in England since 1972, and today operates from two main locations, the main manufacturing facility in Stanton, Suffolk and the US Distribution centre in Colby Kansas.

The 110,000 square foot factory on a 5-acre rural and currently employs 140 people. It utilises some of the most sophisticated manufacturing equipment and most products are machines that originate in its own design office and have been evolved and improved over the years.

Shelbourne Reynolds commitment to innovation has attracted many export markets with over half of production being exported to over 50 countries worldwide.

The Kansas base was established in 1996 and serves as a sales office, machine storage facility and parts distribution centre. It supports all of Shelbourne's customers in the USA and Canada.

Shelbourne stripper headers were first sold in the US in 1990 when the benefits of a fast, early harvest coupled with the benefits of planting soybeans straight back into the stripped straw were quickly recognised.

www.shelbourne.com

Bespoke Solutions for **Potato** Grading

Saving labour costs and increased output with collaboration between grower and equipment manufacturer

Tong Engineering, Lincolnshire, is a family-run business in its fourth generation, has over 85 years of experience in manufacturing robust and reliable vegetable processing equipment. The company designs, manufactures and installs a variety of vegetable handling equipment, from single machines to full bespoke vegetable handling and grading systems which it now exports to more than 20 countries worldwide.

Recently, contract farmer and potato grower, B&C Farming, from Norfolk, wished to upgrade their 30-year old potato grading line and approached Tong Engineering to design a custom-built seed potato grading facility with all the company's current and future requirements in mind.

The company supply seed potatoes direct to growers, operating a 'just in time' delivery system using their own lorries. A new grading facility would ensure they could continue to produce more, higher-quality seed potatoes to meet ongoing contract demands.

"Specifying a new grading line is a very individual process," says B&C Farming Managing Director Tony Bambridge "It takes time to determine all the processes you want to achieve from the new grading line, whilst understanding all the advanced handling capabilities on offer with the latest equipment on the market. That's why we needed to work with a manufacturer who understood our requirements fully, to make adjustments where necessary to suit our exact needs"

UK VEGETABLE PRODUCTION

UK vegetable production was worth £1.5 billion in 2017, representing annual volume of 2.7 million tonnes
(Annual Government Statistics 2018)

LABOUR COSTS

With a reduction in labour costs a key objective in the specification of the new line, a Tong side-eject box tipper feeds crop onto the line. Potatoes that are lifted into the boxes at harvest before being graded in January and February.

Labour requirements at the crop cleaning and grading section of the line have also been taken into consideration. "Taking care of the complete grading system from start to finish, Tong integrated the Tomra FPS optical sorter into the line for automatic detection of stones and clod in the unwashed crop. With this removal of debris now being performed automatically, inspection staff are now in a fully-insulated, heated and sound-proofed cabin, allowing for much more pleasant inspection conditions.

The new grading line at B&C Farming also features Tong's industry-leading box filler the Midi EasyFill, which gently transfers graded and sorted crop back into boxes for storage. In addition, a series of Tong vertical lowerator box fillers are used for high capacity yet gentle box filling. "When crop comes out of store and is ready for delivery to customers in March, Tong's UniFill big bag filler comes into its own as crop is tipped onto a second line where it passes through final inspection and is gently filled into 1 or 1.25 ton bags," explains Tony.

"We've almost doubled the throughput of our grading facility, reduced costs and maintained, if not improved, quality," added Tony.

TONG

www.tongengineering.com

Precision seeding

Stanhay is one of the world's leading specialists in the design and manufacture of precision seed drills, trusted by growers worldwide to establish their crops. Over the decades, Stanhay's market leading technology has consistently proven to give some of the highest and most consistent yields at harvest.

The company's UK Lincolnshire headquarters is home to all departments including administration, sales, service, assembly, design and testing. Stanhay engineers use the latest 3D computer aided design software and on-site manufacturing facilities include computer numerical control (CNC) laser cutters, CNC press brakes, robot and manual welding and paint. This means that in conjunction with Stanhay's growing network of international distributors and dealers the right drill, part or technical support is always available when needed.

The core Stanhay technology differs from other products by allowing the grower to plant up to 4 lines of produce from one single row unit using pelleted, coated or natural seed. Couple this with low seed drop, innovative linkage designs to maintain constant seed depth and a range of accessories to suit a huge range of ground conditions and growers have the recipe for unsurpassed precision seed placement and the very best start for their crop.

Expanded international distribution from Stanhay

ProAir

50 years of precision planting experience has gone into Stanhay's latest development. The ProAir is a compact, lightweight but durable row unit packed with adjustability and options to suit any type of ground condition or planting pattern. The drive is maintenance and slip free thanks to a sealed flexible shaft drive system similar to that used on over one million maize drills globally. Coupled wit reliable 26 speed chain driven gearbox and a choice of small or large fans this machine offers the ultimate in precision planting performance.

Stanhay says the ProAir offers specialist growers a compact and durable precision drill that is 40% lighter and 30% shorter than previous models, but remains easy to set up and is more adjustable than other units.

Infinite depth control – measurable to 0.1mm accuracy, thanks to a mechanical counter – is a new feature, as is the maintenance-free flexible drive from the lay shaft to the metering unit, a first for a vegetable seeder. A 6m horizontally folding frame and a vacuum seed emptier, standard on all air drills, are amongst other new features.

International Distribution

Stanhay has recently agreed a new distribution deal with the Grimme Group a leading manufacturer of vegetable, potato and sugar beet machinery. From 2019 onwards the UK made and newly branded 'Grimme by Stanhay' machines will be distributed through the Grimme network in Germany, the Netherlands, Great Britain, Ireland, Poland, Russia and China.

The move allows Grimme to offer a precision drill to complete its range of vegetable technology that already includes cultivation, harvesting and storage equipment. With Stanhay's extensive experience in precision drill technology and Grimme's renowned after sales performance the partnership provides the vegetable grower with a perfect machinery partner.

As well as all new machinery enquiries, current Stanhay customers in these markets will also be able to access service and spare parts through their local Grimme representatives.

STANHAY

www.stanhay.com

High Speed carrot grading and cleaning

Established in 1944, Haith is one the UK's largest manufacturer of grading, washing, bulk handling, weighing, pre-packing lines and water treatment systems and has an existing network of agents around the world, and is keen to grow the company's representation, especially in Canada, South America, Spain and Italy.

To meet increased growth, the company has recently opened a new £1.5 million factory extension.

The new building will allow Haith to work on multiple large-scale projects at the same time and provide much-needed space to assemble the company's Rota-tip box tipper, Root Veg Polisher, barrel washers and box fillers, for which Haith is enjoying unprecedented demand.

Taking just 13 weeks to build, the new factory was officially opened in September 2018 by Haith Group founder, 92-year-old Mr Geoff Haith.

His son, managing director Nigel Haith said: "My father set out to design and build machinery that would meet the needs of his customers, solve their problems and provide them with a high quality, reliable and efficient solution to their problems. 75 years later and our focus hasn't changed."

Haith's range of grading, washing, bulk handling, weighing, pre-pack systems and water treatment solutions are relied upon by some of the world's largest food producers and packing companies along with farmers of all sizes in the UK and overseas.

HIGH CAPACITY CARROT WASHING

Recently, Haith was asked to design and manufacture a high capacity carrot washing system for Polish carrot producer Witmar Spz which specified that the system must have a washing capacity of 20 tonnes per hour with the ability to store over 100 tonnes of washed produce for further processing. The emphasis was on high quality washing with minimal fork truck movements to create a safe working environment. Also, where possible, Witmar was looking to reduce the number of operatives to reduce labour costs.

The line consists of a Haith patented rotary box tippler for gentle handling feeding into a self-cleaning soak tank which removes stones and aerates the water for the effective removal of heavy soils. The carrots, after passing over a top removing elevator are washed in a self cleaning barrel washer. Two polishers are fed by the washer which further cleans the carrots before they are graded by length where the smalls and oversize can be separated from the line.

Two inspection roller tables allow poorer quality produce and foreign objects to be removed before the carrots are diameter graded and cooled for optimum storage.

Once in storage, the operator has wide range of options for further processing. Carrots can be topped before being peeled using the Haith peeling system, or be bagged or boxed using a Haith vertical filler or bulk filled into trailers.

All these operations are controlled through an easy to use touch screen interface.

On top of all this, Haith has also installed a water treatment system comprising a mixer tank where polymer can be introduced for efficient separation; a settlement tank for the extraction of solids; a belt press for further separation and a treated water storage tank before for pumping back to the wash system. This not only saves water for the plant but also reduces wear on pumps and pipes through the effective removal of abrasive solids.

Haith group

www.haith.co.uk

Martin Lishman

Ensuring **Crop** Quality

Digital technologies reduce crop losses

Established in 1975, Martin Lishman Ltd is a designer, manufacturer and distributor of specialist agricultural equipment, while also serving the environmental and building industries. Its agricultural manufacturing specialisms include compact spraying systems and equipment for cultivation, potato quality assurance, and crop storage and monitoring.

The company has a particular focus on low-cost digital technologies to meet the challenge of reducing post-harvest food waste.

With almost 60 per cent of crops spoilt, damaged or wasted during post-harvest operations, and annual global food wastage calculated to total 1.3bn tonnes, the food industry faces a significant challenge in helping crops reach their ultimate destination. Martin Lishman's product emphasis is on practical, low-cost, time- and money-saving digital technology solutions that improve post-harvest management of crops for relatively low investment. This approach has the potential to reduce losses to as low as one to two per cent, whilst simultaneously protecting quality.

At the core of the company's ongoing product development programme is the Martin Lishman Professional Crop Storage System. This is centred around the firm's Pile-Dry and FloorVent Pedestal crop cooling systems, which are used in on-floor and under-floor storage sites from 100 to 100,000 tonnes capacity.

The systems make it possible to aerate grain stored in heaps ranging from 2.5 to more than 14 metres depth, reflecting the trend on the largest farms and grain storage facilities for faster store filling systems.

The Pedestals are designed to work with Martin Lishman's 'Green' high performance Pile-Dry Fans, which deliver the highest airflow of any low-volume system available. Improvements in fan design have increased air output performance to achieve the fastest cooling possible, reach target temperatures more quickly and reduce energy costs.

While faster cooling at less energy cost is the key to reducing stored crop losses, the natural climate rarely provides a reliably steady supply of cold air when needed, and this has been the driver behind Martin Lishman's development of remote crop temperature monitoring and automatic fan control to maintain crop quality. Its Barn Owl Wireless cloud-based automatic fan control and remote temperature monitoring system saves at least 40 per cent of storage energy costs and provides full traceability via the internet without the need to travel to the store to take crop temperatures or operate fans.

Cooling and drying fans will only operate when the ventilating air can improve the condition of the grain, and otherwise, stay switched off to save wasted energy and cost. Algorithms fine-tune the control to extract the last element of heat from the grain. The system is equally suited to small farm on-floor storage and multi-silo commercial stores.

FOOD SHAPES

Martin Lishman's other focus in the area of food wastage reduction and prevention is its ImpacTrack family of synthetic food shapes, which replicate the size, density and movement characteristics of fruit and vegetables prone to damage and bruising during handling and transport. ImpacTrack measures temperature and shock in the production line, and transmits this via Bluetooth to the ML Sensing App, which helps locate damage sources and improve quality control. Operators can also use the App to record internally during transport shipments. The firm uses 3D printing to create shapes which mimic virtually any shape and size of produce, including potatoes, strawberries, peaches, apples and avocados, although most shapes are possible. ImpacTrack use adds to the quality control tools available to reduce fruit and vegetable losses due to damage in handling and transit, leading to less waste and higher production yields.

Robotic Farming

UK agri-tech engineers at the forefront of the drive to use autonomous technology for future crop production.

HANDS FREE HECTARE

Growing crops remotely

A worlds-first project, to grow the first arable crop remotely, without operators in the driving seats or agronomists on the ground was completed in 2017 by a team at a leading UK university – and is being extended to an on-going project.

'Hands Free Hectare' is run by a team based at leading UK University, Harper Adams, in collaboration with Precision Decisions and supported by Innovate UK. Team leader Kit Franklin explains **"**Previously, people have automised sections of agricultural systems, but that generally only applies to one single area. Our aim was to string everything together to create one whole system, which will allow us to drill, tend and harvest a hectare of cereal crop from establishment to harvest, without having to go into the field".

"The first year of the project, with a crop of spring barley, aimed to prove that there's now no technological reason a field can't be farmed without humans working the land directly and we did that with only using off-the-shelf technology and open source software".

For the second year of the project in 2018, the team grew and harvested a crop of winter wheat – and improved on the operational difficulties and shortcomings highlighted during the first year when bad weather hampered the fledgling project.

Mechatronics Engineer for Precision Decisions Martin Abell said: "Our key achievement in the second year was completing a rolling team. Last year, we tried an unload on the move, but we weren't able to get out tractor close enough to the combine due to accuracy issues with the control systems".

"We have continued to make improvements to our system on the tractor, including adding an auto-start so we can start it remotely if required. We enhanced the auto-pilot in time for drilling which led to improved driving accuracy".

"Thanks to these improvements, we were also able to run the rolling team; unloading grain from the combine into a trailer behind our tractor which was running alongside it, which makes the harvest process far more efficient and quicker to complete".

The first year's crop of barley went into producing a batch of Hands Free Gin, whilst the wheat from the second year was used to make pizzas for the team.

www.handsfreehectare.com

MAMUT

Monitoring crop health

Innovation specialist Cambridge Consultants have announced Mamut, an autonomous robot that explores crop fields, capturing data on health and yield at the level of individual plants and on a massive scale. By automating data capture, Mamut gives growers regular, precise and actionable information on their crops, enabling them to predict and optimize yields.

Agriculture is under pressure to increase efficiencies and to meet these demands, growers need precise information on crop growth and health throughout the growing season.

Automation of data collection is essential to providing growers with information at scale. Existing large-scale monitoring approaches use drones, which cannot capture information from beneath the crop canopy. Attempts to use ground-based monitoring have been limited by the requirement for additional infrastructure, such as cabling or radio beacons.

Mamut is an AI-powered autonomous robotic platform. Equipped with an array of sensors, Mamut maps and navigates its surroundings

Innovate UK

Many of the recent innovations in UK agri-tech engineering are as a result of collaboration with Innovate UK, part of UK Research and Innovation. The organisation was set up to ensure that the UK maintains its world leading position in research and innovation.

The UK government has set an ambition for the UK to become the most innovative country in the world.

without the need for GPS or fixed radio infrastructure. As it travels the rows of a field, orchard or vineyard, cameras capture detailed crop data at the plant level, enabling accurate predictions of yield and crop health. Mamut integrates stereo cameras, LIDAR, an inertial measurement unit (IMU), a compass, wheel odometers and an on-board AI system that fuses the multiple sensor data inputs.

This sophisticated blend of technologies enables Mamut to know where it is and how to navigate through a new environment, in real time.

Mamut's capability to perform simultaneous localization and mapping (SLAM), enabling the robot to react and learn from unstructured routes in real time, was developed in navigation trials through the twists and turns of a 12-acre maize maze and an orchard, both in Cambridgeshire, UK.

www.cambridgeconsultants.com

Innovate UK is focused on accelerating business growth through innovation and is ideally placed to support that investment.

Since its inception in 2007, Innovate UK has invested around £2.5 billion to help businesses across the country to innovate, with match funding from industry taking the total value of projects above £4.3 billion. This has helped 8,500 organisations create around 70,000 jobs.

www.innovateuk.ukri.org

SMALL ROBOT COMPANY

Autonomous machines for different roles

Robots must become more central to farming than tractors if the industry is to be more sustainable and provide enough food for everyone, the Small Robot Company believes.

The British start-up recently raised £1.2m, including significant support from farmers, to develop its autonomous 'farmbots' they have called Tom, Dick and Harry

Each machine will focus on a different task, using technologies including autonomy, robotic arms and artificial intelligence (AI) to make farm work more efficient and minimise the use of chemicals.

Farmer Sam Watson Jones formed the company with entrepreneur Ben Scott-Robinson. He says "All of this technology is well established in other areas such as manufacturing, but no one has brought it to the challenge of providing enough food for us all to live on."

"With a farming background, we aim to solve the problems we see in farming, and also solve what we see as a shortfall in the technology offered"

Central to the company's vision is 'precision farming', tending to each plant individually. Such a meticulous process relies on a deep, accurate knowledge of the lie of the land – enter **Tom**, the first of the company's machines to get out in the field.

The monitoring machine is the firm's smallest robot. It trundles around the field at walking pace, taking two or three photos a second. The images are then stitched together and combined with magnetometer data and GPS information accurate to within 2cm. An AI system then analyses the images, separating wheat from weeds and giving the farmer an accurate map of every plant, letting them allocate resources efficiently.

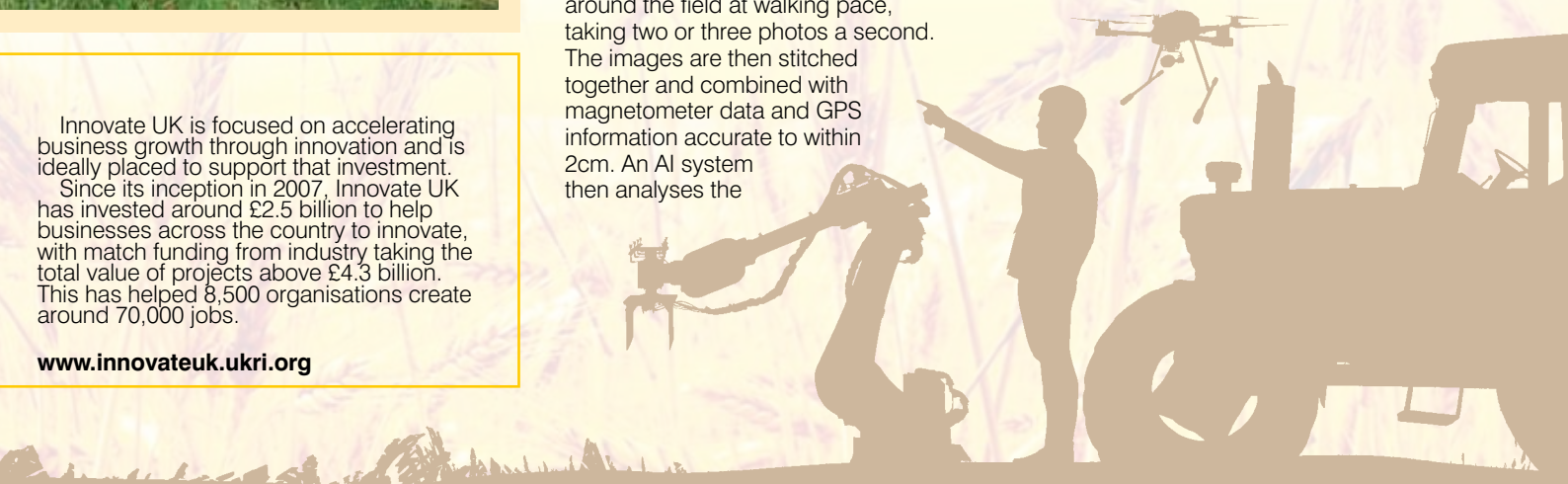
Dick and **Harry** are bigger units and share a chassis design. They are the size of a small car but still tiny in agricultural terms. The small size and low weight compared to tractors is key to the firm's environmental credentials, as it will help prevent soil compaction and have a negative effect on the wider environment.

Dick is for 'weeding and feeding'. It will use either precision pesticide spraying or electric weeding to target unwanted plants using much less energy than pulling them from the ground.

Harry will plant seeds using 'punch planting', a mechanism to 'punch' the seeds into the ground to an exact depth and position in the field.

The innovation is intended to boost yields and help drastically reduce the use of chemicals.

www.smallrobotcompany.com



IMPORTANT ORGANISATIONS IN **UK AGRI-TECH**

Agricultural Engineers Association
Samuelson House
62 Forder Way, Hampton
Peterborough PE7 8JB
T: 0845 644 8748
E: ab@aea.uk.co
www.aea.uk.com
The AEA was established in 1875 to promote the technical, trade and commercial interests of British manufacturers and suppliers of agricultural machinery. Today our members cover a broad spectrum of UK manufacturers.

British Agricultural and Garden Machinery Association
225 Bristol Road
Birmingham B5 7UB
T: +44 (0) 1295 713344
E: info@bagma.com
www.bagma.com
The British Agricultural and Garden Machinery Association (BAGMA) supports thousands of independent agricultural, garden and groundcare machinery dealers across the UK providing support and services to industry.

Institution of Agricultural Engineers
The Bullock Building
University Way
Cranfield, Bedford MK43 0GH
T: +44 (0) 1234 750876
E: secretary@iagre.org
www.iagre.org
The Institution of Agricultural Engineers (IAgrE) is a professional membership organisation with grades for all those working, or with an interest in, engineering, science and technology within agriculture and the environment.

MAKE UK
Broadway House
Tothill Street,
Westminster
London SW1H 9NQ
T: 0808 168 5874
www.makeuk.org
Britain is one of the world's biggest manufacturing nations. Almost 3 million people work in our sector and deliver almost half of all UK exports. MAKE UK champions and celebrates British manufacturers and manufacturing.

Milking Equipment Association
Samuelson House
62 Forder Way, Hampton
Peterborough PE7 8JB
T: 0845 644 8748
www.milkingsystems.co.uk
The Milking Equipment Association (MEA) is the trade association for manufacturers, dealers and suppliers of milking equipment and systems, with the aim to promote, educate and improve best practice and standards and represent the best interests of the UK based Milking Equipment industry in a globally changing environment.

National Sprayer Testing Scheme
Samuelson House
62 Forder Way, Hampton
Peterborough PE7 8JB
T: 0845 644 8748
www.nsts.org.uk
The NSTS provide testing for all types of Pesticide Application Equipment (PAE) and fertiliser spreaders. The scheme was introduced in 2002 following the introduction of a voluntary scheme set up in 1997 by the Agricultural Engineers Association (AEA) and today tests more than 20,000 machines annually.

National Centre for Precision Farming / Agricultural Engineering Innovation Centre
Harper Adams University
Newport
Shropshire, TF10 8NB
T: +44 (0) 1952 820280
E: servicedesk@harper-adams.ac.uk
www.harper-adams.ac.uk/research/ncpf
The Agricultural Engineering Innovation Centre, home to the National Centre for Precision Centre provides 'clean' engineering facilities including electronics/ mechatronics lab, hydraulic lab, research lab for tractors and machines, and accommodation.

National Farmers Union
Agriculture House
Stoneleigh Park
Stoneleigh, Warwickshire CV8 2TZ
T: +44 (0) 24 7685 8500
www.nfuonline.com
The NFU is the representation body for agriculture and horticulture in England and Wales with the main purpose to champion British agriculture and horticulture and campaign for a stable and sustainable future for British farmers.

National Farmers Union Scotland
Rural Centre – West Mains
Ingliston
Edinburgh EH28 8LT
T: + 44 (0) 131 472 4000
E: info@nfus.org.uk
www.nfus.org.uk
The organisation was formed in 1913 and is Scotland's leading agricultural organisation representing 9,000 farmers, crofters, growers and other supporters the length and breadth of the country.

Ulster Farmers' Union
475 Antrim Road
Belfast BT15 3DA
T: +44 (0) 2890 370 222
E: info@ufuhq.com
www.ufuni.org
Founded in 1918, the Ulster Farmers' Union (UFU) is the largest democratic voluntary organisation representing farmers and growers in Northern Ireland. Its central objective is to promote their interests both at home and abroad through professional lobbying.

TRAINING TOMORROW'S AGRI -TECH ENGINEERS
The UK's key land-based universities, colleges and training providers for the agri-tech sector.

Harper Adams University
Harper Adams University
Newport
Shropshire, TF10 8NB
T: +44 (0) 1952 820280
www.harper-adams.ac.uk

Royal Agricultural University
Cirencester
Gloucestershire GL7 6JS
T: +44 (0) 1285 652 531
www.rau.ac.uk

Cranfield Soil and Agrifood Institute
Cranfield University
Cranfield
Bedford MK43 0AL
T: +44 (0) 1234 750111 (ext 2732)
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