Agriculture • Horticulture • Forestry • Environment • Amenity

LANDWARDS

Early Spring 2005

- Robotics
- Crop Storage

Bionic Buildings

IAgrE JOURNAL Volume 60 No.1 www.iagre.org

DIARY of EVENTS

MARCH 2005

Monday 7 March
East Anglia Branch
Branch AGM and Technical Talk
Speaker: Professor Dick Godwin
Further details to be advised

Monday 7 March 19.15 h
West Midlands Branch
Branch AGM and Technical Talk
'An Update of Spraying Development'
Speaker: President-Elect, Professor Paul Miller, SRI
Venue: Friends Meeting House, Stratford upon Avon
For more information contact: westmids@iagre.biz

Monday 7 March 19.30 h
Wrekin Branch
'Second User Applications for Military Vehicles'
Speaker: Stuart Hockley, Head of Business Development, Leavesley International
Venue: Harper Adams University College

Tuesday 8 March 19.30 h
Yorkshire Branch
'Bird Management CSL'
Venue: Buckles Inn, Askham Richard
Provisional date - final details to be confirmed – contact Branch Secretary

Wednesday 9 March
IAgrE Annual Conference
'Sustainability in Engineering Design'
Venue: Harper Adams University College
See details on Back Cover of Landwards

Thursday 10 March
Herts & Essex Branch
Branch AGM and Technical Talk
Speaker: Geoff Freedman, Forestry Civil Engineering, Forest Enterprise
Further details to be confirmed

Monday 14 March pm
South East Midlands Branch/Soil & Water Specialist Group
Mini-conference: 'Restoration Engineering'
Speakers to include: Jeff Kew, RSPB; Professor Jim Harris and Dr Mike Hann, Cranfield University Silsoe; and a representative from Ready Mix Concrete
Talk: 'The Society for the Environment'
Speaker: Christopher Whetnall
Tour: Marston Vale Millenium Country Park
Venue: Marston Vale Millennium Country Park, Marston Moretaine, Bedford
For further details contact the IAgrE Secretariat or visit the IAgrE website **www.iagre.org**

Monday 14 March 19.30 h
Wrekin Branch
Branch AGM and Technical Talk
Speaker: Presidential Representative
Venue: Harper Adams University College
Final details to be confirmed – contact Branch Secretary

Thursday 17 March 2005
Young Engineers Competition
For further details contact the IAgrE Secretariat

Friday 18 March 19.30 h
East Midlands Branch
Branch AGM and Dinner
Venue: The Red House Country Manor, Main Street, Kelham, Newark, Nottinghamshire
Meet at 19.30 h for 20.00 h dinner

March
Scottish Branch
Branch AGM and Conference
Date and further details to be confirmed

APRIL 2005

Tuesday 12 April 19.30 h
Yorkshire Branch
Branch AGM and Technical Talk
Venue: Buckles Inn, Askham Richard
Date and final details to be confirmed – contact Branch Secretary

Tuesday 12 April 19.30 h
East Midlands Branch
'State of the Art Milking' – A tour and presentation of one of the country's most modern milking parlours
Venue: Nottingham University's School of Agriculture, Sutton Bonnington, Nottinghamshire
This is a joint meeting with the IAgrE Livestock Group

Wednesday 13 April 18.15 h
Western Branch
Branch AGM and Technical Talk
'New Holland Agricultural Diesel Engine Development'
Speaker: Mike Hawkins, New Holland
Venue: Lackham House, Wiltshire College, Lackham
Contact Nick Paul njp@iagre.biz if interested in attending this meeting.

Monday 25 April 19.15 h
West Midlands Branch
'Stirling Engines – An Update by Norris Bomford
Venue: Salford Priors Village Hall
For more information contact: westmids@iagre.biz

Volume 60 No 1, **2005**

LANDWARDS

The Professional Journal for Engineers, Scientists, and Technologists *in* Agriculture, Horticulture, Forestry, Environment and Amenity

Editor
Eur Ing Prof Brian D Witney
PhD CEng CEnv FIMechE HonFIAgrE MemASAE FFCS
LAND TECHNOLOGY LTD
33 South Barnton Ave,
Edinburgh, EH4 6AN
Tel/Fax: +44 (0)131 336 3129
E-mail: landwards@landtec.co.uk
Website: http://www.landtec.co.uk

Advertising
All enquiries to IAgrE
Tel: +44 (0)1525 861096
Fax: +44 (0)1525 861660

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IAgrE,
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Tel: +44 (0)1525 861096
Fax: +44(0)1525 861660
E-mail: secretary@iagre.org
Website: http://www.iagre.org

President
Peter L Redman
BSc(Hons) CEnv FIAgrE

Chief Executive & Secretary
Christopher R Whetnall
CEnv IEng FIAgrE MemASAE

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Front cover: *'Shipping combine harvesters to Bulgaria' – overtly disguising a flight simulator in preparation for the next generation of parasonic autonomous machines, see feature articles (Photo courtesy: AGCO Ltd)*

ISSN 1363-8300

A conceptual model of a greenfactory displayed during the lecture presentation at the AgEng 2004 International Conference

THE FUTURE OF AGRICULTUTRE:

AGRICULTURAL TRANSFORMATION CLUSTERED GREENFACTORIES

Constantinos Valero, Pablo Gutierrez, Teresa Riquelme, Victor Gil,Luis Ruiz, Belen Diezma, Maria Marin, Natalia Hernandez and Jose Rodriguez

Abstract

A forecast view of agricultural production is outlined inside a new type of building with photosynthetic walls and in vitro culture inside it. Recent advances in genetic engineering, nanoelectronics, biosensors and bionic building will make this futuristic type of greenhouse possible.

Introduction

Looking ahead to year 2200, activities associated with agricultural engineers have influenced world characteristics all through previous centuries, in areas such as:

- population increase;
- water availability;
- food production;
- land usage;
- biodiversity; and
- energy consumption.

Population

Despite humanity's success in feeding a growing world population, the natural resources upon which life depends, i.e. fresh water, cropland, fisheries and forests, are weakening. In the new millennium the population growth is slowing at a much faster rate than was previously predicted. However, significant growth continues, meaning that more people will be sharing such finite resources as fresh water and cropland.

Having reached nearly 6.1 billion in 2000, the human population continues to grow. Population projections for the year 2025 range from 7.2 billion to 8 billion and for 2050 range from 7.9 billion to 10.9 billion, suggesting the extent to which we can influence our future. More people and higher incomes worldwide are multiplying humanity's impact on the environment and on natural resources. (Hardner & Rice, 2002; UNFPA, 2002)

Water

Water may be the resource that defines the limits of development. The supply of fresh water is essentially fixed, and the balance between humanity's demand and the available quantity is already precarious. While global population has tripled over the past 70 years, water use has grown six-fold. Worldwide, 54% of the annual available fresh water is being used, two thirds of it for agriculture. By 2025, this figure could be as high as 70% because

BIO NOTE

Constantino Valero, Department of Rural Engineering, Polytechnic University of Madrid (UPM), Av Complutense s/n, 28040 Madrid. 913365862, Spain. E-mail: cvalero@iru.etsia.upm.es Dr Valero coordinated the formal presentation of the project by the participating members of the team.

This paper was selected for the UNACOMA Vision Award 2004, AgEng Conference in Leuven, 12-16th September 2004. A web page has been created on the project at http://iru16.iru.etsia.upm.es/atcg_en.htm

of population growth alone, or 90%, if per capita consumption everywhere reaches the level of more developed countries.

Currently, 434 million people face either water stress or scarcity. Depending on future population growth rates, between 2.6 billion and 3.1 billion people may be living in either water-scarce or water-stressed conditions by 2025 (UNFPA, 2002). For 2025, water usage will be 800 km^3 higher, and other related problems will worsen, such as soil salinity and underground water (Hardner & Rice, 2002).

Food

To accommodate close to 8 billion people, expected on earth by 2025 and improve their diets, the world will have to double food production. Since available cropland is shrinking, most production will have to come from higher yields, rather than new cultivation. However, traditional high yielding crops require increasing levels of input. Taking into account the crop surface to extract a certain quantity of protein and also that required to feed an animal to produce the same quantity of animal protein, the conclusion looks clear. In a decreasing worldwide crop surface, the source of proteins must come from photosynthetic organisms.

Land

Agriculture uses more than 50% of the inhabitable areas of the planet at present. Urbanization also affects food production by removing agricultural land from cultivation, as cities expand. On the other hand, agricultural activity is one of the bigger threats to the environment, having contributed to:

- deforestation;
- pollution of water;
- salination of soils; and
- extinction of species (Jason Clay & WWF, 2003; Postel, 2001).

The introduction of agrarian activities and cattle in wild areas does not always end in an economic improvement for the inhabitants of the zone (Hardner & Rice, 2002). A strong demand for land actually pushes traditional crop fields away from the landscape.

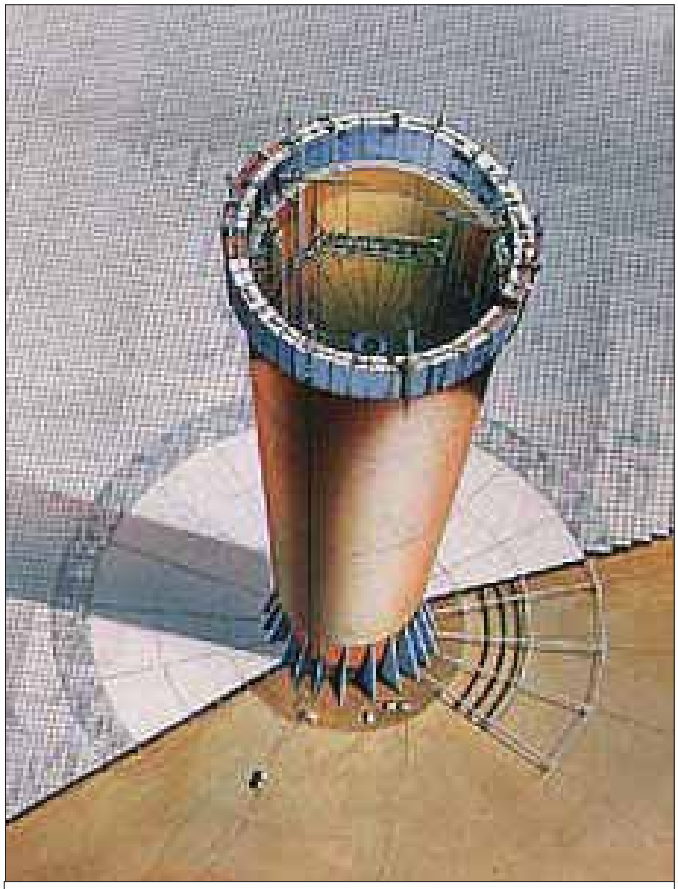

Fig. 1 3D tower view illustrating the magnitude of the enterprise

Biodiversity and ecological equilibrium with urban areas

In the last few decades as population growth has peaked, deforestation rates have reached the highest levels in history. Deforestation of these areas cause irreversible loss of species and also contributes to the build-up of carbon dioxide in the atmosphere.

Wild landscape should be preserved, despite the evolution of big urban areas. The solutions to the urban problems of the future should face the new reality of mega cities.

Under the logic of energetic rationality, accepting that the conquest alternative of the vertical space facing the 'extension without limit' or the conurbation, the present model of the skyscraper is considered inappropriate, as much by its dehumanisation as by its technological limit. The inevitable technological progress should find its equilibrium with the 'bio-ecological' recuperation of natural medium.

Bionic science is shown as an alternative, for the philosophical reflection and the scientific development of humanity, in urban models. Bionic and bio-ecology are two innovative concepts of urban philosophy, and agricultural engineers have the potential to bridge nature and architecture.

Energy

The total consumption of the fossil fuels, oil and coal, would involve a radical change in the composition of the atmosphere, returning it to the carboniferous period conditions. Renewable sources of energy, especially the sun in its different exploitation forms, are the key for future production. Here, again, agriculture has much to say, not only in its role as energy consumer, but also as producer.

Objectives, materials and methods: available technologies

A solution should be planned separating food production from the land, with the following objectives:

- obtaining more land for housing
- maintaining ecosystems as preserved as possible, for recreation and biodiversity purposes
- creating a self-contained, high yielding production system which is autonomous in terms of energy and mass
- producing a diversified agricultural output (food, energy, materials and recycling)

The tools that agricultural engineers have to carry out this goal are:

- advances on renewable energies;
- artificial photosynthesis, biotechnology;
- 'in vitro' culture;
- genetics advances;
- bioelectronics;
- nanomechatronics;
- nanocomputing;
- new constructive materials; and
- bionic architecture.

Results and Conclusion: production inside ATCGs

Food production should be planned in high performance closed environments, built in volume (not surface), self supported in terms of energy and inputs (see Fig. 1). Production will be carried out inside a new building: *Agricultural Transformation Clustered Greenfactories (ATCG).*

Energy collection

There will be several ways of obtaining energy in an ATCG but mainly it will be obtained from energy from the sun. The most promising method is the artificial mimicking of photosynthesis and related solar

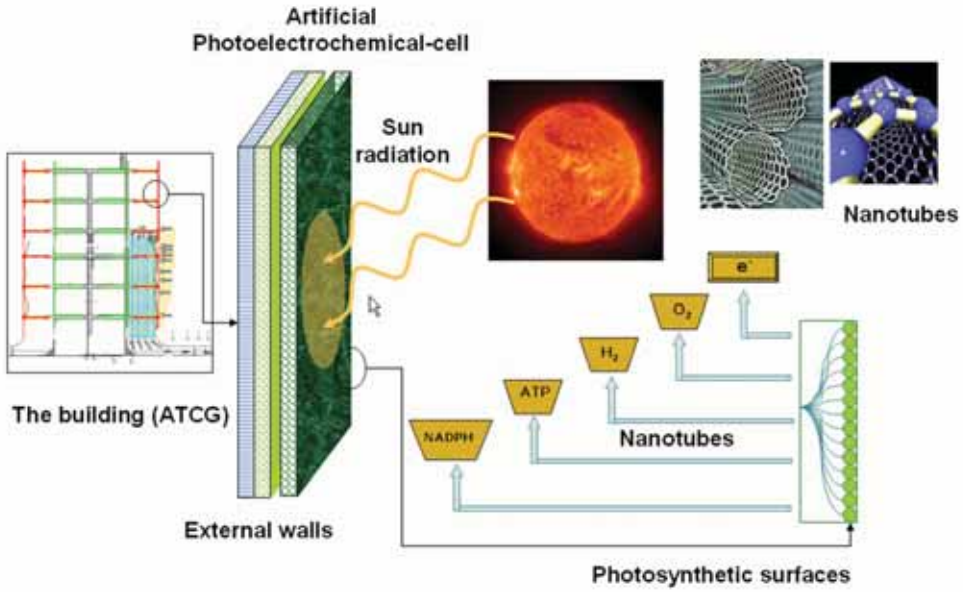

Fig. 2 Electrochemical energy collection; ATCG, Agricultural Transformation Clustered Greenfactories; ATP, adenosine triphosphate; NADPH, chemically reduced form of nicotinamide adenine dinucleotide phosphate

energy conversion (Fig.2).

The external walls of the building will be formed by a double polycarbonate layer, filled with a mimicked vegetal photosystem that will convert photons in electrons [adenosine triphosphate (ATP), chemically reduced form of nicotinamide adenine dinucleotide (NADH)] by means of photosynthesis, capable of feeding the production units inside the building. The oxygenic photosynthesis, the reaction centre of Photosystem II in plants, is the key to the most successful solar energy converting machinery on earth.

The water oxidation is catalyzed by a manganese cluster and it is an abundant source of electrons, H_2 and O_2. The H_2 and O_2 will percolate along nanotubes. They will be used in fuel cells for electricity production (Terrones & Terrones, 2004; Sun et al., 2003; Hammarström, 2003; Ferreira et al., 2004).

For this application, fullerenes present a wide range of chemical and physical properties that make potential chromophores in photoinduced redox processes. A hybrid consisting of Anthracene, fullerenes and fluorescein, acts as an antenna collecting light in the range of 320 - 400 nm, transferring its energy to the reaction centre, fluorescein. The fluorescein can absorb the light in the visible region (400 - 600 nm) and transfer an electron to fullerenes, generating a charge separated state (Jing & Zhu, 2004; Bourianoff, 2004). All the components involved in the charge transfer are designed to possess redox properties to maintain the directionality of the electron transport. Besides that, their disposition mimics the highly organised natural structure.

The ordered artificial system is achieved by incorporating those components in a biomembrane, called a primary biomembrane. This membrane also plays a fundamental role in the generation of the proton gradient for the synthesis of ATP, as occurs in the natural process. The primary biomembrane is bound to a second biomembrane, called a supported membrane (Bengt Kasemo, 2002). A fluid-like space connects both membranes. In this region, the ATP and the NADPH are accumulated. Special 'captor' proteins drive these products through the second biomembrane which is permeable to them. The supported membrane is deposited on a polycarbonate surface. Such a surface possesses suitable topographic, chemical and electronic properties to adsorb and retain the supported membrane. The surface is made by a nanoporous polymer. When the ATP and the NADPH reach the surface, driven by the 'captors', they are released. By means of pulsed concentration gradients, the photosynthetic products percolate along the nanoporous matrix towards specific reservoirs. These reservoirs provide the production units inside the ATCG with such products when they are required for chemo-enzymatic metabolic processes.

The ATCG will also obtain energy in other ways. Photoelectrochemical cells will transform the solar power directly in an electrical current. These systems will be based also on carbon (nanotubes and fullerenes). The conductive substrate of the cell will be nanotubes of carbon doped with a metallic element (Ríus de Riepen & Castro Acuña, 1996; Zavala López & Vasilievna Kharissova, 2002). Solar plates around the base of the building will warm the air. Hot air flows up inside the building and drives turbines that will produce electricity. This airflow also provides the necessary gas mixture (oxygen, carbon and nitrogen) for food production. The nitrogen in the air will be fixed by means of genetically modified micro-organisms, living inside structural cavities inside the ATCG. This organically obtained nitrogen will be used to produce chemical compounds of different order (Smil, 1997; Ludden & Roberts, 2002; Berman-Frank et al., 2003).

Another function of the ATCG will be to recycle residual water. This water flows through a microbial fuel cell, where bacteria will metabolize their substrate – in this case, organic matter in wastewater – to release electrons that yield a steady electrical current (NFS & Office of Legislative and Public Affairs, 2004).

Production

The basic production unit in the ATCG will be the meristematic terminal (MT), using 'in vitro' culture technology (see Fig. 3). It will consist of a scarcely differentiated plant tissue, fixed inside a container. Dozens of MTs will be placed on shelves in the different floors of the ATCG. Each floor will be devoted to the production of one type of raw food. By the year 2200 seed companies and tree nurseries will adapt its production practices to sell MT replicates for food production using 'in vitro' culture technology.

The MT will be able to produce the edible part of the crop (not the entire plant) when it is stimulated to do so. By means of silencing the genes that control the production of plant parts without commercial

interest, the MT will generate only parts of the crop with agricultural interest, for example fruits without leaves or branches.

The control of totipotency allows the formation of any part of a crop out of meristematic cells supplied with the correct nutrients and energy. Meristematic cells inside each MT units will be surrounded by a liquid medium ('cellfood') based on deuterium sulphate to dissociate the particle of water in to hydrogen and oxygen, permitting cell respiration. The energy caption systems and mass transformation tanks will feed the MTs.

The liquid medium will provide also the necessary nutrients for the correct growth of the crop. The growth culture will be liquid to permit its change depending on the development stage of the cultivation: for example, control of hormones and growth regulators in each one of the phases of production. Parameters such as pH, temperature, lighting and the rest of factors that can influence the cultivations will be controlled, also by means of electrochemical sensors and micro injectors, to maximize production and optimize food quality (Pelacho Aja et al., 2002).

ATCG will produce food but also materials for general use and also for its own internal needs. For example, at present the nanotubes are obtained by physical and chemical systems (Terrones & Terrones, 2004) but in the ATCG, genetically modified organisms will possess the metabolic routes necessary for obtaining the nanotubular compounds (Koza et al., 2003; Maddox, 2000; Alcalde, 2003).

Production control

Control, monitoring and stimulation of MTs will be done by a combination of biochemical pathways, electrochemical interfaces and biosensors. Genetic vector nanorobots will start the metabolic routes needed to produce each crop, by stimulating/silencing of genes. Biosensors used in the ATCG have been improved using nanotechnology. Some of the nanoparticle based sensors include the acoustic wave biosensors, optical biosensors, magnetic and electrochemical biosensors.

Advances in the carbon-based processors and photonic nanocomputing will make possible to interact electronically with each MT. Every group of production units (ATCG floors) will exchange information wirelessly with the distributed computing network of the ATCG. Artificial intelligence based on fuzzy neural networks will control the basic principles of production. Interaction with external computing networks will adjust production to consumer and processing industry actual demands.

Harvesting will be carried out by nanotechnology based robot swarms and macrorobots inside the building (Kondo & Ting, 1998), using machine vision and organoleptic sensors. Regarding the sub-topics including in robotics technology, e.g. manipulator mechanism and its control, end-effector design, sensing techniques, mobility and work cell development, it is easily understandable/imaginable as a feasible solution for harvesting products in the ATCG. Both cultural and environmental conditions in the ATCG will be controlled, decreasing the variability that must be taken into consideration in the robot design. In addition, work objects could be positioned in front of the robot by means of coordinated conveyors, simplifying the travelling devices for the robots and their work envelopes.

An external visual sensor based on red/green/blue (RGB) signals will enable discrimination between the work objects and the rest of the transport systems, where the products will be moving. The end-effector mechanisms will have specific designs depending on the work objects but a simple pneumatic suction system could be common in all cases. The products will be transported to the storage space through conduction by airflow.

In the year 2200, it will be possible to construct and deploy legions of micro-robots, as small as a grain of salt or smaller. This possibility is made apparent by recent progress in the fabrication of extremely small leg-like actuators for microelectromechanical systems (MEMS) and by progress toward the fabrication of ultra-densely integrated electronic nanocomputers. The integration of MEMS and nanoelectronics for the construction of such micro-robots in vast numbers is an obvious application of the rapidly advancing techniques for the economical fabrication of nanometer-scale structures, i.e. 'nanofabrication'. Micro-robots made via contemporary techniques for nanomanipulation and nanofabrication are a logical next step toward the more difficult, longer term goal of constructing artificial nanometer-scale machinery, such as molecular assemblers.

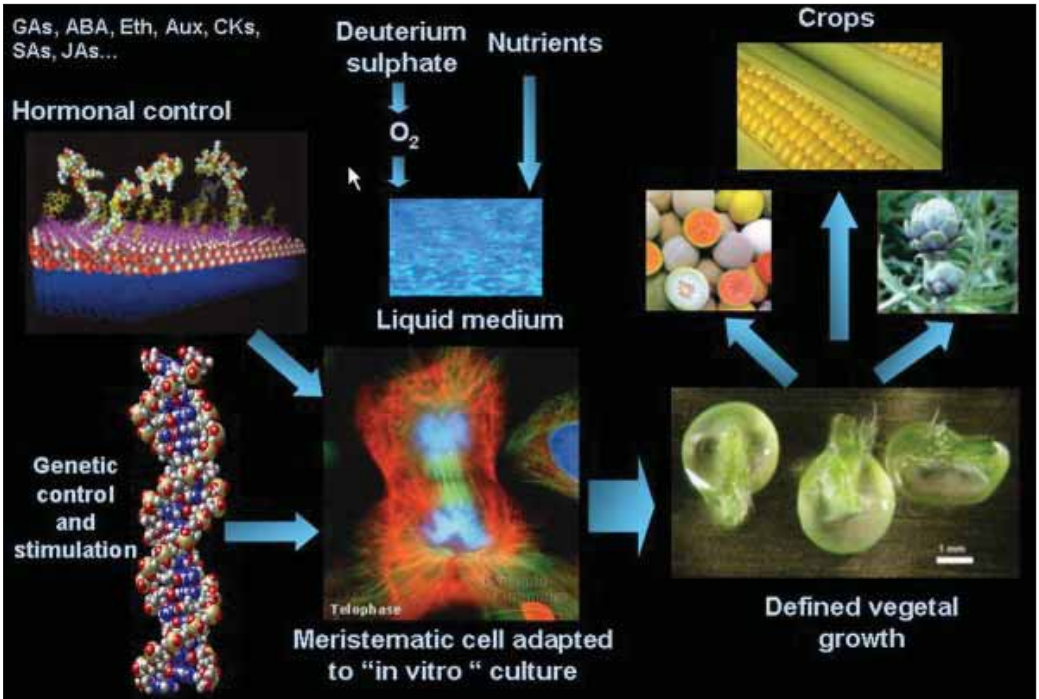

Fig. 3 Meristematic terminal culture; GAs, giberellins; ABA, abscisic acid; Eth, ethylene; Aux, auxins; CKs, cytokinins; SAs, salicylates; JAs, jasmonates

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Professor Ettore Gasparetto (left) who presented the award on behalf of the sponsors UNACOMA to the winning team (standing, from left to right): Teresa Riquelme (with the prize money!), Jose Rodriguez, Natalia Hernandez, Luis Ruiz, Belen Diezma, Maria Marin, and Victor Gil; and in front displaying the award certificate, Pablo Gutierrez (left) and Constantinos Valero [Photo courtesy: Mike Hurst]

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EurAgEng's 'UNACOMA Vision' event

Two papers, one on Bionic Buildings and the other on Robotics, were entered for the UNACOMA Vision event which took place as part of AgEng 2004 in Leuven, Belgium in September 2004. The European Society of Agricultural Engineers (EurAgEng) invited 'visionary people from the younger age group' to answer the questions of 'what can agricultural engineering do for society?' and 'what will agricultural engineering look like in the future?' Taking the form of a competition, 'young people' of aged 35 or under presented papers with their vision of the future of agriculture and technology in agriculture. Entrants were allowed to bring details of inventions and prototypes to demonstrate their vision, with the emphasis on looking forward, not looking back at work already done. The ideas had to show lateral thinking and consideration of ecological and economic factors had to be taken into account. The Vision event was sponsored by the Italian Machinery Manufacturers' Association (UNACOMA).

The two submissions for the UNACOMA Vision event were highly commended by the judges drawn from the EurAgEng Council – Professor Bill Day (EurAgEng President), Professor Ettore Gasparetto (Italy) and Professor Brian D Witney (UK) – and oral presentations received well deserved praise from a large audience of conference delegates. Congratulations to all the contestants for their commitment and enthusiasm as they embark on their careers in biosystems engineering.

Flights of fancy

The judges withdrew to the inner sanctum to consult, confer and communicate with the networked sources of perceived wisdom.

"This high rise tube project is just too far-fetched for words", averred the Learned Professor. "The logistics of the production processes have been totally ignored. They haven't given a thought to service elevators and provender chutes. Its an inaccessible 'pie in the sky' ".

The Chief Adjudicator heaved a sigh at the yawning gap in unity: "We need consensus, time is short."

"No we don't and no its not", interjected the Ancient Philosopher. "We need to change our mindset and get back to the future, then history will provide the outcome irrespective of disunity and in next to no time.

"Don't you recall, well beyond any of those outmoded Research Foresight programmes at the turn of the century, that exciting innovative project that would have been completed precisely to overcome the very objection that has been raised? That futuristic construction project would have essentially guaranteed the effective technology transfer and commercial exploitation of the incipient research on self replicating, autonomous flying microbots, fully equipped with communication, navigation and collision avoidance networks as standard. Each drone would have been fitted with retractable, articulated, multi-leg landing struts, incorporating self-levelling, active suspension systems. Inbuilt appendage design redundancy would have facilitated their partial redeployment capability as manipulators for crop handling and harvesting, together with the ingenious PB cargo stowage facility. Myriads of these microbots would have been organised into squadrons, known as 'flights of fancy'."

After a pause to trawl across the wealth of his experience, the Learned Professor withdrew his reservations: "For all the world, swarms of these drones camouflaged with black and yellow stripes would be indistinguishable from bumble bees!"

"And PB?", queried the Chief Adjudicator, anxious to be fully briefed before the General Assembly reconvened.

"Oh that's just to assert my txting street 'cred'. It originates from the Old English entomological term 'pollen basket' and defined by the cognoscenti as *corbicula*", whispered the Ancient Philosopher, but nobody was listening any more. Everyone knew PB meant 'Pure Balderdash'.

BDW

MACHINE DEVELOPMENT

British firm punches its way to New Zealand

A British company that has invented and designed a machine for planting fence posts safely, reaps the rewards after licensing out its machine to equipment manufacturers in New Zealand. Meade Machines Ltd based in Tisbury, Wiltshire has given Postpuncher NZ exclusive rights to manufacture and sell a machine that will improve the safety of workers installing fences. The deal was sealed with the help of UK Trade & Investment, the government organisation that provides support services for UK companies trading overseas.

The company's managing director, Ed Ross said: "I visited New Zealand in June to support Postpuncher NZ at Fieldays 2004, the third largest agricultural show in the world. Half a dozen of our machines were sold at the show. Achieving this at such an initial stage of partnership is very encouraging.

"The UK Trade and Investment team at the British Consulate-General in Auckland has been very helpful in terms of organising the trade mission and promoting our product in the New Zealand media. Following our success in New Zealand, we have signed another agreement with El-Gra Engineering Pty Ltd which will soon see our products marketed across Australia. We expect our turnover to increase by 30% over the next three years as a result of increased sales in New Zealand and Australia," added Mr Ross.

The Postpuncher, is a post-driver designed to be mounted to the front of the parent machine, increasing safety by allowing the operator to easily see the banksmen guiding the vehicle on the ground. The unique tube design of the Postpuncher prevents post damage and operator fatigue and also helps to prevent accidents in the event of hydraulic failure.

Since its launch in 2001, more than 160 Postpuncher machines have been sold in the UK. In order to expand business overseas Kevin Meade, co-founder and director of Meade Machines Ltd, participated in a trade mission to New Zealand.

Meade Machines Ltd also exports the Postpuncher to Sweden, Italy and Germany and is currently hoping to introduce the product to France and Spain.

There's always a bigger fish....

see page 11

SUSTAINABILITY IN ENGINEERING DESIGN

YOUR FUTURE IS AT STAKE

Geoffrey F D Wakeham

Mr Bush – or possibly his advisors – is unwilling to let the USA become involved in any way in the Kyoto agreement, writes Geoffrey Wakeham, of Harper Adams University College, Shropshire. They question the scientific basis on which the various targets and outcomes have been arrived at. It appears they may be unwilling to compromise the economic sustainability of their industries by getting entangled in what they could see as irrational activities such as trading in CO_2 emissions and gross unbalanced taxing of energy.

BIO NOTE

Geoffrey Wakeham MIAgrE was formerly Principal Engineering Lecturer at Harper Adams University College and is the Convenor of the forthcoming IAgrE Annual Conference (see Back Cover) on March 9th 2005. Be there! Further details can be obtained from the IAgrE, West End Road, Silsoe, Bedford, MK45 4DU tel: +44 (0)1525 861096 or Harper Adams University College, Newport, Shropshire TF10 8NB tel: +44 (0)1952 820280.

As I see it, there is a real danger that companies will export their unsustainable activities to countries where pollution, Health & Safety legislation and expensive labour laws do not present problems to governments or industrialists.

However, in practice, US industries are likely to be less damaging to the environment than many other countries and they will continue to seek ways of reducing their impact on the environment as the economies become clear. Within the UK, companies will have greater pressures put on them to become more economically and environmentally sustainable than both the USA and 'emerging' industrial nations. These environmental constraints will impact on economic sustainability already under pressure.

There is a need to find ways of maximising the economic benefits of sound environmental policies. Energy use can be reduced by improving processes and premises, while material costs and waste can be improved by clever design and by managing waste retrieval and reuse in such a way as to be cost positive.

There are materials available that are seen as environmentally friendly. Whether these can compete with more traditional materials that are easy to recycle is still in question but certainly should be investigated.

It is possible within sophisticated markets to sell one's 'green credentials' and obtain a price premium but this has limited value in the longer term. It is more likely that a good end of life policy that benefits the customer and generates positive cash flow for the supplier will be a more valuable marketing tool and have real environmental value.

I foresee that manufacturing will move away from the UK, and companies must manage this to provide long term economic sustainability. This is likely to require a shift in design philosophy not only towards good environmental practice, but also towards systems capable of local manufacture without compromising the function or life of the product. Loss of reputation in the market place will ensure loss of long term viability. After all, green but dead is not where any economy wishes to be.

For those who do wish to be alive and green there is a need to continually seek ways to ensure the long term sustainability of their enterprises.

A conference to be held at Harper Adams University College in conjunction with the IAgrE on the 9th March 2005 aims to help those who seek *'Sustainability in Engineering Design'*. For details go to **www.iagre.org** or 'phone +44 (0)1525 861096.

Help extend your future and that of the environment you live in.

HARVESTING IN THE FUTURE

AUTONOMOUS SELF-HELPING MACHINE NETWORK

Ole Peters and Christiane Albrecht

BIO NOTE

Ole Peters and Christiane Albrecht are both students in the Programme of Agricultural Sciences, within the field of Agricultural Engineering, at the University of Hohenheim, Institute of Agricultural Engineering-440, Garbenstrasse 9, 70599 Stuttgart, Germany. E-mail: opeters@uni-hohenheim.de or nanealb@uni-hohenheim.de.

This paper was presented at the UNACOMA Vision event, organised by EurAgEng and held at AgEng 2004 International Conference in Leuven, Belgium, 12-16th September 2004.

Introduction

In agriculture of the future there will be a rapidly increasing claim for agricultural products, due to a growing world population and raised living standards.

Scientists predict that world population will explode up to seven billion humans by the year 2013 throughout the world (Dustmann, 2004).

More than before, farmers will have to produce greater amounts of food while, at the same time, achieving a higher quality on soil of unchanging or even decreasing potential. Due to urbanisation and unsustainable cultivation, everyday 17,000 ha are taken away from massed farmland. These contrary developments will enforce an evolution in the processes of agricultural engineering, adapted to the natural and social conditions. In developing countries, the main focus will have to be on the most efficient utilisation and preservation of the limited natural resources. In contrast, in developed countries, which are characterised by highly intensive and high quality production of agricultural commodities in a very competitive market, the focus will be on a minimum human and financial expenditure, in addition to the attention towards the ecological factors. In under developed countries, it will be important to stop the environmental destruction and to start with countermeasures to gain more farmland which can be used not just for short term sustainability.

The improved utilisation of these production factors on the perception of process engineering will be one main challenge in the future of agricultural engineering.

Objective of paper

It is necessary to think of new strategies. Single machines cannot get bigger, heavier and more efficient, it has to be across the board. If only one part of the chain is weak, the whole system is prevented from working; the least chain link will limit the mass flow. This is because with unoccupied time of up to 30 percent, single components can never then be fully loaded and every component is always calibrated suboptimally, due to average adjustment. A further

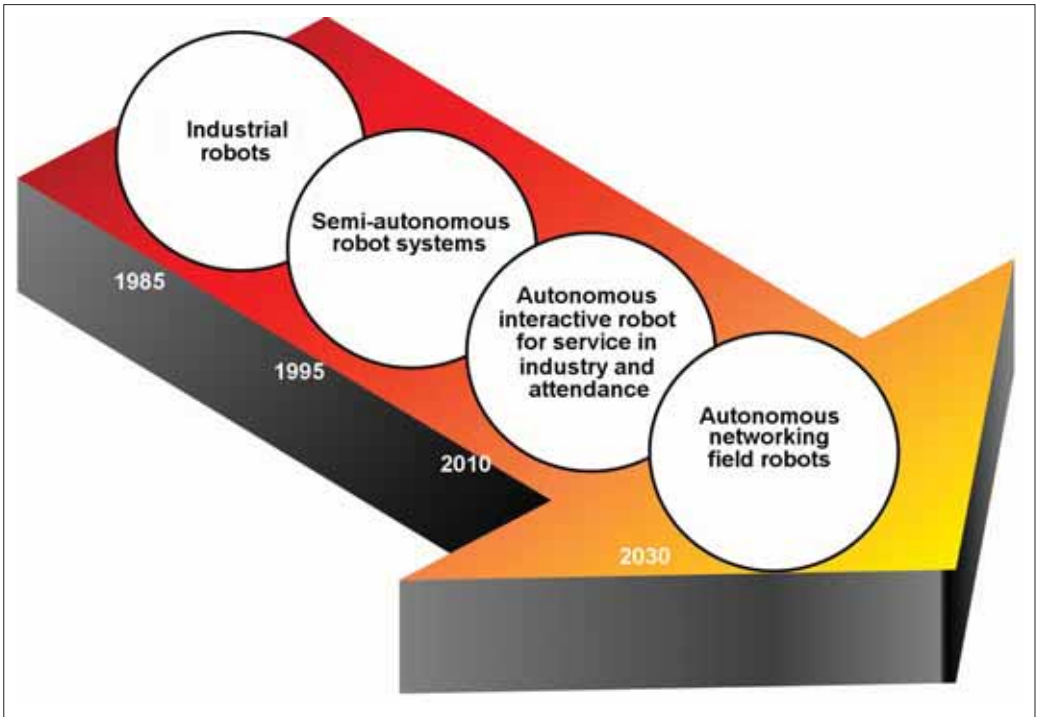

Fig. 1 Development of robots

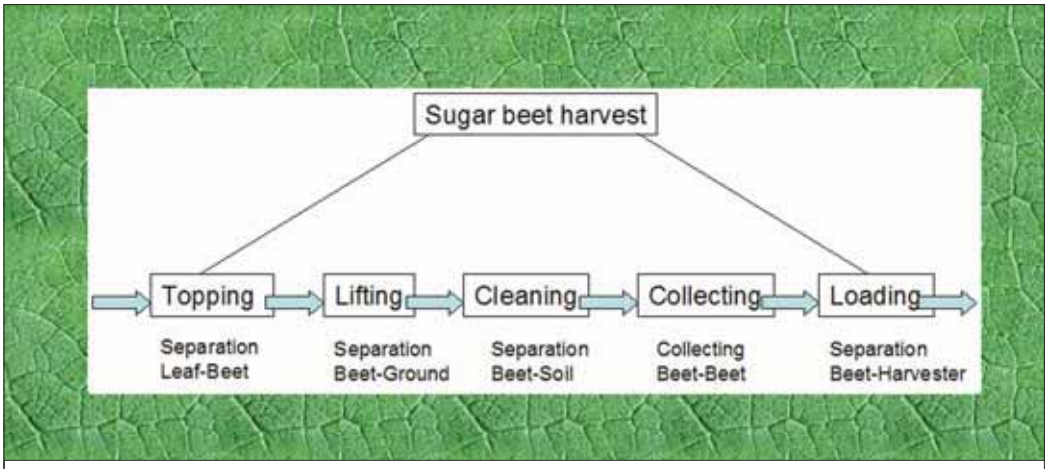

Fig. 2 Overview sugar beet harvest: path planned by stored single plant positions; preset using crop models; identification of leaf and beet by image processing; beet conveying by conveyor belt or further in the future by tractor beam

disadvantage of this strategy is the machinery weight and size.

For example, sugar beet harvesting is one of the most difficult harvest processes in Europe with impracticality of both manoeuvrability on the field and also in road traffic. A 60 t heavy beet harvester cannot be steered with an accuracy of just a few centimetres under wet conditions and soft ground. Additionally, each plant has different dimensions and interacts differently with the soil. Gathering beet usually takes place during bad weather conditions. The sugar beet harvest creates a high technical expenditure and work load. In particular, high demands on quality of working method, especially the quality of topping and also losses of sugar content caused by damaging sugar beet during harvesting or storage.

Since 1985, robots entered our lives as supporting but not particularly adaptive systems so far. Figure 1, shows a time bar which starts from the development status in year 1985 up to a higher development status in year 2030. Creation of artificial intelligence is the next important development requirement in agriculture engineering (Anon, 2004).

An entirely autonomous network of robots will open up completely new opportunities. The main characteristic attribute of these robots will be their detached construction. This means, that every robot will only perform one processing step.

Cropping by hand has the lowest sugar losses, so robots developed in future should have the same capability as harvesting by hand or an even better quality, reducing losses further. The whole process will be divided up into individual processing steps, to optimise the whole process (see Fig. 2). Each processing step stands for one, or nearly one, robot unit.

For the example of sugar beet harvesting, processing will consist of four robot classes:

- topper/crown cleaner
- lifter/beet cleaner
- beet elevator
- beet hopper

The lifting robot unit will stand for all four robotic units to explain the general working method of those robots.

The lifting robot will have to fulfill a lot of demands, for example the root of every beet has a different size, and the lifting robot will have to lift them free from breakage and damage. It will have to harvest sugar beet without damaging them or causing mass loss to each beet, per unit area due to root breakages. However, the robot should be able to remove bolters and dirt tare as part of its functionality.

A major requirement for these robots is the ability to work in wet operating conditions, in addition to all other conditions where applicable.

These robots will be powered entirely by electricity preferably using renewable energy, e.g. by fuel cells (Pehnt, 2004). The size of the robots will vary greatly, from less than one hundred kilograms (topper) up to several tonnes (beet hopper). The effectiveness of electrically driven systems is higher and therefore more economical and ecological, additionally; they are smaller and more flexible. They will guide themselves by global positioning systems (GPS) path planning (topper robot routed by drill robot) and operate in close-up range by picture processing (Jahns, 2004).

The robots will use all available data and they will be able to interpret it. Each robot will have a small and highly efficient processor which is compatible between robots, they will be built in a modular system and for this reason they will be able to repair themselves. They will use all this gathered data to optimise a plant grow model. Due to the enormous amount of data gathered, this 'plant grow model' will become extremely accurate and will enable the robots to decide on correct actions concerning areas such as, pest management, plant nutrition and crop rotation management.

Their collaborative use of information (as with the 'connected drive system' used already in the automotive industry) will be based on: GPS information, active infrared picture processing and implement and wheel friction. Additionally, they will use all information stored from previous passes and previous seasons. This information might contain the single plant positions, the weed pressure, the soil type and the humidity interpreted from the wheel and implement friction and also the yield.

Being very small, these robots will be able to work very accurately and have the ability to align themselves to single plants if it is required for important processing steps.

Already, nowadays, in agricultural engineering an attempt towards specialisation and self-propelled equipment can be seen. The demands towards the rise in accuracy of equipment means that the costs of self-propelled machinery will decrease. In addition, compact fuel cells in all sizes are developing, enabling the provision of electric energy wherever needed. These influencing factors will assist a changeover towards detached, single function, equipment.

Disturbing factors present in other assembly groups will be excluded; any control factor can be adjusted to the requirements without compromise. This concept ensures that no component part ever has to remain idle. Capable of artificial intelligence, these robots will be able to monitor themselves and to provide mutual care, in areas such as calling for service, rescuing each other from dangerous situations and advising each other of risks.

Using the principle of

plurality, the breakdown of a single topper robot will be balanced by his eleven colleagues, without stopping the complete process chain. The reliability of operations will obviously, therefore, be raised. This detached construction will allow a progressive approach to this autonomous self-helping community.

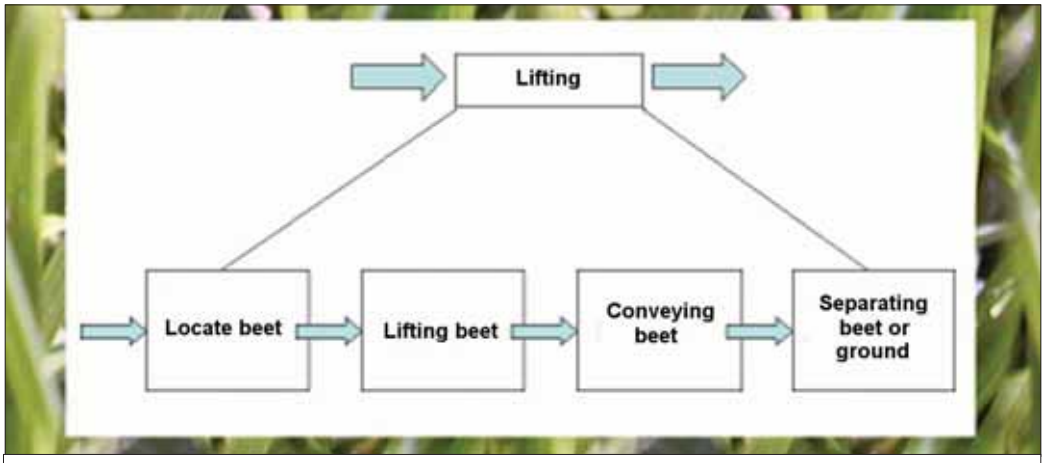

Fig. 3 Survey of a lifting process

Considering the very different conditions and modes of agriculture around the world, these changes will be introduced at different rates. In well defined greenhouses, this will obviously happen sooner than in rough tropical terrain with changing conditions and a big number of disruptive factors. It is likely that in less than 50 years, robot slaves will process more than 80% of operations in European agriculture.

Adapting previously developed technology in this area, for example opto-electronic missile guidance systems from the defence industry, may provide the following advantages:

- existing technology leading to low development costs
- big production numbers resulting in low unit costs
- sophisticated military technology giving rise to high reliability
- optical sampling and therefore capability to identify barriers and hazards and elective behaviour towards barriers (i.e. person, animal, leaf, soft ground)
- insensitivity towards dust by using infrared and ultraviolet light detection of human/animals enabled by heat-sensitive infrared cameras
- ability to realign in all circumstances by GPS/Galileo
- feasibility of operating in unfamiliar areas with only field boundaries specified by the positioning system.

One of the main obstacles of this development is the aspect of safety. Apart from the vision of exclusively GPS routed vehicles, the system of picture processing with the aid of infrared light is an improvement. In questionable situations, a human can be consulted online.

As a transitional solution human-controlled master-units, processing ambitious tasks, will be accompanied by supporting slave robots, processing recurred workflows. For example, fully autonomous trailers may follow a forage harvester. In road-traffic these slaves will follow the human-controlled master in single file.

There will be another group of robots which are responsible for service and maintenance only. These small robots will have dimensions of a few hundred millimetres. Agricultural robots will be populated by the small robots (micro robots) like useful symbiontic insects. Micro robots will be able to reproduce themselves. They will also be able to include new development standards themselves and insert this new important development into agricultural robots.

Conclusions

The rising demands on agricultural products in matters of quality and quantity, can only be satisfied by a higher level of precision and automation. Towards the challenge of complexity, precision and safety, the changeover to multistage operation will be beneficial. This will enable a gradual approach to entire automation. A precondition for this vision is the future availability of fuel cells and the possibility of adapting technology from automotive and defence industry which will afford profitable development costs.

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There's always a bigger fish...

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BIODEGRADABLES

TRIF-ic news for waste research

The Department for the Environment, Food and Rural Affairs (Defra) has announced £1.36m of funding for research focused on novel ways to divert biodegradable waste from landfill sites. Defra's Technologies Research and Innovation Fund (TRIF) funds research into innovative technologies and processes that will help to meet England's obligations to reduce the amount of biodegradable waste – including kitchen, garden and paper waste – going into landfill sites. England is committed to reducing landfilled biodegradable municipal waste to 75% of that produced in 1995 by 2010.

Research teams from the University of Leeds, Chester's C-Tech Innovation Ltd, Imperial College London, University of Southampton and the University of Nottingham have been awarded funding, subject to contractual negotiations.

As well as exploring new treatment options to reduce the amount of waste going to landfill sites, the research programme will investigate techniques to speed up the production of composting and ways to produce clean hydrogen energy from waste. Potentially, the programme could reduce the amount of waste going to landfill, open up new markets for high grade compost and reduce emissions of greenhouse gases.

Environment Minister, Elliot Morley said: "Sustainable waste management is now a commercial imperative, not just an environmental ideal. This research programme marks a key step forward in the Government's plans to find more sustainable ways to manage waste and to plan for the long-term.

"With good management, we can achieve greater resource productivity and a cleaner, better-protected environment. Better knowledge and understanding of waste issues are essential to underpin effective policy making and specific action programmes designed to change the way we generate as well as manage waste streams in the UK. This programme takes us a step closer to our goals."

While funded separately through Defra's Waste Implementation Programme, this work feeds into the government's new strategy for waste related research. The strategy places a particular emphasis on encouraging research into cross-cutting issues and is based on eight key themes: sustainable resource consumption and management; systems for resource recovery; residual wastes management; market development and intervention; social dimensions; environment and health (risk assessment and impact management); economics; and decision tools.

MORE INFORMATION

Defra, Nobel House, 17 Smith Square, London, SW1P 3JR. Tel: +44 (0)8459 335577. Fax: +44 (0)20 7238 5529. Web: www.defra.gov.uk
Copies of the strategy document can be obtained from Defra's Publications Unit or downloaded online. Web: www.defra.gov.uk/environment/waste/wip/research/index.htm

REGULATION

Transport vote condemns animals to further suffering

Leading international animal welfare group Compassion In World Farming (CIWF) has condemned the decision of EU leaders, including United Kingdom Government Ministers Ben Bradshaw and Margaret Beckett, to sidestep crucial decisions affecting the welfare of millions of farm animals across the continent.

The criticism follows last night's vote by the EU Agriculture Council to defer a decision on new rules on journey times, rest periods and stocking densities for animals during transport for six years. EU Agriculture Ministers opted instead to support a limited package of reforms aimed at improving animal welfare within a new EU Regulation.

Compassion in World Farming Chief Executive Joyce D'Silva said: "CIWF despairs of the lack of courage shown by the UK Government and by the other Member States in failing to tackle this crucial issue, when all of the evidence, scientific research and data points to the need to limit journey times. "This collective failure by EU Agriculture Ministers means live animals can continue to be transported from Aberdeen to Athens simply to be slaughtered; while politicians procrastinate, millions of animals will continue to suffer for years to come.

"The decision to adopt a six year delay has nothing to do with the need for further work to be carried out and everything to do with a lack of political will to tackle this problem. "CIWF will continue to highlight the scale of animal cruelty, and the urgent need for reform within the trade in live animals across Europe."

The modest package adopted by the Council in Brussels offers greater training, certification and enforcement of the rules, including the use of satellite navigation systems to monitor journeys on all vehicles by 2009. It also enables stricter national rules to be made – which should allow the UK to maintain the effective ban on British horses being exported to the continent for slaughter.

CIWF welcomes both moves and acknowledges the opportunity they offer to bring improvements in animal welfare; but points out that only very limited improvements in welfare during transport can ever be made without addressing the crucial areas of journey and rest times, and stocking densities.

Last night's vote saw Denmark vote against the proposals, calling instead for stricter rules. Germany, Belgium, Sweden and Luxembourg abstained, while all other Member States supported the proposal.

MORE INFORMATION

Compassion in World Farming Limited. Tel: +44 (0)1730 233 904. Fax: +44 (0)1730 260 791.

Bimonthly EARLY SPRING 2005

MEMBERSHIP MATTERS

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

OFFICIAL LAUNCH OF THE SOCIETY FOR THE ENVIRONMENT – THE CHARTERED BODY

On November 29th 2004 at the Crown Estates office in Carlton Terrace, The Society for the Environment (SocEnv) formally received its Royal Charter.

The Charter was formally presented to the Society by Alex Galloway (Clerk to the Privy Council) and received, on its behalf, by Will Pope, Chairman of SocEnv.

This was a red letter day, not only for SocEnv, but for the ten licensed bodies of SocEnv.

The opportunity was taken also to present each of these bodies with their full licences.

Baroness Young was presented with her Chartered Environmentalist certificate (numbered 1) by Peter Matthews, Chairman of the Registration Authority.

IAgrE was represented by Chris Whetnall who is seen here receiving IAgrE's full licence to award the Chartered Environmentalist qualification.

There are now fifty IAgrE members who have received this award with more in the pipeline. The abbreviated (Grandparent) procedure will be available to IAgrE members until September 21st 2005. After this date, candidates will have to undergo the full process including a professional review interview. So get those applications in now! Full details of how to apply can be found on the IAgrE website.

(Left to Right) Chris Whetnall with Will Pope (Chair SocEnv) and Peter Matthews (Vice Chair SocEnv) displaying IAgrE's full licence to award the Chartered Environmentalist qualification

CAREERS

PRINCESS ROYAL LAUNCHES INDUSTRY CAREERS PROJECT AT THE ROYAL SMITHFIELD SHOW

The BAGMA Dealer Centre at Smithfield was a hive of activity on December 2nd when the Princess Royal formally launched the "World of Opportunity" Industry Careers Project.

With the tag line of:
Recruit
Retain
Develop
the project, which resulted from IAgrE's skills crisis conference, is designed to assist all sectors of the industry in the recruitment, retention and development of staff.

A steering group, comprising BAGMA and AEA, working in partnership with IAgrE and Lantra and Chaired by Professor Dick Godwin, has been working for some months to formulate aims and objectives and terms of reference.

The Princess Royal spent more than her allotted time meeting and talking with representatives from the industry and was clearly both interested and knowledgeable about the sector and the problems it faces. Amongst the dignitaries in the line up to meet with Princess Anne were Ian Jones (BAGMA), IAgrE President Peter Redman, Peter Leech (John Deere) and Paul Hemingway (JCB).

Her Royal Highness The Princess Royal launched the farm machinery industry Careers Project at the BAGMA Dealer Centre, Royal Smithfield Show and is seen here discussing the project with Director General Ian Jones and BAGMA staff Nikk Etherton and Alice Fennell, whilst Peter Leech (John Deere)and Paul Hemingway(JCB) are in the background (centre L and R, respectively) [Photo courtesy: Careertrack]

Funded by contributions from the industry's dealers and the manufacturers they represent, the project is already producing results. Launched at Smithfield was a 16 page full colour brochure detailing career opportunities in the various sectors:

- Farming
- Forestry
- Landscaping
- Sportsgrounds
- Lawncare

Also up and running is a project website **http://www.careertrack.info** containing details of all those contributors to the project. This will be a dynamic website and is intended to be a useful resource centre with, eventually, live links to those organisations who are looking to recruit.

The site also contains a number of job profiles comprising interviews with young (and not so young) people working in various parts of the industry.

Other major components of the initiative include:

the production of a manual to assist dealer staff in the recruitment process, this manual containing job descriptions and details of career prospects and also providing dealers with tools such as Powerpoint presentations to use in local recruitment drives; and

IAgrE's 'promoting professionalism' campaign which is encouraging the registration of suitably qualified staff as Engineering Technicians.

REGISTRATION

MINISTER CALLS ON INDUSTRY TO ADOPT TECHNICIAN STANDARDS

"I believe that professional membership and registration have a real value for technicians through the commitment to lifelong learning and development, and to professional standards, which it brings", said Lord Sainsbury, Minister for Science and Innovation.

Speaking at the Engineering Council (UK) conference which was supported by the Engineering and Technology Board (etb) and the Engineering & Manufacturer's Standard & Skills Forum (EMSSF), and was entitled 'The Value of the Engineering Technician to Business', Lord Sainsbury went on to praise the guidelines for UK professional registration, known as the UK Standard for Professional Engineering Competence (UK-SPEC), as an "extremely helpful descriptor" for the Engineering Technician.

Lord Sainsbury pointed out that lack of technicians and intermediate skills had a major impact on UK productivity. "It seems to me to be clear that if we are going to correct this situation then a starting point has to be a clear set of professional standards which is widely understood and accepted", he said.

He therefore urged Sector Skills Councils (SSC's) and employers to work together with professional bodies such as EC(UK) and etb to raise awareness of the full value of the UK-SPEC descriptors to business. "Although employers may have generally positive feelings about professional membership and registration, they are not going to go out of their way to promote it unless they can be convinced that it will be of real benefit to their business for their employees to be professionally qualified and have a range of transferable skills."

Andrew Ramsay, Executive Director at EC(UK) said: "The high attendance figures and calibre of our panel today demonstrate the importance of this issue to industry and Government. Working with etb we will continue to champion the role of the Engineering Technician in adding value to business. To this end we have launched a dedicated website **www.engtech.co.uk** to highlight the issues discussed at the conference and act as a foundation for future initiatives."

WESTERN BRANCH – SHARING OUR VISIT WITH YOU

The Western Branch afternoon meeting, 26th May 2004, was held at the Science Museum Wroughton, near Swindon. A museum with a difference.

It is a fantastic countryside location having views over an area of Wiltshire, on a World War 2 airfield with numerous preserved massive hangers. We were taken on a guided tour by Keith Brown, a senior curator, whose knowledge of the very early passenger machines was incredible.

We saw the first De Havilland wood and Irish linen twin-engine machine. It was specially designed for a farmer customer to take fare-paying passengers and was able to be maintained by farm staff. Even the wings hinged back to enable them to go through his barn doors!

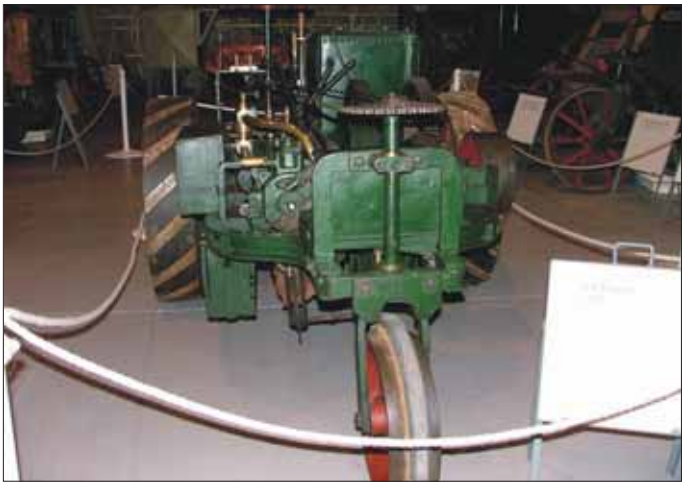
Radar and radio equipment were also on display along with rockets (remember Blue Steel?), the SRN1 hovercraft and several battery electric cars. One very early car, similar to a horse carriage, was equipped with two motors, one driving each front wheel with front wheel Ackerman type steering.

The last hanger we visited was full of agricultural machinery with a grain drier, cleaner, cultivation equipment and tractors including steam and petrol, ploughing and towing types. Some of the machines and tractors were from National Institute of Agricultural Engineering (NIAE) experimental work at Silsoe. Amongst these,

we also found several of the very early lorries, some solid tyred and just to add further interest more very early cars and motorcycles.

This is a place to visit again. It is open at holiday periods and can be opened for group visits, when prior arrangements are made.

Eric Lacy (Western Branch)



NEWS OF MEMBERS

Melvin Johnson recently been appointed to the post of Section Manager for Engineering, Construction and Adventure Sport at Reaseheath College.

Michael Povey has moved to New Zealand and is working as a Subdivisions Engineer for Nelson City Council. His job is basically looking after subdivision engineering works from proposal and approval through to site checking and completion sign off.

Michael says that the change in pace and lifestyle is huge and they are still adjusting to it.

Tony Chestney

Write to Tony Chestney with your news! His address is 32 Beverley Crescent, Bedford, MK40 4BY.

MEMBERSHIPS

Academic Members

Askham Bryan College
Askham Bryan
York
YO23 3FR

Barony College
Parkgate
Dumfries
DG1 3NE

Cranfield University at Silsoe
Bedford
MK45 4DT

Duchy College
Rosewarne
Camborne
Cornwall
TR14 0AB

Greenmount Campus
CAFRE
22 Greenmount Road
Co Antrim
Northern Ireland
BT41 4PU

Harper Adams University
College
Newport
Shropshire
TF10 8NB

Institute of Technology, Tralee
Clash
Tralee
Co Kerry
Ireland

Myerscough College
Myerscough Hall
Bilsborrow
Preston
Lancashire
PR7 0RY

Oatridge Agricultural College
Ecclesmachan
Broxburn
West Lothian
EH52 6NH

Pallaskenry Agricultural College
Co Limerick
Ireland

Pencoed College
Pencoed
Bridgend
CF35 5LG

Plumpton College
Ditchling Road
Lewes
East Sussex
BN73AE

Reaseheath College
Reaseheath
Nantwich
Cheshire
CW5 6DF

Royal Agricultural College
Cirencester
Gloucester
GL7 6JS

Scottish Agricultural College
SAC Ayr Campus
Auchincruive Estate
Ayr
KA6 5HW

Sparsholt College
Sparsholt
Winchester
Hampshire
SO21 2NF

Willowdene Training Ltd
Willowdene Farm
Chorley
Bridgnorth
Shropshire
WV16 6PP

Wiltshire College - Lackham
Lacock
Chippenham
Wiltshire
SN15 2NY

COMMERCIAL MEMBERS

Autoguide Equipment Ltd
Stockley Road
Heddington
Calne
Wiltshire
SN11 0PS

Douglas Bomford Trust
Springhill House
Salters Lane
Lower Moor
Pershore
Worcestershire
WR10 2PE

Bomford Turner Limited
Salford Priors
Evesham
Worcestershire
WR11 5SW

John Deere Ltd
Harby Road
Langar
Nottinghamshire
NG13 9HT

FEC Services
NAC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2LS

G C Professional Services
for land-based and related industries
Highdown Cottage
Compton Down
Winchester
Hampshire
SO21 2AP

Law-Denis Engineering Ltd
Millstream Works
Station Road
Wickwar
Wotton-under-Edge
Gloucestershire
GL12 8NB

David Ritchie (Implements) Ltd
Carseview Road
Suttieside
Forfar
Angus
DD8 3EE

Shelbourne Reynolds
Shepherds Grove Industrial Estate
Stanton
Bury St Edmunds
Suffolk
IP31 2AR

Silsoe Research Institute
Wrest Park
Silsoe
Bedford
MK45 4HS

White Horse Contractors Ltd
Lodge Hill
Abingdon
Oxfordshire
OX14 2JD

LONG SERVICE CERTIFICATES

Name	*Grade*	*Date of Anniversary*
50 years		
John Brian **Finney**	HonFIAgrE	11 Jan 2005
35 years		
Charles Michael **Blackbrough**	IEng MIAgrE	27 Jan 2005
Peter George **Braithwaite**	CEng FIAgrE	27 Jan 2005
William **Hancox**	CEng MIAgrE	27 Jan 2005
John **Matthews**	CEng HonFIAgrE	27 Jan 2005
Anthony Edward **Moore**	IEng MIAgrE	27 Jan 2005
Robert Tyson **Pringle**	CEng MIAgrE	9 Jan 2005
David William McQueen **Pullen**	CEng MIAgrE	9 Jan 2005
James Wilhelmus **Squires**	AIAgrE	27 Jan 2005
Matthew James **Taylor**	CEng MIAgrE	27 Jan 2005
Edward David **Weekes**	CEng MIAgrE	1 Jan 2005
25 years		
Richard John **Belding**	MIAgrE	24 Jan 2005
Kenneth **Hopkins**	IEng MIAgrE	28 Feb 2005
Robert James **Hunter**	AMIAgrE	20 Feb 2005
Richard Waiter **Langley**	CEng MIAgrE	24 Jan 2005
Terence **Massen**	IEng MIAgrE	20 Feb 2005
Henry Duncan **McLain**	CEng MIAgrE	21 Feb 2005

AG TECH CELEBRATES 10TH ANNIVERSARY

All the guests at the John Deere Ag Tech 10th anniversary reunion at Brooksby Melton College in Leicestershire.

John Deere's Ag Tech agricultural apprentice engineer training programme celebrated a unique 10th anniversary last month with a special reunion lunch and presentation at Brooksby Melton College in Leicestershire. This attracted 118 past and present students and guests, including Chris Whetnall, chief executive and secretary of the Institution of Agricultural Engineers; Ian Jones, director general of BAGMA; and Tony Belmega, head of strategy at the Learning & Skills Council.

Ag Tech was the first such scheme to be introduced in the UK, and won a National Training Award at the end of 1997, the only one ever made to an agricultural machinery company. Since it started in 1992, with the first group of students qualifying in 1994, altogether 147 Ag Tech apprentices have graduated through the scheme; including those currently undergoing training, the programme's total intake to date has been a staggering 324.

This year's new intake of 41 apprentice engineers from John Deere dealerships across the country is the biggest ever, covering both Ag Tech and the new Turf Tech programme for groundscare technicians, which was introduced in 2002.

"I cannot emphasise enough how important these technicians are to the success and the future of our industry and business," commented John Deere Limited managing director Alec McKee at the Brooksby reunion. "The professional qualifications and registration provided the by Ag Tech programme demonstrate vital skills and knowledge. Customers should value the experience of the dealer technician as a key asset when making their buying decisions."

The Ag and Turf Tech schemes are run by John Deere and machinery lecturers Richard Trevarthen and Phil Spencer of Brooksby Melton College, and are supported by the Learning & Skills Council. Each offers three years of 'on-the-job' training with block release at Brooksby, and includes regular attendance at the John Deere training centre at Langar. A fourth year of special training leads to the Ag Tech Diploma.

"John Deere Ag Tech was the best training programme available at the time and still is," says Simon Amos, now a director of dealer Alexander & Duncan of Leominster, who was one of the first apprentices to enter the agricultural scheme in 1992. "I now send all my lads through the programme, it's so much better than anything the local colleges can offer."

Technicians graduating through the programme achieve the BAGMA/City & Guilds of London Institute 4024 Agricultural/Groundcare Service Engineers NVQ Level 2 & 3 Certificates and the John Deere Ag Tech Certificate. Successful completion of the fourth year also qualifies technicians for Associate Membership of the Institution of Agricultural Engineers, and registration as Eng Tech with Engineering Council, provided free by John Deere.

"In the late 1980's, increasing sophistication and new technology in farm machinery led to concerns that apprentice service engineers were not receiving sufficient quality training to gain the necessary technical skills," says Peter Leech, John Deere Limited's manager, customer support, who has worked with Richard Trevarthen since 1990 in developing and managing the Ag Tech programme.

"As a direct result of this initiative, we have been able to increase customer loyalty to our brand and our dealer network. We have also been able to help dealers recruit and retain high calibre service engineers, trained to a high level of technical competence covering all aspects of repair and service of John Deere machinery. Training in Deere's growing computerised parts and service support system provides an added benefit for dealers."

The roll call of successful Ag Tech graduates who have gone on to achieve prestigious national awards reflects the quality of the training they receive. A total of eight City & Guilds Medals of Excellence have been awarded to Ag Tech apprentices at both Level 2 and Level 3, the highest recognition available, and competed for by thousands each year from all vocational disciplines and industries.

Carl Pitelen of dealer Ben Burgess at Norwich received his City & Guilds Medal of Excellence in 1997, and went on to become the first Ag Tech graduate to receive the John Deere ROSE (Recognition of Service Excellence) Award in 2002. This is given to the best all round service technician from John Deere dealerships throughout the UK and Ireland.

This year a second Ag Tech trained technician has won the ROSE Award. Michael Strange of Devon based dealer Masons was a City & Guilds Medal of Excellence winner in 1996, and was presented with the ROSE Bowl trophy on the John Deere stand at the 2004 Royal Smithfield Show.

MEMBERSHIP CHANGES

Admissions

A warm welcome to the following new members

Fellow

M David (Cheshire)
R Herbert (Cambridgeshire)

Member

P V Muskett (Essex)
M J I White (Lincolnshire)

Associate Member

T K Buhari (North Yorkshire)
P Cortbaoui (Canada)
G A R Smith (Cheshire)

Associate

P Davies (Cheshire)
P Naylor Staffordshire)
D H O'Neill (Bedford)
S Ratcliffe (Staffordshire)

Student

Cranfield University:
A Dedousis
M A Jennings-Temple
P H Momori
C Patrick
B R T Vilane

Harper Adams University College:
A Adedoyin
T Andrews
C Baum
J D Bell
J Black
H J Blandford
P N Brown
R P Brown
J W Bubb
S A Carter
D J Cousins
A N Darch
L W Davies
J G Dickson
R H Doyle
C M Dyer
S Etherington
T J Gold
S M G Hodges
E P Hodson
G T Hughes
G W Jones
J Jones
D J Kerr
C Kirkwood
A R Lee
J Meehan
R A Moore
R P Proctor
G P Renton
P J Richards
P Rowlands
R T Slater
J A Sykes
M Targett
J J Toogood
K Tutty
A J Wallbridge
H R J West
S J Wilkinson

Myerscough College:
J P J Baxandall
A R Beckerton

Writtle College:
A Aier
K M K Alam
K C Bodduluri
E Evangelaras
Y Hasan
J S Lopez Escudero
M Marediya
S Nandimandalam
A A Patel
S Rupavatharam
F Xue
Q Q Zheng

Readmission

W R Legg (Zambia)

Transfers

Congratulations to members achieving a further phase of their professional development

Member

P J Doyle (Wiltshire)

Associate Member

J H Hammett (Essex)

Death

With great sadness, we record the death of the following member
W G Gale (Wiltshire)

Engineering Council

Congratulations to the following members who have qualified as Chartered Engineers or Engineering Technicians, entitling them to use the designatory letters CEng and Eng Tech, respectively, after their name

Registrations

CEng

M J I White (Lincolnshire)

EngTech

J D Jewitt (Northumberland)
A Jones-Parry (Gwynedd)
S J Wallace (Rutland)

Society for the Environment

Congratulations to the following members who have met the criteria for Chartered Environmentalist, entitling them to use the designatory letters CEnv after their name

Registrations

L G Campbell (USA)
E D Chesmore (E Yorkshire)
W C Hill (Devon)
B G F Mathew (London)

Produced by: Land Technology Ltd, Edinburgh Printed by: Barr Printers, Glenrothes

FOGGED PROTECTION FOR FOOD ON THE MOVE

Terry Mabbett

A swingfog thermal (hot) fogger from Allman, operating in a food storage area

Whether meat, dairy, chocolate and confectionery, grain, flour, fruit or vegetables, food is under potential and continual threat from insect damage and microbial spoilage, contamination and infection. From the moment it leaves the farm gate, food embarks on a long and potentially 'hazardous' journey, through transit, storage, processing, manufacturing and preparation prior to consumption.

The longer and more 'multi-staged' the transit, and the more frequent the 'ports of call', the more food is at risk. The threat is sequential and cumulative. Just one contaminated vehicle or store is all that is needed to pass infestation, infection and contamination 'down-the-line', gathering pace as it moves. Every transit environment, including trucks, aircraft and ship's holds, storage rooms and food processing and manufacturing areas, must be treated as potentially hazardous situations, with potential to jeopardise food safety and human health.

Irrespective of whether food commodities or manufactured products are pest and disease free when leaving a specific site, they are prone to contamination along the chain if transit vehicles, shipping containers, aircraft holds, storage and distribution centres are not clean.

Requirements are for portable application equipment able to apply a wide range of recommended and registered disinfectants, antiseptics and insecticides that are cleared for use in the food industry. They must be able to deliver the chemical in a minimum of volume of water and achieve rapid control, then aerate and dissipate rapidly to leave minimum residue and a taint-free atmosphere. That said the 'spray' must be sufficiently mobile so that droplets penetrate every 'crack and crevice', and stay suspended in the atmosphere long enough to deal with air-borne insect and disease threats, whether they be moths, bacterial spores or virus particles contained in droplets of water.

Hot (thermal) fogging is one of the very few application techniques that is able to deliver these requirements and fulfil the needs of rapid and effective insect control and disinfecting of the areas and spaces used to transport, ship and store food commodities and manufactured food products.

Thermal foggers are unique in that they are charged with chemicals formulated in a liquid solution, issued as a gas but act in liquid form to control pests and diseases. The chemical is dissolved in an appropriate light oil or organic solvent to form a

BIO NOTE

Dr Terry Mabbett is a Consultant at 2 Albemarle Avenue, Potters Bar, Hertfordshire EN6 1TD Tel/Fax: +44 (0)1707 644953

solution that is converted into a hot vapour (gas) within the machine. It subsequently condenses into tiny droplets on delivery into the cold atmosphere.

The fog thus produced is a cloud of minute droplets formed as the hot gas condenses as when interfaces with the cold air on leaving the fogging pipe. Droplet sizes are generally 15 microns or less, the exact size depending on several factors including the exact nature of the solvent used to dissolve the chemical in the mixture. The smaller the droplets the denser the fog and the longer it stays suspended in the atmosphere. If there are perceived safety problems in using light oils or organic solvents then water may be used. The desired spectrum of small-sized droplets is then achieved by using a mixture of water and an appropriate glycol as the carrier liquid for the chemical product.

Facts on fogging

E. Allman & Company Limited of Chichester in West Sussex markets one of the widest ranges of thermal foggers in the world that are widely used to maintain the integrity of food supplies right along the chain of storage, processing/manufacturing, distribution and preparation.

For floor areas/spaces up to 500 m^2/1500 m^3 machines of the Swingfog SN 50 series should be used. These comprise:

- SN 50 stainless steel spray mixture tank, capacity 6.5 /
- SN 50 PE polyethylene spray mixture tank, capacity 7.0 /
- SN 50 - 10 stainless steel spray mixture tank, capacity 9.0 /
- SN 50 - 10 PE polyethylene spray mixture tank, capacity 10.0 /

For larger floor areas/spaces the Swingfog SN 81 and SN 101 machines are more appropriate.

- The Swingfog SN 81 is available either with a 9.0 / stainless-steel spray mixture tank (SN 81) or with a 10.0 / polyethylene spray mixture tank (SN 81 PE).
- The Swingfog SN 81 pump has no integrated spray mixture tank, but is equipped with an electrical pump to draw the spray liquid out of the original container (pre-packed products) or out of another suitable container (user-mixed formulations). This machine is equipped with a rechargeable battery, and an integrated battery power supply device to drive the chemical pump. The chemical pump can be driven off the battery or the public power supply.
- The Swingfog SN 101 is equipped with a 68 / stainless steel spray mixture tank and is available with manual pump start (Swingfog SN 101 M) or with electrical start (Swingfog SN 101 E).
- The Swingfog SN 101 pump has no integrated spray mixture tank, but is equipped with two electrical pumps to draw the spraying liquid from the appropriate container. Power for the starting (ignition of) the applicator and for the operation of the chemical pump is most conveniently drawn from a 12 V car battery.

Optimum treatment will only be obtained if the vehicle, store or other space is thoroughly cleaned out before hand. The presence of organic matter and dirt will impair the action and activity of the chemicals applied. With a thorough pre-fogging clean-up carried out pest and pathogen control using thermal fogging can be achieved with one application of just 20 - 25 / of spray mixture per 1000 m^3 of space within a matter of hours. By using the Swingfog thermal fogging technique, users are able to deliver the chemical within the ultra low volume (ULV) spectrum of droplet size which is 5-25 microns. The larger droplets in the spectrum impact on the ceiling, walls and floor to provide a residual treatment. Those at the other end of the spectrum remain suspended in the air to provide the aerosol treatment.

Operators using thermal foggers in the carrying mode must wear full protective clothing including an appropriate respirator. However, these machines can be operated in a stand-alone mode inside the room or store, or from outside by inserting the fogging pipe through 'ports' in the wall. These modes of operation avoid the need for personnel to be inside the building while fogging is in operation.

Swingfog thermal (hot) foggers offer the ideal means of protecting 'food on the move' by ensuring pest and disease free status of all transit vehicles, stores and other premises along the 'food chain'. Their high degree of portability and manoeuvrability makes them ideal for use in a wide variety of situations both on land and at sea. Use with an appropriate disinfectant or antiseptic ensures that food transport vehicles and storage premises are kept free of a wide variety of pathogens including salmonella. And they allow rapid on-board control of the intestinal viruses that continually threaten safety of passengers on the world's cruise liners.

MORE INFORMATION

Bruce Allman, E Allman & Company Ltd, Birdham Road, Chichester, West Sussex PO20 7BT Tel: +44 (0)1243 512511 Fax: +44 (0)1243 511171 E-mail: sales@allman-sprayers.co.uk Web site:

FORESTRY

Mound spacing on restock sites

The latest information on the spacing of mounds on restock sites has been published by the Forestry Commission.

The technical note *Excavator Mound Spacing on Restocking Sites* provides detailed advice on this method of ground preparation.

"Good excavator mounding practices ensure that the appropriate density, uniformity and quality of mounds are produced with good mound to soil contact," said the paper's co-author Steve Morgan of Forest Research. "Excavator mounding is a robust and flexible system for many restock sites and creates a good microsite for tree growth. Successful establishment of young trees is one of the requirements to produce good quality timber. Good mounding practices contribute to the goal of improving timber quality and reducing establishment costs."

MORE INFORMATION

***Excavator Mound Spacing on Restocking Sites* (FCTN008) is available free from Forestry Commission Publications, PO Box 25, Wetherby, West Yorkshire, LS23 7EW. Tel: +44 (0)8701 214180. E-mail: forestry@twoten.press.net Web: www.forestry.gov.uk/publications**

KEY ISSUES IN MANAGING SOIL FOR THE 21ST CENTURY

A review by Mike Hann

On the 3rd November, the IAgrE Soil and Water Group held a one day conference for scientists and practitioner. The aim of the conference was to discuss the issues of soil management practice in view of the new government legislation on soil management.

The conference was ably chaired by Peter Kendall, Deputy President of the National Farmers Union (NFU). The delegates totalling over 100, included members of academic and research institutions, the Department for the Environment Food and Rural Affairs (Defra), ADAS, Environment Agency (EA) and the Scottish Environment Protection Agency (SEPA). There was also good representation from farmers, consultants, the agrochemical and machinery industries and the press.

On a personal note, I am able to remember some 40 years of soil management practice. The 1960s and 1970 brought the implications of the Strutt report which demonstrated the lack of soil care and its effects on agricultural production. This provided an impetus for research particularly at Silsoe (both Research Institute and the (then) College) related to soil damage and its alleviation. During the same period government grants for soil management (particularly drainage) led to a great deal of farming interest in improving their soil care, much influenced by the excellent ADAS 'Drainage Officers' and the like. Simultaneously, the colleges and universities were offering qualifications at all levels relating to soil and water engineering and management. The late 1970s through the 80s and 90s saw a decline in the interest in soil management issues, driven by a host of influences including the removal of grants and 'over production'.

As I move into my dotage, there is again a change in our attitude/interest in soil management. This is driven by sound government legislation and the farming industry once again seeing the financial, agronomic and environmental advantages of good soil management. This interest was demonstrated by the good attendance at the conference.

The first paper was presented by Professor Mark Kibblewhite, Head of the National Soils Resource Institute (NSRI) at Cranfield University at Silsoe, and dealt with the diverse nature and functions of soil. For me, it was a refreshingly new approach to soil considering the shift in thinking, driven by the application of biology and information science to soil science. This new idea argues soil as a living system, a complex architecture that is moderated by soil-water physical processes. The consequences of this approach is that quality soail management must address the ecological condition of the whole soil as determined by its biological, chemical and physical configuration.

Thus, the future for me depends upon researches developing the biological and chemical features of soil to help with improved soil management strategies. I am heartened by the work I see within NSRI and others which aims to provide answers. I encourage support for this research approach.

The next two papers were delivered by other prominent members of NSRI. Firstly Dick Thompson addressed the thorny problem 'the assessment of soil quality'. Professor Dick Godwin provided a well argued researchers perspective of soil management at farm level. This was followed by the governments' perspectives of soil management on farms.

Defra's vision was well argued by Dr Sharon Ellis. She considered the impact of the Common Agricultural Policy – Good Agricultural and Environmental Condition (CAP-GAEC) for soils dealing with soil erosion organic matter content and structure. The guidance developed by EA, Defra and ADAS was introduced. Further information related to good soil management and the strategies for protection of soil.

Peter Redfern presented EA's approach to soil protection. I was impressed with their determination to work with others, sharing expertise with industry and the science community for best results

The afternoon session started with a good resumé by Ian Bradley (NSRI) of the existing state of soils in England. This was followed by two presentations arguing how quality soil management might be delivered. Firstly Professor Gordon Spoor asked in his usual challenging way what is required. Then Innes McEwan (Unilever R&D, Colworth) gave a very well considered farmers' perspective of what is economically feasible.

The day was rounded off by

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Freddy Nachtergaele [Food and Agriculture Organisation (FAO) of the United Nations] who gave a fascinating insight into the National Aeronautics and Space Administration (NASA) and FAO Agro-ecological assessment for agriculture in the 21st century. All in all, it was an excellent day with first class presentations to which I probably have not given full recognition, for which I apologise.

I am left to reflect that I am privileged to be involved in the resurgence of soil management. Further I am heartened that the development of a new MSc in Soil Management at Cranfield University at Silsoe is very timely as is the British Agrochemical Standards Inspection Scheme (BASIS) one week short course in soil management aimed at presenting the Defra guidelines. An MSc in Urban Soil Management is planned. The soil and my future is bright – perhaps there is a God!!

LIVESTOCK CONTROLS

Pilot trial of electronic identification and data transfer for sheep

The Department for the Environment, Food and Rural Affairs (Defra) has published an interim progress report on its Sheep electronic identification (EID) and electronic data transfer (EDT) pilot trial for sheep.

The trial is assessing ease of use of EID equipment. It is establishing training and support requirements for use of EID and EDT on farms, in abattoirs, and markets prior to the wider introduction of sheep EID from 1 January 2008. It is also looking at potential benefits of EID/EDT for the sheep industry. The study is due to end in June 2005.

The trial is taking place in the North of England, South West and Midlands. It involves 69 farmers who have been selected to ensure a full range of environmental conditions, production systems and attitudes to technology. More than 80,000 sheep have so far been electronically identified using a range of ear tags and boluses. In addition, use of EID and EDT is being examined and tested in a number of market and abattoir situations.

Progress with the project includes:

- good engagement with the farming industry;
- effective industry collaboration in scoping and developing protocols for abattoir trials;
- adoption of a phased approach to market trials; first phase volumetric tests have been completed and the next phase will introduce EID and EDT into a market environment on a non-sale day;
- strong preference for electronic tags rather than boluses amongst participant farmers but no evidence of related animal health and welfare issues where boluses have been used;
- tests of EID hardware and software reliability and complexity;
- a modular approach to farmer training has proved successful and training methods and support requirements continue to be monitored;
- wider industry surveys have been conducted to establish a baseline for industry attitudes and awareness of EID.

The National Sheep Association, National Farmers Union, British Meat Processors Association and Livestock Auctioneers' Association were consulted during the setting up of the project and continue to be involved with project delivery.

Ben Bradshaw, Defra's Animal Health and Welfare Minister, said: 'I am pleased with the progress made by this study and related work being done in other parts of the UK. There is more work to do before electronic identification of sheep becomes mandatory from 2008. I am confident that by working with the sheep and EID industries, we can influence the Commission in relation to the practicalities of EID implementation for sheep.'

SOIL IMPROVEMNET

Plant Health Care acquires Vamtech Inc.

Plant Health Care plc ('PHC' or the 'Company'), a leading provider of natural products for plants and soil, has completed the acquisition of VAMTech Inc, for a consideration of $1,950,000 (approximately £1.1 million) plus payment of $775,000 in interest free debt (approximately £430,000) over five years.

VAMTech specialises in the synthesis of formononetin, a compound that stimulates the growth of mycorrhizal fungi already existing in the soil. The acquisition includes all technology and patents surrounding VAMTech's production of formononetin.

Formononetin has been demonstrated to increase the yields of row crops such as maize, soya beans and cotton, even when used in very small quantities and PHC will be aggressively targeting this commodity crop market throughout the world. The acquisition of VAMTech will open up the agriculture market to PHC with the VAMTech technology enhancing PHC's existing natural product line.

John Brady, Chief Executive of PHC said: "VAMTech has historically been an R&D company and PHC will now provide routes to market through our own existing sales channels. In addition, we will be able to target new markets, the most important of which is agriculture.

"While this acquisition is relatively small in cash terms, its impact on PHC will be significant. It means we now own the right to a very powerful patented product that has broad applications across all of our extensive product lines, making them even more effective".

PHC's technology is based on mycorrhizal fungi which are an essential part of all plant growth. In natural soil, mycorrhizal fungi are readily available to plants, however, in urban landscapes, degraded lands and most agricultural lands, mycorrhizal fungi are often not present in adequate quantities. Studies have shown that stimulating plant roots with mycorrhizal fungi products can increase the surface area of the root system and improve the health and survivability of plants, but no method was previously available for reproducing the fungi in the amounts required for commercial use.

PHC has developed processes that isolate and concentrate VAM (Vesicular-Arbuscular Mycorrhizal) fungal spores allowing PHC to produce products that have a longer shelf life than similar products. VAM Spores can be mixed effectively with other biological (e.g. bacteria) and non-biological (e.g. biostimulants) ingredients enabling PHC to diversify its product portfolio. Formononetin is already a key ingredient in a number of PHC products.

Defining the European sludge treatment equipment market

Though currently in the growth stage of its life cycle, the European sludge treatment equipment market is rapidly maturing – leading to consolidation of revenues and market shares. Even so, the market offers substantial opportunities, chiefly due to a combination of legislation and increasing public concern regarding safe disposal of waste and other toxic elements. Recent analysis by Frost & Sullivan reveals that the market is projected to grow from $1.95 billion in 2004 to $2.77 billion in 2010 at a compound annual growth rate of 6.2 per cent.

Sludge treatment and disposal techniques have been subject to particularly rigorous inspection, leading to strict policies governing the treatment processes suitable for final disposal routes. These dominant forces present a major market opportunity for equipment manufacturers.

"The Urban Wastewater Treatment Directive, with its next deadlines now to be put into practice, in particular drives the market to meet legislative requirements – thus boosting the demand for treatment equipment," states Frost & Sullivan Research Analyst, Suchitra Padmanabhan.

There is a need for high technological capability and industry knowledge. Environmental credentials and responsiveness to regulatory changes are also critical success factors for those operating in this industry. Innovative and flexible services are also likely to ensure future growth in this regulated market where environmental consciousness is rising.

Significant opportunities remain in upstream treatment efficiencies where innovation and adaptability is a key for success. The most progressive technologies, such as dewatering and drying, continue to be advantageous to companies compelled to find methods for reducing the amount of water content in sludge to minimise transport and disposal costs. Sludge drying is expected to garner greater demand and revenues with increasing safety regulations and restrictions being placed on disposal options such as landfills.

An increasing emphasis on thermal disposal is further likely to push up demand for dewatering and drying since the sludge that requires incineration necessitates such forms of pre-treatment.

The market is highly fragmented with a surfeit of participants. Though this is not a particularly threatening trend currently, it is envisaged that in the long term aggressive policies by market leaders could make it difficult for smaller and medium-sized competitors to exist and compete successfully in the market. Another factor to consider is the significant regional disparities within Europe with respect to the level of market development with variations in technological progress, scope of treatment capacity and associated demand for treatment equipment.

While the established treatment markets, such as Germany and Scandinavia are primarily driven by revenues from replacements and upgrades, the major prospects depend on growing demands in the United Kingdom and France as well as emerging markets such as Belgium, Spain, Portugal, and – to some extent – Italy. With the increasing consolidation and strengthening of market majors, smaller companies have to find opportunities by developing unique technical expertise or targeting niche specialist markets.

"Future success is largely dependent on the ability of participants to collaborate with equal partners and integrate additional services," states Ms. Padmanabhan. As treatment capacities become increasingly met, the future pattern for investment is largely seen in smaller to medium-sized treatment plants. The impending saturation in demand and slow down in revenue growth rates are a prominent challenge faced by most market participants. Equipment suppliers have responded by expanding toward international markets or by specialising in niche markets which still experience continued, even if sporadic, potential. For example, market leaders Degrémont and Veolia maintain an active profile in all domestic as well as international markets, and others use specialisation to succeed in a particular segment, such as Andritz in drying technology.

The European Union and national legislative measures that continually seek to develop a more environmentally conscious approach toward sludge management remain the main driver in the sludge treatment equipment market. In such a compelling market climate, the most proactive and solution-driven suppliers are likely to excel.

MORE INFORMATION

Kristina Menzefricke, Frost & Sullivan. Tel: +44 (0)20 7343 8376. E-mail: kristina.menzefricke@frost.com

There's always a bigger fish...

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CONSERVATION OVERSEAS

New conservation assessment shines light on Sumatra's rainforests

A report released by Rainforest Alliance, a leading non-profit international conservation organisation, is destined to set a new standard for the way in which the Indonesian pulpwood industry assesses its forests for conservation values. The biodiversity conservation assessment, commissioned by Asia Pulp & Paper Co. Ltd. (APP), was based on the 'High Conservation Value Forest (HCVF)' Toolkit developed in 2003 for Indonesia and provides a scientific platform for the management of conservation forests within plantation concession areas.

SmartWood, a sustainable forestry program of the New York-based Rainforest Alliance, developed a methodology by adopting existing criteria for use in the unique natural environment of the Pulau Muda area of Riau in Sumatra, where APP has now agreed to set aside more than 34,000 ha of forest for conservation.

SmartWood's Asia Pacific Regional Manager, Jeffrey Hayward, explained that the 'Indonesian HCVF Toolkit' has great potential for further use in Indonesia. He added, "The Toolkit enabled our team of ecological and social scientists to systematically identify and map the forest areas of greatest conservation value within the concession. As a result of this approach, our international team has been able to indicate the forest areas that APP should protect from harvesting. APP has stated that they will accept the results of the assessment and will protect and manage the HCVF that has been identified. We believe that it is critical for good conservation management that they do so."

APP appointed SmartWood, following an agreement reached with the export credit agencies of Germany, Japan, France, Austria, Sweden, Finland, Italy, Spain and Denmark on environmental covenants in the master restructuring agreements of the company's principal Indonesian operating companies. Earlier in the year, APP had launched its Sustainability Action Plan, which included putting over 72,000 ha of Sumatra's natural peat swamp forest into conservation. This was based on studies APP commissioned in 2003 to assess the forests' ability to provide long-term habitats to species, safe from human disturbance.

This latest assessment found evidence that the Pulau Muda area is home to the white-winged duck (Cairina scutulata). With a remaining population of only 450, it is even more endangered than the Sumatran tiger. The scientists also saw 11 examples of the world's most endangered stork, the Storm's stork (Ciconia stormi), and local villagers interviewed during the study confirmed that the swamp rivers are also home to the False Gharial crocodile (*Tomistoma schlegelii*).

Michael Black, APP's Deputy CEO, said, "We think that this is a very professional assessment. We accept the results and recommendations and have begun altering our operations accordingly. This report gives us a scientific basis for the sustainable development of our plantations and the management of our conservations areas. We believe that APP's approach to conservation is working and this assessment is yet another demonstration that real 'on the ground' progress is being made. The 'Indonesian HCVF Toolkit' and its commercial application is a first for the pulp and paper industry in Indonesia."

Previous assessments by APP had identified the areas in Pulau Muda that should be set aside for conservation, local tree species development and community use. The SmartWood assessment team, which includes leading international forestry, wildlife, community and mapping experts, has been into APP's Pulau Muda concession areas and assessed which ones contain High Conservation Values. The team has now provided preliminary recommendations for how these should be managed.

Black continues, "The SmartWood experts have identified that some adjustments and additions to our conservation boundaries are needed and we fully accept this as part of their assessment. Importantly for us, the SmartWood assessment has deepened our understanding of the biodiversity values in our concessions and given us practical information on what we must do to protect them."

The Rainforest Alliance, an international conservation organisation, is a leader in developing best management practices for sustainable land use and offers third-party certification and ecolabelling services to forests and farms that are managed in ways that reduce environmental impacts and increase social benefits. As the first organisation in the world to utilise market forces to conserve tropical forests, launching a sustainable forestry division in 1989 and a sustainable agriculture division in 1991, the Rainforest Alliance pioneered a worldwide certification movement. Over 12 million ha are now managed according to the highest standards through the Rainforest Alliance's SmartWood program. The Rainforest Alliance has recruited over 1,000 companies in this effort and improved the quality of life of some tens of thousands workers and their families. The Rainforest Alliance's sustainable agriculture certification program has certified more than 1,000 farms and cooperatives and has benefited over 125,000 farm families in the tropics.

Asia Pulp & Paper Co. Ltd. is one of the world's leading pulp and paper companies. With current combined pulp, paper and packaging grades capacity of 6.9 million tonnes in Indonesia, it ranks number one in non-Japan Asia. Headquartered in Singapore, APP currently has multi-locational manufacturing facilities in Indonesia and markets its products in more than 65 countries on six continents.

MORE INFORMATION

To read SmartWood's report on its HCVF assessment of APP's Pulau Muda district, visit: www.rainforest-alliance.org/programs/forestry/smartwood/app.html

Pesticides in freshwater down by 23%

The level of pesticides found in rivers and reservoirs in England and Wales has decreased by 23%, according to figures published by the Environment Agency. The findings, which come from the Environment Agency's annual pesticide monitoring programme, show that levels of the most commonly found pesticides in freshwater in 2003 were substantially lower when compared with the average for the previous five year period.

This decline in water pollution from pesticides could be down to a number of possible factors. Farmers continue to improve the way they apply pesticides to their crops and fields to minimise impact on the environment under the Voluntary Initiative. These efforts may have resulted in lower levels of pesticides in freshwater. However, the low levels of rainfall in autumn 2003 may also have resulted in fewer pesticides being washed into rivers.

The top nine most frequently found pesticides in freshwater environments were all widely used herbicides including Mecoprop, Isoproturon and Diuron. Of the top nine, only Chlorotoluron is rising in level, as it is increasingly used to control grass weeds in cereals as some weeds become resistant to other pesticides.

Although important for many industries, pesticides can cause serious environmental problems and can have devastating effects on our rivers and streams if used carelessly or not disposed of properly. Agriculture and horticulture account for more than 80 per cent of all pesticide use in England and Wales.

The report shows some positive results, in terms of protecting the environment from pesticides, but there are still areas of concern. Sheep dip chemicals are still a significant and widespread problem impacting on river ecology and causing freshwater samples to fail to meet environmental quality standards.

The main areas for concern are:

- dipping activities, especially in Wales and the north of England; and
- discharges from the wool processing industries centred on Yorkshire.

Andy Croxford, Environment Agency Pesticides Policy Manager, said: "The fact that the level of pesticides found in our rivers and streams has declined is encouraging, but there is no room for complacency. We cannot be certain whether the reduced levels are down to better use of pesticides, or how big a factor the dry weather has been.

That is why we will continue to monitor the situation closely and to work with farmers and other pesticide users, together with the wool processing industries, to build on the improvements that have already been achieved. We will be particularly targeting those involved in sheep dipping."

As part of the implementation of its Chemical Strategy, the Environment Agency works to protect the environment from pesticides by:

- monitoring pesticide usage and concentrations;
- investigating pollution incidents involving pesticides and taking relevant enforcement action;
- working with pesticide users to encourage best practice in the use of pesticides – such as the Voluntary Initiative whereby farmers are being asked to get their spray machinery tested, keep their pesticide training up-to-date and annually review their environment performance; and
- encouraging sheep farmers to adopt improved flock management practices to reduce their use of sheep dip.

MORE INFORMATION

Environment Agency. Tel: +44 (0)8708 506 506. The Pesticides in the Environment Report is available on the website: http://www.environment-agency.gov.uk/yourenv/eff/business_industry/agri/pests/?version=1&lang=_e

The Voluntary Initiative is a programme of voluntary measures drawn up by the crop protection and farming industries in consultation with several environmental bodies including the Environment Agency to improve practices, the use of technology, information provision and training. Web: www.voluntaryinitiative.org.uk

There's always a bigger fish...

Back page 17 **Always err on the safe side**

INNOVATIVE FORESTRY

Forestry goes high-tech

Satellite technology could be used to identify tree species and monitor the health of Galloway Forest Park. A group of forestry specialists met in Newton Stewart to discuss the latest satellite technology available to carry out the task. The representatives from Sweden, Forestry Commission Scotland and Durham University, are partners in the Euro-funded ForestSAFE initiative, which aims to create better and up to date information on the forest.

By using satellite technology, detailed maps of the forest can be generated by using heat signatures taken from the landscape. The technology allows foresters to check the condition of the trees and other plantlife on a massive scale. It may now be possible to identify problem plants such as rhododendron from space using this and other technology. This is great news for foresters as it helps them quickly identify key areas for action, without having to spend hours on foot looking for the problem areas.

Jimmy Wilson, Forestry Commission Scotland's head of forest planning and mapping in Galloway Forest Park said: "Forest technology is taking huge steps forward. Managing a large area such as Galloway is a major undertaking, so when technology arrives that enables us to look at the forest as a whole unit from above we must grab it with both hands.

"In the long-term the savings in time and money are significant and the benefits of being able to spot areas of potentially invasive species, or areas of good biodiversity, are also invaluable. The time saved also helps us concentrate on delivering other forestry benefits for people and the industry.

He added: "It's brilliant having the expertise of the other partners not only from here in the UK, but also from the ForestSAFE project leaders in Sweden. Their experience in the forest industry is world renowned and we have certainly gained a valuable insight into how they do it in other countries."

The final meeting and seminar of the project is planned for June 2005 in Sweden where the results of testing the technology will be widely available.

MORE INFORMATION

For more information on the project visit: www.svo.se/dokument/ac/kansli/ForestSafe/Web_UK/home.htm

RESOURCE EFFICIENCY

A brew to help the environment

The chance to make Britain a low carbon economy is a step closer with the introduction of BREW (the Business Resource Efficiency and Waste programme), a government initiative to help businesses become more resource efficient and make the most out of their waste.

Regional Development Agencies (RDAs) will play an important role in delivering this agenda receiving funding from BREW to coordinate resource efficiency and waste initiatives to meet the needs of business.

BREW will return landfill tax to businesses in the form of coordinated programmes which provide access to a wide range of support on resource efficiency and waste issues. This means £284 million over the next three years is available through groups such as Waste Recycling Action Programme, Envirowise and Carbon Trust. Regional Development Agencies will work with these groups and receive their own funding to ensure the projects are completed.

Richard Ellis, chairman of England Development Agency (EEDA) which holds the lead role for sustainable development issues, said: "The extra funds made available by the government will enable businesses to significantly contribute to a low carbon based economy.

"For this to happen we must work not just with companies but partner agencies and government departments. The structures are in place through integrated business support to make this easier but sustainable development should not be taken for granted. For the initiative is an investment in our future and will enable businesses to both save money and contribute to long term protection of the natural environment."

Environment Secretary Margaret Beckett said: "Every business, big and small, can benefit from this package of initiatives which have been designed to move towards more sustainable production practices.

"If businesses use these services they should be able to recoup the increasing costs of landfill by reducing the amount of waste they send to landfill as well as driving down energy use – all of which should help them become more competitive through cash savings and increasing resource efficiency."

MORE INFORMATION

Web: www.defra.gov.uk/environment/waste/BREW

GLOBAL WARMING

UK joins *Methane to Markets Partnership* to cut emissions

To help the fight against global warming, the UK has joined a US-led partnership that seeks to cut global methane gas emissions. The Methane to Markets Partnership, launched in Washington, aims to promote methane recovery and use, as a clean energy source to foster sustainable economic growth.

It will focus, through sector working groups, on schemes such as landfill gas to energy projects, methane recovery at underground coal mines and improvements in natural gas system operations. It aims to reduce net methane emissions by up to 50 Mt of carbon equivalent by 2015.

Environment Minister Elliot Morley welcomed the US proposal, saying it was a valuable initiative in the global campaign to reduce greenhouse gases, while stressing that tackling carbon dioxide (CO_2) emissions remained the single largest challenge in combating climate change. Carbon dioxide emissions in the UK in 2002 were 12 times higher than methane emissions.

"Methane is one of the six greenhouse gases covered by the Kyoto Protocol and is second only in importance to CO_2 as a contributor to global warming. We are happy to join others in an international partnership, comparable to the international partnerships on hydrogen and carbon sequestration, which both involve the US and the UK. We will continue to use every opportunity to cut greenhouse gases and help with UK and international emissions reduction targets."

Mr Morley said the UK had an excellent record on lowering methane emissions. Latest figures show that the UK has reduced its methane emissions by 43 per cent over the last 12 years. This is primarily due to cuts in emissions from the disposal of solid waste on land and from coal mines.

"We look forward to contributing our experience to the partnership, as well as learning from it. Cooperation in multilateral partnerships is a good way to help countries find effective ways of reducing emissions. Such partnerships are a valuable complement to international action through the United Nations Framework Convention on Climate Change, which is the main forum for tackling climate change globally."

CONTACT

Defra, Nobel House, 17 Smith Square, London SW1P 3JR. Tel: +44(0) 8459 335577. Web: www.defra.gov.uk

EQUIPMENT RECYCLING INITIATIVE

First pan-European compliance scheme for electronic waste

Four leading manufacturers of electrical and electronic appliances, Braun, Electrolux, HP and Sony have today set up the first ever pan-European take back and compliance scheme for waste from electrical and electronic equipment (WEEE). To administer the pan-European scheme, the companies have today established the limited company, European Recycling Platform (ERP), which is registered in Paris, France. The scheme, operating as the ERP WEEE Compliance Scheme, has been in development since December 2003 and is in response to the European WEEE Directive which is due to come into effect across Europe in the second half of 2005.

"Our objective is to create the most cost efficient WEEE take back compliance scheme and to stimulate competition between WEEE take back systems in all EU countries," says Hans Korfmacher, assigned president of the ERP company. "We anticipate that the customers and consumers of each of the companies involved will benefit from the cost efficiencies we will achieve through the ERP."

ERP will outsource all operational activities, including recycling, logistics and the administrative work to manage the operational activities to at least two general contractors. "ERP will take back WEEE from municipal and other collection points, such as retailers, in order to provide the best service for our customers and to ensure compliance for ERP Members." Korfmacher explains.

ERP WEEE Compliance Scheme will focus on operations in Austria, France, Germany, Italy, Poland, Spain and the UK and will apply for any necessary permits as and when the legislation and procedures become clear in each individual market. Additional countries will be considered at a later stage. Based on the four founders, ERP represents an estimated 15 percent of the pan-European WEEE take back market. Negotiations are taking place with a number of other companies interested in becoming ERP Members. Membership of ERP will be limited to avoid ERP establishing any dominant position.

MORE INFORMATION

Web: www.erp-recycling.org

GRAFFITI MANAGEMENT

Eco-friendly answer to illegal graffiti menace

A new company 'graffitifree' based in Ilkley, Yorkshire represents a completely new concept in professional graffiti management. The Company aims to target anti-social and illegal graffiti with its advanced range of environmentally safe removal and protection products. It is also offering businesses, schools, councils and other organisations a 24 hour mobile 'graffiti clean-up' call-out service to tackle the menace nationwide.

Part of the Bio Natura Group - a leading specialist UK supplier of natural cleaning products - graffitifree represents a completely new concept in professional graffiti management.

Graffitifree service van on 24 hour call out (top); graffitifree is available in an advanced range of environmentally safe removal and protection products, covering all of your graffiti removal requirements

Its comprehensive and highly effective range of graffiti control products is specially formulated to be biodegradable, non-toxic and harmless to the surrounding environment and the public.

At the same time, the impressive line-up of four high energy cleaning solutions and three prevention coatings offers maximum versatility for dealing with all known types of graffiti on all surfaces.

Sam Labadie, business development manager for the Company, says: "One of the challenges facing many urban areas is the proliferation of graffiti - tags, symbols, racist and other offensive statements, scrawls and even illegal marketing campaigns. Councils and businesses right across the UK are working round the clock to eradicate graffiti as soon as it goes up.

"The chemicals many removal teams use can cause damage to the natural ecosystem. Where strong solvents are used, time-consuming precautions make the operation slow and tedious. There is always the risk that dangerous chemicals could destroy nearby plants, animals and habitats, or find their way into rivers, streams and even the human food chain."

She explains that graffitifree's new cleaning products and protective coatings are safe to handle and wash away after use where this applies - a factor which is particularly important when cleaning community areas such as schools, parks and shopping precincts where protecting the public from chemicals is vital.

The Company's seven new patented products, which are available directly from the company and are also used by their fully equipped, expert mobile service teams, comprise:

- **graffitifree 1** - a general purpose removal liquid for brick and stone, concrete, aluminium and other metals, plastic, polycarbonate and perspex, wood, glass and painted surfaces;
- **graffitifree 2** - a high strength removal liqua-gel for stubborn, heavily marked graffiti on brick, stone, concrete, metals, wood and glass;
- **graffitifree 3** - a liquid for removing 'ghosting' where ink or paint has soaked into porous surfaces like brick, render and stone. Highly effective for marker pen graffiti;
- **graffitifree 4** - handy disposable wipes for cleaning non-porous surfaces like aluminium and other metals, plastics, polycarbonates, painted surfaces, glass, some woods, tiles and whiteboards;
- **graffitifree 5** - a sacrificial, surface protective coating for indoor use, which prevents graffiti from fully bonding and is easily washed away;
- **graffitifree 6** - a permanent protective coating to speed up graffiti removal from stone, brick, concrete, metals, wood, polycarbonates, glass, tiles and painted surfaces; and
- **graffitifree 7** - a permanent non-stick protective coating that will stop graffiti and flyposters bonding with the surface. They are then easily washed away with soap and water.

Graffitifree has also

launched a convenient, easy-to-use 'First Aid Kit' which is available to customers who wish to deal with graffiti emergencies themselves. The kit, containing handy quantities of all removal products and one protective coating, is ideal for schools, colleges and small businesses.

Independent tests carried out by 4-Rail, which assesses new products for use in transport applications, have proved conclusively the effectiveness and safety of products in the graffitifree range.

Tested on tough inks and paints, and on surfaces commonly subjected to graffiti, their performance in comparison with a number of competitors' products was outstanding for both effectiveness and safety. The testers' report stated, for instance: "The lower health hazard presented [by graffitifree 1] is a benefit" and concluded "there are clear advantages that end-users could obtain by using this product."

The preventative sacrificial coating [graffitifree 5] also easily outperformed rival brands and the assessors said the Company's products met the stringent requirements of the transport industry, adding that they provide "very good protection against graffiti ... in interior and exterior situations," and "out-performed the reference coating which is of similar cost.'

CONTACT

graffitifree, 25 The Grove Promenade, Ilkley, West Yorkshire, LS29 8AF. Tel: +44 (0)800 612 0430 Fax: +44 (0)1943 816818 E-mail: sales@graffitifree.co.uk Website: www.graffitifree.co.uk

CROP SPRAYERS

Interactive sprayer control systems at your fingertips

Knight Farm Machinery is now offering two types of interactive fingertip control systems (FCS) on its crop sprayers.

The full version which is fitted as standard on Knight's latest self-propelled machines, provides interactive control of all functions including the electro-hydraulic systems, while the alternative simpler version controls only the spraying and washing out systems.

With the full FCS system there are two control panels - one on the outside of the sprayer and one inside the cab - and also a joystick in the cab. All three are fully interlinked, so operators can control all functions from all positions with full logic and without having to re-set one switch panel before using another. The joystick only has five buttons to control the sprayer boom sections and the hydraulics which is far fewer than usual and makes it easier to use.

The simpler version retains the interactive character of the full system for spraying and washing out via the two interlinked control panels but there is no joystick and the electro-hydraulic functions are operated conventionally.

The FCS systems work with the company's advanced plumbing system, which was introduced two years ago in order to reduce the amount of pipework on the sprayers. FCS takes this process a stage further by using electric valve actuation by means of touch pads, allowing valves to be located in the best place on the machines because operators do not need to reach them. This reduces pipe work to a minimum and also makes the operator's work far more convenient.

Knight's full fingertip control system (FCS) has two control panels and a joystick, all interlinked to provide full logic

Fail-safe features can be programmed in to ensure correct valve combinations are always selected. For example, when the operator selects the 'spray on' function, even the unrelated valves are re-set to the optimum condition for spraying.

By using multiplexing, which allows multiple functions to be executed through a single set of wires, Knight has minimised the amount of wiring and also made it possible for several valves to be operated by a single button.

The system also makes the washing out procedure easier for operators. The onboard water supply can be easily split into three rinses to maximise cleaning and minimise retained chemical, and operators can pump clean water into the main tank, rinse it out and spray out the washings without even stopping the vehicle.

CONTACT

Knight Farm Machinery Ltd, Wireless Hill, South Luffenham, Oakham, Rutland, LE15 8NF. Tel: +44 (0)1780 722200 Fax: +44 (0)1780 722201 Website: www.knight-ltd.com

ROBOTIC WELDING

Robot cell has equivalent productivity to three welders

Robotic welding is more than three times as productive as any manual welder, according to Industrial and Agricultural Engineers (IAE), a major European manufacturer of agricultural and equestrian equipment as well as steel railings and gates.

Based in six locations around Leek, Staffordshire, the company took delivery of its first automated welding system in July 2004, comprising two Motoman 6-axis robots configured for MIG welding and a 3 m wide, twin-station servo positioner with integral glare shield that allows production to continue while the next parts are being loaded.

Despite IAE having more than 500 mild steel products that need welding, batch sizes are high for some stock items, especially in the run-up to the winter season. For example, a year's production of 650 sheep cradles generates 2,000 separate items for welding, while 700 sheep round bale feeders require 1,400 ends and 2,100 ladders to be welded. These were among the first to be put through the Motoman cell which is set up to operate continuously for two to three days on such long-running jobs.

Works Manager, Andy Ball said, "We have trouble finding skilled welders in this area yet we need a lot of staff to fulfil our production requirements. Nearly 20 people weld gates and other stock items at our Barnfields factory in Leek where the robotic cell has been installed. There are a further 40 welders producing special gates, doors and troughs plus scheme jobs such as cattle markets at our Macciesfield Road plant - and these are just two of six locations currently being consolidated onto a new, purpose-built site at Longton, Stoke on Trent.

"We have 10 hectares of manufacturing and storage and have just built a three hectare stock yard at Stoke capable of holding £2 million of products. When it is on stream, it will be full in September at the start of a season with production running flat out through to the following April to keep stock levels topped up. We sell 3,000 gates alone every week at the peak, which gives an idea of the scale of our operation. We see round-the-clock robotic welding as playing a major part in our production strategy going forward, although there will always be a place for good manual welders to carry out smaller batch work and special tasks."

The Motoman twin-robot welding cell in action at Industrial and Agricultural Engineers (IAE)

Mr Ball went on to comment that accuracy and repeatability of products produced in the robotic cell are superior to those welded by hand. However, the quality of fit-up must be better for automated welding. To this end, IAE has also invested in an automatic saw and a CNC laser tube-cutting machine from BLM-Adige (UK). Not only are the resulting products within closer tolerance but there is also minimal porosity in weld beads laid down robotics. The result after galvanising is a better cosmetic finish, which is important even in the agricultural sector, especially when supplying prestige projects like cattle markets.

A further advantage of automating the welding function is the small footprint of a robotic cell compared with that of manual welding benches needed to yield equivalent output. Automated production also results in a cleaner working environment, as efficient fume extraction can be strategically located above the robots,

Manual welding tends to be a monotonous job, especially for large-batch production such as at IAE, where a welder might be deployed on a popular standard product for weeks if not months on end. Fewer and fewer people are prepared to do this type of work so it is likely that robots will increasingly fill the need for additional capacity.

IAE is a privately owned, 460-employee company chaired by David Klucznik, son of the founder. Business has doubled in the past 10 years, despite BSE and the foot and mouth crisis, and the manufacturer claims to have won market share. Adoption of advanced manufacturing disciplines such as robotic welding and CNC machining look set to increase the firm's lead still further.

CONTACT

John D'Angelillo, Managing Director, Motoman Robotics (UK) Ltd, Unit 2, Johnson Park, Wildmere Road, Wildmere Industrial Estate, Banbury, Oxfordshire, OX16 3JU. Tel: +44 (0)1295 272755 Fax: +44 (0)1295 267127. E-mail: johndangelillo@motoman.co.uk Web site: www.motoman.co.uk

MOTORS

Baldor launches large single-phase motors on UK market

Baldor has expanded its presence in the UK motor market by launching a range of large metric-mounting single-phase AC induction motors primarily intended for farm and agricultural applications. The motors are available exclusively from the E. Bennett (Electrical) Company - one of Baldor's UK distributors - and span a power range from 2.2 to 5.5 kW.

The range comprises four models, with IEC frame sizes of D100L, D112M, D132S and D132M, and power ratings of 2.2, 3.0, 4.0 and 5.5 kW respectively.

The motors are capacitor start/capacitor run models, designed for direct-on-line operation from standard 240 V, 50 Hz single-phase mains supplies. They are all 4-pole designs, intended for running at 1425 rpm and have very low no-load current ratings, making them particularly economic for applications involving lengthy idle times. The 2.2 kW model, for example, requires just 1.8 A at no load, and even the largest 5.5 kW model only requires 8.92 A.

The 2.2 and 3 kW models feature very low starting currents, enabling them to be run from a standard domestic supply. This reduces installation time and costs to an absolute minimum, making the motors especially attractive to customers seeking a speedy replacement for a failed unit. The motors' combination of low starting and running currents also make them suitable for a variety of hobbyist and home business applications. The 2.2 kW model, for example, has a full load current of 12.5 A and can be plugged straight into a standard 13 A socket, making it ideal for use with small lathes or machine tools. Another suitable application is driving the compressor in the refrigeration plant of an ice-cream van overnight, to recharge the freezer.

Baldor's range of large metric-mounting single-phase AC induction motors are primarily targeted at farm and agricultural applications

The 4 and 5.5 kW motors also feature a low starting current facility. They are equipped with combined 240 V/480 V windings and are designed specifically to be compatible with industry standard series/parallel starters for single phase motors, which keep the starting current down to twice the full load current. The 4 kW motor has a full load current of 24.2 A, while the 5.5 kW model requires 30 A.

All four motors feature Totally Enclosed Fan Cooled (TEFC) enclosures with an IP55 rating, and are suitable for continuous operation at ambient temperatures up to +40ºC. Constructed from heavy gauge rolled steel with an epoxy paint finish, the motors are particularly suitable for the type of arduous, low-maintenance environment that is characteristic of farm and agricultural applications.

Built-in condensation drains help minimise maintenance, and a manually re-settable thermal cut-out protects the motor against overload conditions.

The cut-out is incorporated in the conduit box to guard against the ingress of water and dust. Long-term reliability is further enhanced by the use of ball-bearing races loaded with advanced Polyrex EM grease which provides extended lubrication life and superior resistance to washout, rust and corrosion.

Baldor's large metric-mounting single-phase motors are ideal for applications on outlying farms and remote agricultural installations, where the costs of installing a three-phase supply could prove prohibitive.

Typical applications include milk pumps, conveyor and hopper feed systems, crop dryers and grain stirrers.

CONTACT

Mark Crocker, Baldor UK Ltd, Mint Motion Centre, 6 Bristol Distribution Park, Hawkley Drive, Bristol, BS32 OBF. Tel: +44 (0) 1454 850000 Fax: +44 (0) 1454 859001 E-mail: mcrocker@baldor.com Website: www.baldor.com

TOOL CARRIERS

Approved: Mercedes-Benz newly designed Unimog

Mercedes-Benz UK has launched the fully approved agricultural specification for its Unimog implement carrier range, the U300, U400 and U500.

The Unimog range now has a range of additional built-in safety factors for off-road operations, along with a pick-up hitch, rear linkage and options for front and rear pto: all developed and manufactured by Mercedes-Benz Unimog in the UK.

Mark Hopkins, Director of Unimog in the UK, said the new agricultural specification Unimog has undergone and passed the rigorous Silsoe Testing standards. A special steel frame has also been designed, manufactured and fitted to his specifications so that the cab area now meets the Organisation for Economic Co-operation and Development (OECD) Code 4 specification.

"Financial pressures on farmers are growing and we are now able to offer a fully approved agricultural vehicle capable of normal road speeds as well as working on land with proven fuel efficiency. Evidence from trials has shown fuel consumption to be far in excess of any other fast tractor," Mark says.

"Health and safety was the prime motivator. Even with the renowned rigidity and durability of the Unimog range, it was important that we were able to offer a vehicle to the agricultural industry designed for its purpose. The rollover protection frame is wrapped around the existing, modern, single mould cab. This not only allows the cab to tilt, but it also provides more areas for attaching equipment as well as retaining the inherent comfort of the cab.

"Our target market is the agricultural contracting industry. We have recognised the trend for farmers to combine haulage activities with their agricultural expertise and we now have the ideal vehicle for their business," Mark adds.

The new Agricultural Specification Unimogs U300, U400 and U500 incorporate a range of optional benefits previously unavailable on Unimogs. These include VarioPilot - the ability to switch driving position from right to left or left to right to suit conditions in less than a minute - and a new auto-shift gear box.

The U400 and U500 are also available with Central Tyre Inflation, a system developed by Mercedes-Benz to deflate or inflate all the tyres from within the cab. This allows the Unimog to spread its load by widening the 'footprint' off-road and then to re-inflate for driving on roads.

Emissions and noise levels have been checked to ensure that the Mercedes-Benz Euro 3 diesel engines are as environmentally friendly as possible. The U300's four-cylinder engine produces up to 135 kW; with the six-cylinder U400 and U500 producing up to 172 kW and 208 kW, respectively. The agricultural specification also has up to 24 forward and 22 reverse gears.

"This may be directed towards the agricultural industry but it is still a Unimog with all the benefits that involves," Mark Hopkins adds. "We are now able to offer a modern, comfortable, easy to drive and operate vehicle that has the ability to work as hard for agricultural contractors as it has already proven in a wide range of other industries."

CONTACT

Mark Hopkins, Director, Unimog UK. Tel: +44 (0)1908 245761 Fax: (0)1908 245107 E-mail: mark.hopkins@daimlerchrysler.co.uk Website: www.daimlerchrysler.co.uk

HARROWS

Maschio's heavy duty power harrow

Maschios DM Rapido Plus from RECO has additional protection on the underside circular blade holders and stone deflectors between the alternate rotors

A new Maschio's heavy-duty power harrow designed for use in the most arduous conditions, particularly stony land, is now available from UK distributor Rustons Engineering.

On the DM Rapido Plus the gear trough has a bolted second skin to protect the underside of themachine and deflectors to stop stones jamming between adjacent rotors. Also, the circular shape of the blade holders prevents stones being carried through the gear tray and working parts.

Spring-loaded side clod boards also help to avoid damage and keep clods in contact with the blades to produce a better finish. The DM rapido Plus has many of the same features as the standard DM Rapido machines, including quick-change clades, multi-speed gearboxes with through drive and reinforced frames and headstocks.

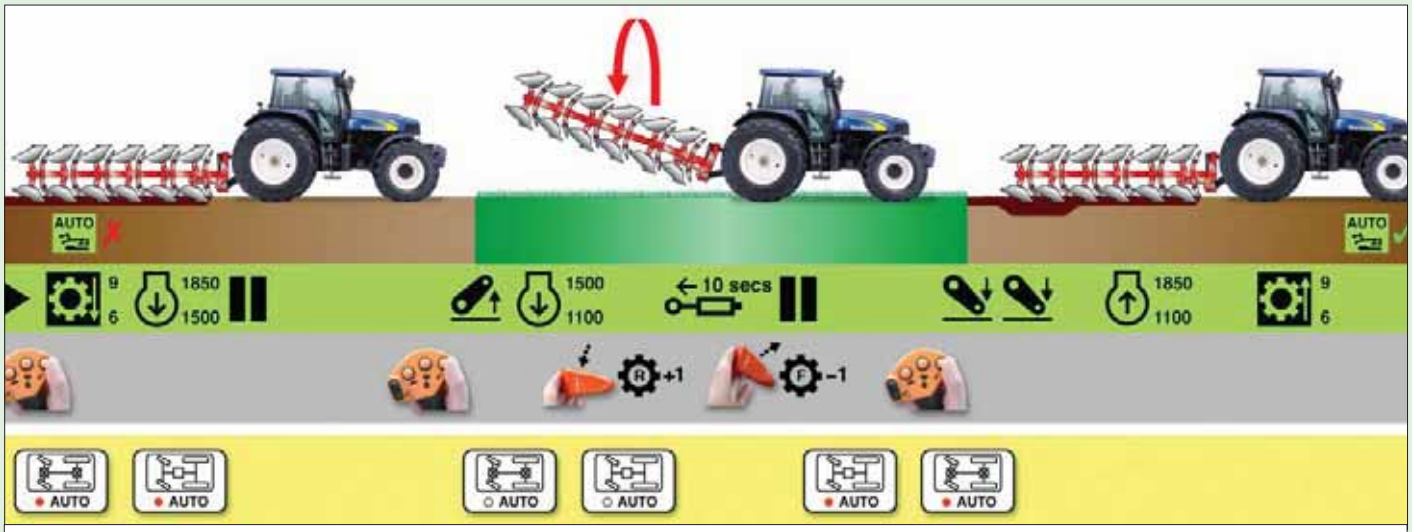
The machines are available in 3, 3.5 or 4 metre working widths and are suitable for use with 90 kW to 134 kW tractors. All gear try components are covered by a two-year warranty.

A three metre Maschio DM3000 Plus with a crumbler roller currently costs £8075.

CONTACT

Rustons Engineering Co. Ltd, Brampton Road, Huntingdon, Cambridgeshire, PE29 3BS. Tel: +44 (0)1480 455151 Fax: +44 (0)1480 52116 E-mail: sales@reco.co.uk Website: www.reco.co.uk

New Holland TM - improvements in productivity



Continued improvements taking on board operators suggestions, means that New Holland's TM has never been in better shape

The TM's auto systems, HTS, Terralock, programmable reverse function and engine management, work together to drastically reduce manual intervention to just two operations per headland turn.

Continuous improvement to the New Holland TM has enabled this product range to strengthen its position in the mid-high horsepower sector, offering both excellent value for money and features that buyers want. A two year or 2000 hour manufacturer's warranty is also available on TM175s and 190s purchased before October 31st, complementing an impressive new package.

The long wheelbase TM175 and TM190 models enjoy the majority of the enhancements, which include the new 40 km/h Eco Drive and upgraded Headland Turn Sequencing, while all Power Command™ models feature transmission improvements.

The new Eco Drive 40 km/h option for the Power Command™ full powershift transmission uses a software-limited version of the TM's 19x6, 50 km/h transmission to offer travel speeds of up to 40 km/h at much reduced engine speeds. Not only does this result in less noise and reduced engine wear, there is also the opportunity to make significant fuel savings.

The TM175 and TM190 receive a major upgrade to Headland Turn Sequencing (HTS). This powerful system already allows the operator to automate gear changes, engine speed and rear linkage movements but now it can also be used to manage control of the TM's electro-hydraulic remote valves (of which up to five can now be specified). Programming the system remains straightforward with a simple record and play back mode.

HTS is further enhanced by a new Auto pto control system. The pto can now be set to disengage when the rear linkage is raised and restart when it is lowered. The pto remains protected by the TM's automatic Soft Start feature for smooth, progressive application of power. Four-wheel drive and front and rear differential locks are automated via the standard Terralock system.

All models equipped with Power Command transmissions, TM140 to 190, get another improvement to make life easier for the tractor operator. Following feedback from users that twelfth gear was sometimes too high for the tractor to pull away with a heavy load on steep slopes, the TM's Auto Transport mode has been extended by three gears to allow automatic changes between ninth gear and top gear. Starting in twelfth gear will remain the default Auto Transport setting, while pressing the selector button twice will allow starts to be made from ninth when required.

With impact resistant mirrors also now being offered across the TM Series, New Holland has lived up to its aim of keeping the features that operators like and adding new ones that they asked for. Indeed, it's true to say that the TM has never been better.

MORE INFORMATION

New Holland. Website: www.newholland.com

Sustainability in Engineering Design

Sustainable engineering design aims to meet customer's expectations, comply with legislative demands, work within a finite environment and still provide economic returns. Financial sustainability is necessary.

This conference looks to explore these topic areas and propose ways of achieving a sustainable future.

IAgrE Annual Conference

March 9th 2005

Venue:

Harper Adams University College
Shropshire

Innovation, science and technology in **Ag**riculture and the **R**ural **E**nvironment

Outline Programme *

Morning Papers

- Opening address
- Sustainable Business
- Sustainable Design

Lunch and Awards Ceremony

Afternoon Papers

- End of Life Policy
- Sustainable Engines
- Sustainable Materials
- Design Processes and Systems
- Design for Local Manufacture

Parallel Specialist Papers (pm)

- Building Materials
- Waste Management
- Soil Sustainability in a Decoupled Environment
- Horticultural Buildings
- Reed Bed Technology
- Food Chain Waste Limitation
- Energy Crops

* Subject to change

IAgrE

The professional body for engineers, scientists, technologists and managers in agricultural and allied industries including food, forestry and biological systems

IAgrE is a licensed body of the Engineering Council[UK] and a founding constituent body of the Society for the Environment

For further information, please contact the Convenor
G.F.D.Wakeham
gwakeham@harper-adams.ac.uk
OR
IAgrE Secretariat:
conferences@iagre.org

IAgrE
West End Road
Silsoe
Bedford
MK45 4DU
t: +44 (0)1525 861096
f: +44 (0)1525 861660

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