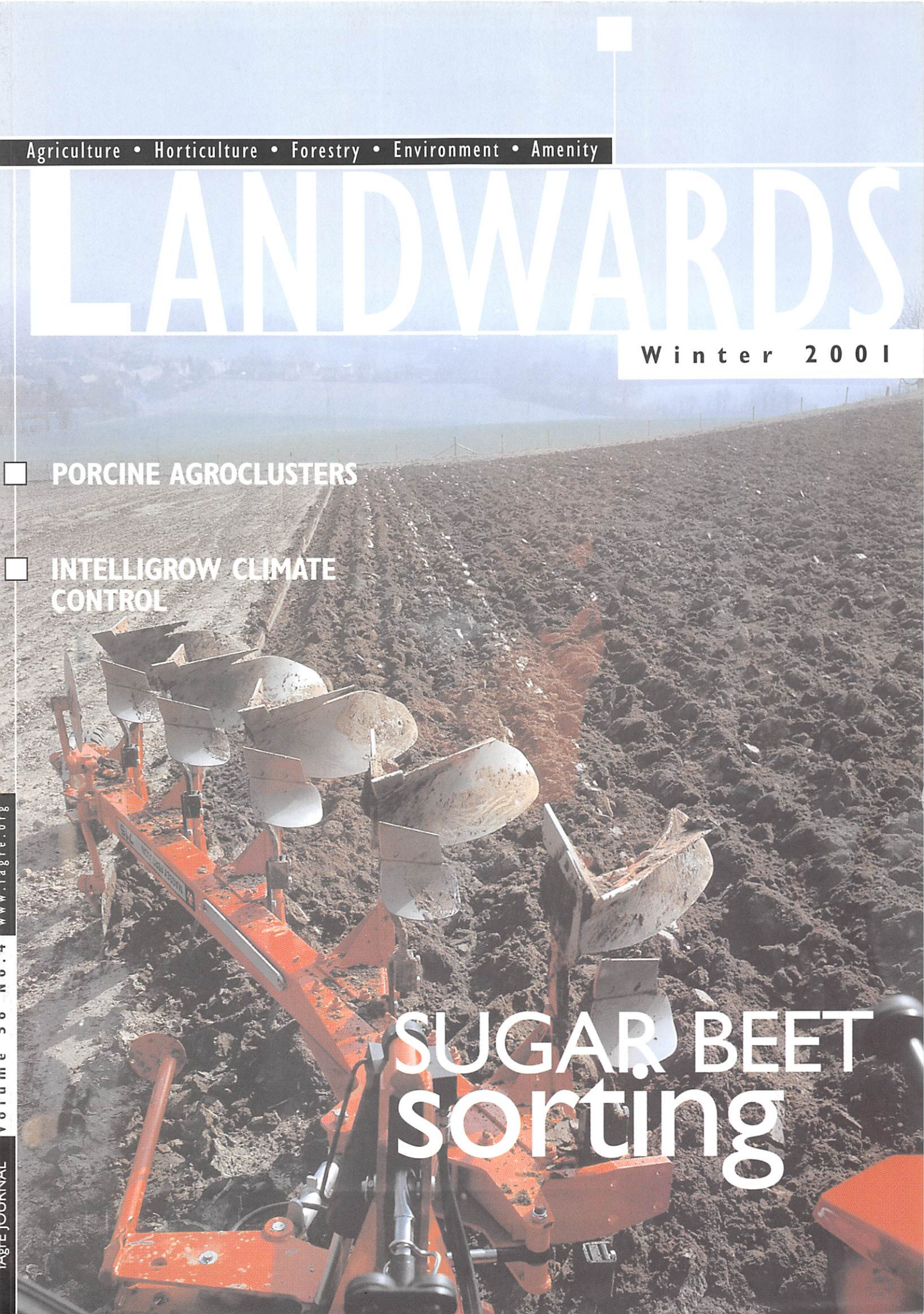
Agriculture • Horticulture • Forestry • Environment • Amenity

LANDWARDS

Winter 2001



PORCINE AGROCLUSTERS

INTELLIGROW CLIMATE CONTROL

SUGAR BEET sorting

IAgrE JOURNAL Volume 36 No.4 www.iagre.org

Volume 56 No 4, **Winter 2001**

LANDWARDS

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

Editor
Eur Ing Prof Brian D Witney
PhD CEng FIMechE HonFIAgrE MemASAE FFCS
LAND TECHNOLOGY LTD
33 South Barnton Ave,
Edinburgh, EH4 6AN
Tel/Fax: 0131 336 3129
E-mail: landwards@landtec.co.uk
Website: http://www.landtec.co.uk

Advertising
All enquiries to the Institution of Agricultural Engineers
Tel: 01525 861096
Fax: 01525 861660

Origination: David King

Printing: Barr Printers Ltd

Price £16.00 per copy
subscription £52.00 (post free in UK)

Publisher
Landwards is published quarterly by:
Institution of Agricultural Engineers,
West End Road, Silsoe,
Bedford, MK45 4DU
Tel: 01525 861096
Fax: 01525 861660
E-mail: secretary@iagre.org
Website: http://www.iagre.org

President
Geoffrey J H Freedman
BSc CEng FIAgrE

Chief Executive & Secretary
Christopher R Whetnall
IEng MIAgrE MemASAE

CONTENTS

Feature Articles

News and Comment

Front cover: *Ploughman's view from the MF 710 tractor (photo: AGCO Ltd)*

ISSN 1363-8300

INTELLIGROW — A NEW CLIMATE CONTROL CONCEPT

Jesper Mazanti Aaslyng, Niels Ehler, Janni Bjerregaard Christensen, Eva Rosenqvist and Carl Otto-Ottosen

BIO NOTE

Bionote

This paper was presented at the IAgrE Annual Conference entitled 'Information Engineering for Agriculture and Horticulture' held at Silsoe Research Institute, Bedford on 15 May 2001. Jesper Mazanti Aaslyng, Niels Ehler and Janni Bjerregaard Christensen work at the Royal Veterinary and Agricultural University, Copenhagen. Eva Rosenqvist and Carl Otto-Ottosen work at the Danish Institute of Agricultural Sciences at Aarslev.

Introduction

During winter, light level is far from adequate for optimal plant production in the Northern Hemisphere. As light is the energy source driving photosynthesis and growth, other environmental factors cannot be utilised efficiently under low light conditions. Irradiance level is therefore the most growth-limiting factor during winter. Under low irradiance conditions, energy use can be reduced, since increased temperatures cannot be used efficiently for growth. By contrast, if irradiance level is increased, plants are able commensurately to utilise both higher temperatures and CO_2 concentrations. This balancing act is accomplished with a new form of dynamic greenhouse climate control concept called IntelliGrow, with heat and CO_2 supplied only in periods when the plants can make optimal use of them.

The project is a collaboration between the Royal Veterinary and Agricultural University, the Danish Institute of Agricultural Science, the Danish Association of Horticultural Producers and DGT-Volmatic, and is funded by grants from the Danish Energy Agency and the Danish Association of Pot Plant Producers.

Overview of the concept

IntelliGrow controls greenhouse climate in correspondence with both outside irradiance and microclimate of the plants inside. Built into the system are mathematical models for biological, economic and physical phenomena. The microclimate can therefore be optimised to ensure optimal plant production, with energy use taken into consideration.

IntelliGrow is designed to plug in to a standard environmental-control computer (ECC). The system comprises both hardware and software (Fig. 1). IntelliGrow is integrated with a standard ECC system (LCC1200, DGT-Volmatic, Vallensbaek, Denmark) through the BipsArch application interface. The BipsArch interface enables the control application to communicate with a generic climate computer by supplying routines and rules for reading information from the ECC and giving the application the ability to change the set points in the ECC. IntelliGrow obtains climate information from the ECC's standard sensors through BipsArch and from a number of sensors connected to the personal computer (PC) using a data logger. Based on the climate data, IntelliGrow calculates set points, transfers the set point

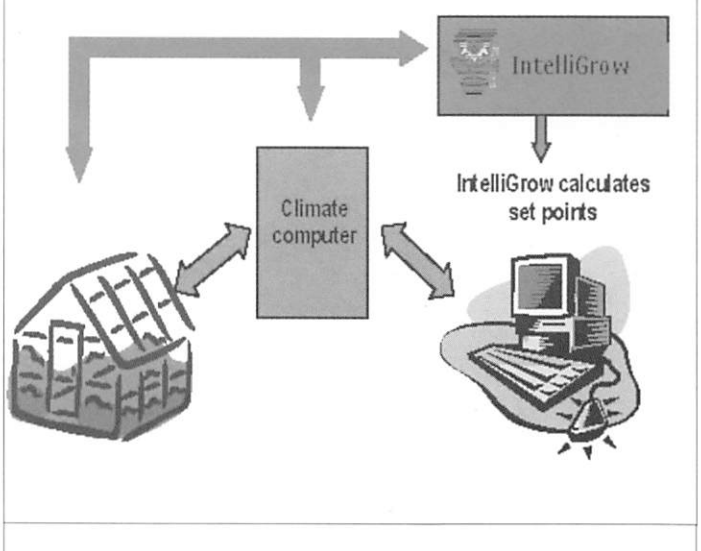


Fig. 1 Overview of the component based climate control system

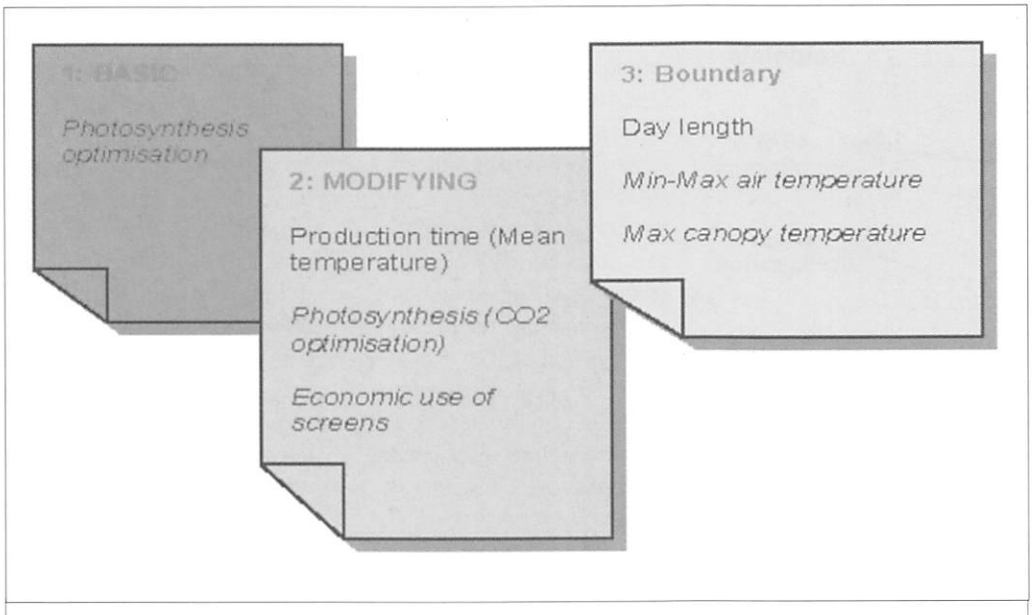


Fig. 2 Examples of components, those shown in italics being used in the experiments described in the paper.

through BipsArch to the ECC, and performs actual climate control.

The component concept

IntelliGrow is constructed of individual software building blocks. These incorporate the knowledge generated by many years of research and represents one way of distributing this knowledge and rendering it useful. Components can be constructed to meet the specific requirements of the individual nursery, and very advanced processes can be controlled. Each component handles a biological, physical or environmental control task. A component, implemented as a structural program part, contains information about necessary input (models, rules, etc.) and output data. When the main program is running the component, its input is obtained from a common database table, new set points and check values are calculated, and the set points are written to a shared set-point table. Modifying existing components or adding new ones can expand system functions.

Components are divided into three priority groups so that several components can coexist: basic, modifying and boundary components (Fig. 2). The basic components calculate the base climate values, such as set points for temperature and CO_2 concentration. The base set points can be changed using the modifying components, which in turn ensure that the plants develop in the way desired and in the specified time, and that the environmental load is maintained at a satisfactory level. The boundary components handle climate control restrictions that always have to exist; for example, they ensure that correct night length and minimum and maximum temperatures are

The components are treated hierarchically in the application, starting with the most basic, followed by the modifying and boundary components, and are also calculated hierarchically within each group.

Information is exchanged through a set of Paradox tables (Fig. 3). Each minute, the climatic parameters are measured and stored in a minute-based data table. At noon, the data are used for calculating daily values, which are then stored in a daily-based data table. The components exchange information through a set-point table containing information on all set points generated by the different components. The set-point values might later be used by the modifying components. If, for example, an average temperature component is included in the control set-up, the temperature set point can be adjusted to ensure the specific average temperature. A standard dialog can be used to set-up the component, overview the calculations, check the different input and output values, see messages and graphically monitor the work of the component.

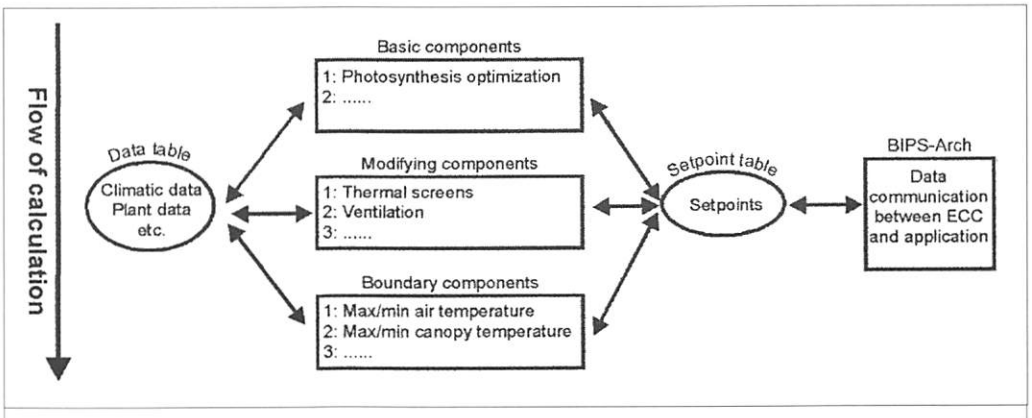


Fig. 3 Diagram showing the flow of calculation and the exchange of information from component to component using a set of Paradox tables.

The main components

Photosynthesis optimisation

The optimal set points for temperature and CO_2 are determined from a model of the photosynthesis (Hansen *et al.*, 1996). From this, the system generates a two-dimensional array of photosynthesis rates as a function of a range of chosen temperatures and CO_2 concentrations at a fixed irradiance. The array is calculated from a lower (15°C) to a higher (30°C) temperature limit in steps of 1°C, and from a lower (300 ppm) to a higher (2000 ppm) CO_2 concentration limit (Fig. 4). The maximum photosynthesis at any given

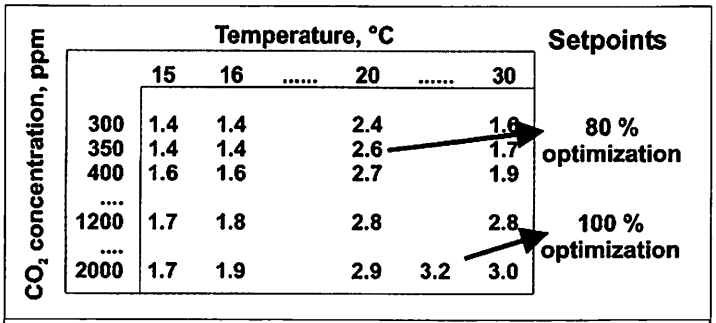


Fig. 4 Example of a two-dimensional array of leaf-photosynthesis in mg $m^{-2}s^{-1}$ as a function of temperature and CO_2 concentration at a certain level of irradiance.

level of irradiance is defined as 100% optimisation. Searching through the array, other levels of optimisation can be found; for example, 80% or 90% of optimal photosynthesis. The lower and higher limits of temperature have to be adapted to suit a particular crop, but the limits will always be lower and higher than the current standard.

The screen component

Energy savings can be obtained by adjusting temperature to the current irradiance, but also by controlling thermal screens and vents. The economic optimum time for withdrawal of thermal screens at dawn is determined using a thermal screen simulation system (Ehler, 1998). With this system, the energy saving resulting from keeping the screens on (E_s, £ m^{-2}) is balanced against the production loss (L_p, £ m^{-2}) caused by the decrease in irradiance as a result of the shading effect of the screens.

The system accumulates values of L_p and E_s. When the accumulated values of the production loss exceed the accumulated values of the energy savings, the screen is removed. A similar calculation is used as a criterion for closing the screens in the evening.

As irradiance is normally the limiting factor for plant production in the northern hemisphere, the use of screens in daytime is limited as much as possible by the screen component. During the experiments, the screens were not actually used for shading at all, resulting in remarkably few heat damages. For commercial use, however, the screen has to be used to some extent.

The average temperature component

To ensure the right production time, the system incorporates a mean temperature component that calculates the mean weighted temperature 5 days (or any other number of days) back in time. The furthest back is weighted lower than the most recent. If mean temperature is below the set point, the minimum temperature is increased from 15°C to the necessary level. No adjustment is made if the mean temperature is higher than the set point. This component is particularly important in a dark period during mid-winter. Here the mean temperature may often be too low, resulting in restricted plant development.

The maximum temperature component

To increase the amount of solar energy harvested by the greenhouse construction, the operation of ventilation windows is delayed significantly compared with standard procedures. The highest possible ventilation limit for the chosen plant species is used. This is implemented as a fixed set point for opening the ventilation windows, and results in a very warm greenhouse climate on sunny days obtained solely by solar irradiance. In our experiments, the maximum air temperature set point was 30°C.

If the temperature rose to above the ventilation set point, the temperature set point was lowered to 24°C and the ventilation set point to 25°C. When the air temperature reached this temperature, the set points were reset to the values determined by the other components, with a ventilation set point at 30°C. This was done so that CO_2 could be injected for as long as possible. If 30°C had been used as the set point, the windows would have opened and closed throughout a major part of the day, resulting in a shorter time with possible CO_2 injection.

As the use of screens in daytime is limited as much as possible by the screen component, and temperatures are allowed to increase to a very high level, the risk of heat damage to the leaves has to be addressed. Measuring the average canopy temperature with infrared thermocouples does this. If the average canopy temperature increases to >28°C, the windows open, and if it increases to >32°C, the shading screens are drawn 90% on.

It has to be kept in mind that the components are treated hierarchically. If the photosynthesis components (a basic component) calculate the temperature set point to 17°C, the max temperature component (a modifying component) will not open the vent if the temperature in the greenhouse is below the ventilation limits.

The resulting climate

This type of control results in a dynamic climate, where the set point changes in correspondence with light level (Fig. 5). During the night, the temperature is kept at a minimum level of 15°C. When the sun begins to take effect, the shading screens are drawn back (later than they are typically today). If the weather is very cloudy, the temperature does not rise above 15°C, whereas on a sunny day the temperature might rise to 30°C, and only then are the vents opened. As this very rarely happens during winter, the glasshouse will require very little ventilation. During the dark period, the temperature will fall slowly to 15°C, but the vents do not open to force the temperature down.

The climate is very different from today's greenhouse climate. The temperature limit of 30°C is particularly high, but we have seen only minor damage to the plants. Furthermore, no problems have been observed with condensation of water vapour on the plants, probably because the air cools relatively slowly and condenses mainly on the windows. If humidity is a problem, a component that overrules the restricted use of ventilation can be added to the system.

Energy and plant responses

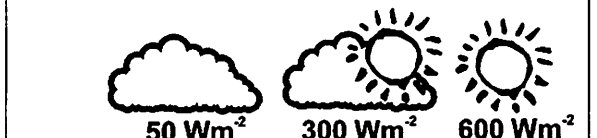
A set point of 100% optimisation secures a high level photosynthesis, but energy consumption is large. A more reasonable set point is between 80% and 90% of the optimal photosynthesis.

Compared to a standard climate control, energy savings in the winter period have been somewhere between 20% and 40%, depending on the set point for percentage photosynthesis that has been used and what actual winter weather was experienced.

Energy savings are due to several factors: (1) lower night temperatures, (2) adjustment of the day temperature to the present light level, (3) a higher ventilation limit, and (4) better utilisation of the free heat.

The response of the plants to the new climate depends on the species grown and the time of year. During the winter months, growth and flowering were slightly delayed, while during the spring months the growth rate increased. During the winter months, the plants were more compact, while later in the spring they became either taller or larger in terms of dry weight. The number of buds and flowers seems to increase with the use of this dynamic climate control. Keeping quality was not influenced.

IntelliGrow has been tested on numerous plant species; among others: pot roses, Hibiscus, Campanula, Asters, Gerbera, Polyscias, Kalanchoë, Chrysanthemum, Begonia, Petunia and different herbs. All were grown in the same climate, so was not optimal for all species. For example, the flowering of Hibiscus was very delayed at the low night temperatures. However, contrary to what one might expect, flowering of Chrysanthemum is not delayed in dynamic climates, despite the deviation in what is normally considered the optimum temperature for flowering.



%	°C	ppm	°C	ppm	°C	ppm
40	15	300	15	300	15	380
50	15	300	15	300	15	620
60	15	300	15	460	18	620
70	15	300	18	540	19	940
80	15	300	18	860	22	1100
90	15	300	22	1100	26	1180

Fig. 5 Example of temperature and CO_2 set points for different levels of photosynthetically active radiation and optimisation levels

References

Aaslyng J M; Ehler N; Karlsen P; Rosenqvist E (1999). Intelligrow: a component-based climate control system for decreasing greenhouse energy consumption. Acta Horticulturae, **507**, 35-41.

Ehler N (1998). System til intelligent gardinstyring i væksthuse: Formindsket energitilførsel ved øget udnyttelse af sollys. Project report. The Danish Energy Agency, Amaliegade **44**, 1656 København K, Danmark. 95 pp. In Danish.

Hansen J M; Ehler N; Karlsen P; Høgh-Schmidt K; Rosenqvist E (1996). Decreasing the environmental load by a photosynthetic based system for greenhouse climate control. Acta Horticulturae, **440**, 105–110.

FOR FURTHER INFORMATION

See more about the energy savings in Aaslyng et al. (1999) and in forthcoming papers. Web: www.intelligrow.dk

PROFESSION

Engineering Council appoints Acting Director General

The Engineering Council today announced the appointment of Andrew Ramsay as Acting Director General, following the resignation of Malcolm Shirley last week. Andrew Ramsay has been Director for Engineers' Regulation at the Engineering Council for the past four years.

Announcing the change, the Chairman, Dr Robert Hawley, said: "During the forthcoming period of detailed development of the proposed new structure of the Engineering and Technology Board (ETB) and New Regulatory Body (NRB), it is vital that the Engineering Council continues to perform its tasks effectively. Malcolm Shirley has decided that it would not be appropriate for him to seek a role in the new structure. At its meeting last week, the Chairman's Advisory Group accepted his decision to step down with immediate effect."

In order to manage effectively the transition of the Engineering Council to the new body, the Council's Chairman's Advisory Group has appointed Andrew Ramsay as acting Director General to succeed Malcolm. He will also continue to head the Director for Engineers' Regulation, responsible for the management of regulating the profession, while David Worskett will continue in his dual role as Directorate of Communications and Marketing and Executive Director of the ETB Unit. The Council's Senate was asked to consider the appointment at its meeting on 3 October.

"I very much wish to thank Malcolm for his highly effective leadership of the Council for the past three years," said Dr Hawley. "Through building the Council's credibility and reputation, he has helped lay the foundations for the changes now underway, and for the greater role that the ETB will have to carry out in the future".

"However", he said, "the proposals for the Engineering and Technology Board will dramatically change the focus of the Council. Malcolm has left us a firm foundation on which to build the wider relationships this initiative will need."

INSURANCE

Insuring protection for engineering firms

Understanding the importance of protecting and helping businesses with employment law has led law firm Ward Hadaway to encourage engineering firms to learn from others in their sector and use a service branded Praesidium.

In recent months the raft of new legislation relating to employee rights in the workplace has increased. From The Working Time Regulations in October 1998 to the complexities of the National Minimum Wage in April 2001, it is vital that every employer keeps abreast of such changes or suffers the costly consequences.

Praesidium Employment Law Protection provides a new concept in employment risk management by combining two fundamental elements: unlimited employment law advice to help minimise any employment tribunal claims; and insurance protection to cover any legal costs or compensation in the unlikely event that a claim is made.

Underlining the success of Praesidium Employment Law Protection is the Gosforth-based company White Bros (Newcastle upon Tyne) Ltd. Concerned with stainless steel fabrication, the company employs approximately 100 people and has been taking advantage of the Praesidium service for over a year.

Neville Ferguson, personnel manager and company secretary explains further: "In a time when companies can easily fall foul of the frequent changes in the law, Praesidium provides a good source of information and expert advice from the legal team. This ensures that we, as a company, stay within the law and follow procedures at all times."

"Although we haven't been subject to any industrial tribunals, we have implemented Praesidium to avoid such eventualities. By making sure that our personnel issues are within the law, we are able to avoid issues or deal with them quickly, should any arise."

Many benefits of the service are catered towards helping businesses with the simplest issues, thus preventing any costly action in the future.

These features include:

- an employment management manual - a personalised, tailored guidance manual covering the procedures necessary to ensure compliance with employment legislation;
- a 24-hour employment-law help line with unlimited access to specialist employment lawyers on day-to-day contentious employment problems;
- employment law updates in a newsletter format which highlights recent, topical developments in employment law and industrial relations;
- an audit to establish the requirements of the employer in developing their personalised manual and procedures in their effectiveness.

A representative from North East-based Ward Hadaway, said: "An employment law tribunal is the worst case scenario for any business; a fact that Ward Hadaway and Praesidium understand. However, in the unfortunate case of an employment tribunal Praesidium will provide comprehensive help. Members receive tribunal representation from qualified employment law solicitors, experienced in tribunal advocacy. It will also provide cover of up to £50,000 per claim to meet both the costs of legal representation and handling of the tribunal action, and any awards of compensation negotiated or awarded. Furthermore, this comprehensive service is available within a pre-determined fixed cost, allowing businesses to guarantee the annual cost of employment law advice and the cost of any employment tribunal claims, making cash flow and budgeting predictions more stable."

"It is now vital that engineering employers understand varying legislation and how to competently deal with it. Praesidium offers valuable advice and help that could see many employers avoid costly tribunals, as well as the peace of mind that experts are on hand should the worst happen."

CONTACT

Sharron Ashurst, Gardiner Richardson. Tel: 0191 261 4250. Fax: 0191 261 4026. Email: sharron@gardiner-richardson.com

SOIL GUIDE

A new guide to optimise crop yield

'A Guide to Better Soil Structure', has been published by the National Soil Resources Institute (NSRI) at Cranfield University, Silsoe, to provide farmers nationally with detailed information on how to get optimum productivity from their crops. The guide is one of the results of a three-year research project undertaken on behalf of MAFF (now DEFRA).

The aim of this free guide is to provide farmers with easy-to-read, detailed information to identify the soil structure within their own fields. It provides practical information on how to improve and maintain soil structure.

Its type and structure govern how a soil should be tilled. A complementary guide from the Soil Management Initiative (of which NSRI is a member), also sponsored by DEFRA, discusses appropriate tillage methods for different soil types to assist farmers in optimising their yields and maximising their income ('A Guide to Better Crop Management'). Research at NSRI shows that ploughing

at the wrong time in the season because of pressure to get a crop sown will lead to compaction, causing that crop and subsequent ones to give a poor yield.

"Farmers need to be fully aware of their soil structure, as this is what ultimately affects the crop yield, especially as soils are becoming more vulnerable to the threat of deterioration through untimely operations. Often yield loss has nothing to do with the topsoil fertility, but is the result of compaction and poor structure at 20 to 30 cm depth. This guide gives farmers the practical information required to understand their own soil types and how to manage them to improve productivity," said research scientist Ian Bradley.

The National Soil Resources Institute has been created by the amalgamation of Soil Survey and Land Research Centre and staff from the Institutes of AgriTechnology and Water and Environment all based at Cranfield University, Silsoe. The aim of NSRI is to provide a multi-disciplinary institute focused on sustainable soil and land management. The guide has been written by staff from the new Institute, with contributions to the main research project from the Scottish Crops Research Institute.

FURTHER INFORMATION

To obtain a copy of A Guide to Better Soil Structure, please contact Ian Bradley on 01525 863259. The guide is also available on-line at www.silsoe.cranfield.ac.uk/nsri.

FARMING FORECASTS

National Trust unveils its vision for the future of farming

Farmers should receive greater incentives to manage the countryside for public benefit and to produce food in an environmentally friendly way, according to a new vision launched by the National Trust.

The country's largest non-Government landowner and conservation organisation adds its contribution to the growing public debate about the future of farming.

Recognising that one organisation cannot provide all the answers, the Trust sets out 10 steps based on its experience of working with 2000 farmers, managing countryside as diverse as the Lake District fells and the Thames Valley lowlands.

It says building a new 'contract' of understanding between farmers and the public is vital to develop a viable future for farming and regain public confidence.

The Trust is calling for:

- a radical overhaul of the Common Agricultural Policy - transferring subsidies by 2010 from food and commodity production to rewarding public benefits such as access to a rich and diverse landscape, clean water and protecting wildlife;
- a New Deal for New Farmers - investing in training and skills for a new generation of farmers and land managers;
- 'outdoor learning' for children - twinning farms with schools and a government-funded voucher giving a free farm visit to every child;
- a significant cash boost for the local food economy - helping farmers process, market and sell their produce locally; and
- a new 'green mark' for food produced to high environmental standards that rewards farmers with premium prices.

The charity already invests over £1 million a year in a huge range of initiatives aimed directly at helping its farm tenants build a viable future. These include:

a) capital support for diversification schemes such as bed and breakfast businesses and assistance for tenants who wish to convert to organic food production;

b) provision of free expert advice to help its tenants adopt more sustainable farming practices;

c) projects aimed at involving farmers in the local food economy such as marketing workshops, setting up farm shops;

d) offering fresh, locally produced food in our restaurants and cafes, helping restore consumer confidence in food and farming;

e) promoting and supporting school visits to farms so children learn how food is produced and understand how landscapes are shaped.

All the Trust's work relies on partnerships - with tenants, other organisations and local communities. It says the lessons learned from much of this work could be applied countrywide. Fiona Reynolds, the Trust's Director-General, believes the Trust's experience offers practical ideas for re-thinking the way farm, food and countryside support is paid for and delivered. She urged Margaret Beckett, Secretary of State for the new Department of Environment, Food and Rural Affairs to put sustainable farming at the heart of the government's rural agenda.

Fiona Reynolds said: "Farming in Britain faces a very uncertain future. It is critical that we grasp the opportunities ahead, learn from what works on the ground and chart a course for sustainable farming in the 21st century."

Standard sugar beet cleaner loader in operation.

E. Robert Toulson

AN INERTIA MEASURING SYSTEM TO AUTOMATICALLY GRADE SUGAR BEET

Currently there is no automated method for removing stones and deteriorated sugar beet from a load of healthy sugar beet. Apparatus has been designed to classify objects by analysing the excitation of a sensor upon impact by an object. The form of the excitation is dependent on the inertial properties of the incident object. Stones, deteriorated sugar beet and healthy sugar beet all possess uniquely different inertial properties. The equipment is shown to successfully remove almost all stones and approximately two-thirds of deteriorated beet from a sample conveying at 5 articles per second. The invention removes no healthy produce accidentally and so is proposed as a method to improve the quality of produce submitted to a sugar refiner. Proposed also are methods to improve the unit's effectiveness further and to develop the technique to classify many different kinds of grown produce and other objects.

Introduction

All types of vegetables are subjected to a screening process before sale. In the case of sugar beet, a grower is penalised for the percentage of tare in a delivery. Tare consists of dirt, clods, greenery, stones and other waste products. Deteriorated sugar beet is also unwanted by the factory as it clogs filters in the sugar extraction process (Dutton ***et al.***, 1983). Loads that have unacceptable amounts of deteriorated sugar beet are rejected by the

factory and returned to the grower. Deteriorated beet, due to disease (Asher, 1992) or frost damage (Francis, 2000), have a greatly reduced sugar content also. The grower is credited by the percentage of sugar content in a load and so it is advantageous to remove deteriorated beet before delivery. Currently, a grower removes tare and deteriorated beet using a cleaner/loader. The cleaner/loader removes dirt by friction as it is conveyed on to a lorry. Stones and deteriorated beet are usually removed by hand from a picking table on the cleaner/loader. Some cleaner loaders do not have pick-off facilities and so the stones and deteriorated beet are not removed at all. With agricultural labour on the decline an automated sorting device would be of great benefit to the industry.

Many previous studies have been conducted in an attempt to automatically grade different fruits and vegetables. Abbott ***et al.*** (1968) and then Finney (1970) investigated the mechanical resonance of fruit, relating the natural frequencies of fruit to their fruit texture. Finney saw that in apples there were two clear natural frequencies below 2,000 Hz. He showed that the first, fundamental natural frequency varied significantly between produce, but the second, higher frequency remained stable and only altered with mass and texture. The square of the magnitude of response at the second natural frequency f_2, multiplied by the mass m of the fruit ($f_2^2 m$), was shown to be a well-correlated index of firmness for fruit with varying mass. This was one of the first non-destructive methods of evaluating fruit quality, most previous methods having required cutting or somehow bruising the fruit being assessed. Bower and Rohrbach (1976) utilised this information to model blueberries travelling along a conveyor. By exciting the blueberries at the correct frequency, it was shown possible to bounce the good fruit off the conveyor on to another belt. Unripe berries did not bounce and so remained on the conveyor and placed in a rejection bin. Yamamoto et al. (1981) built on Finney's work by using new techniques to improve speed. Where Finney had used a vibration plate to excite the fruit through a frequency sweep, Yamamoto et al. simply excited the fruit by striking it with a wooden pendulum. Finney had attached a displacement transducer to the fruit to measure amplitude, but Yamamoto and his colleagues measured the acoustic response by placing a microphone within 3 mm. This allowed quicker handling of fruit and it was then possible to use the technology in a throughput process.

Fig. 1 Multiple sensors sampling objects on a conveyor web.

Delwiche ***et al.*** (1987, 1989), studied peach firmness by analysing impact forces as well as frequency domain information. They used a steel plate with a piezoelectric force transducer mounted on it. This was used to measure the impact response of a peach being dropped from 30 mm. The impulse response index C used to determine between healthy and substandard produce was $C = f_p / t_p^2$, where f_p was the peak impact force and t_p was the time interval between first contact and the peak force. Time domain impact force analysis was thought to have great advantages over frequency analysis techniques. It required a minimum handling of fruit and real time analysis meant that the computer would not hinder throughput capacity. Furthermore, the force transducer could be attached to an external plate instead of the actual fruit. The target throughput of 5 peaches per second was duly achieved.

Chen ***et al.*** (1994) analysed the frequency spectra of an impact force response on radishes and pumpkins. Spectral analysis was performed digitally by calculating a fast Fourier transform of the signal. The ratio of the frequency powers at 300 Hz and 200 Hz were found to correlated best with fruit firmness and so this was used as the firmness index. Digital technology was also used by Shmulevich ***et al.*** (1996) to re-evaluate work done by Finney and Yamamoto ***et al.*** Fruit firmness could be calculated much faster by frequency analysis by using digital Fourier techniques and modern sensors. A piece of piezoelectric film was used to sense the fruit vibrations. This gave to a greater accuracy without the need to stop and physically attach a sensor to the fruit. The increased speed allowed spectral analysis and discrimination to be performed on products during a dynamic throughput process.

This paper introduces a new method for automatically sorting sugar beet from stones and deteriorated sugar beet in a dynamic process. The method uses a non-destructive inertia measuring technique.

BIO NOTE

Robert Toulson is a TCS Associate working with Anglia Polytechnic University, Cambridge, and Harpley Engineering Ltd., Norfolk. E-mail: e.r.toulson@anglia.ac.uk His research is the subject of his doctoral dissertation, which he is planning to submit for examination in early 2002.

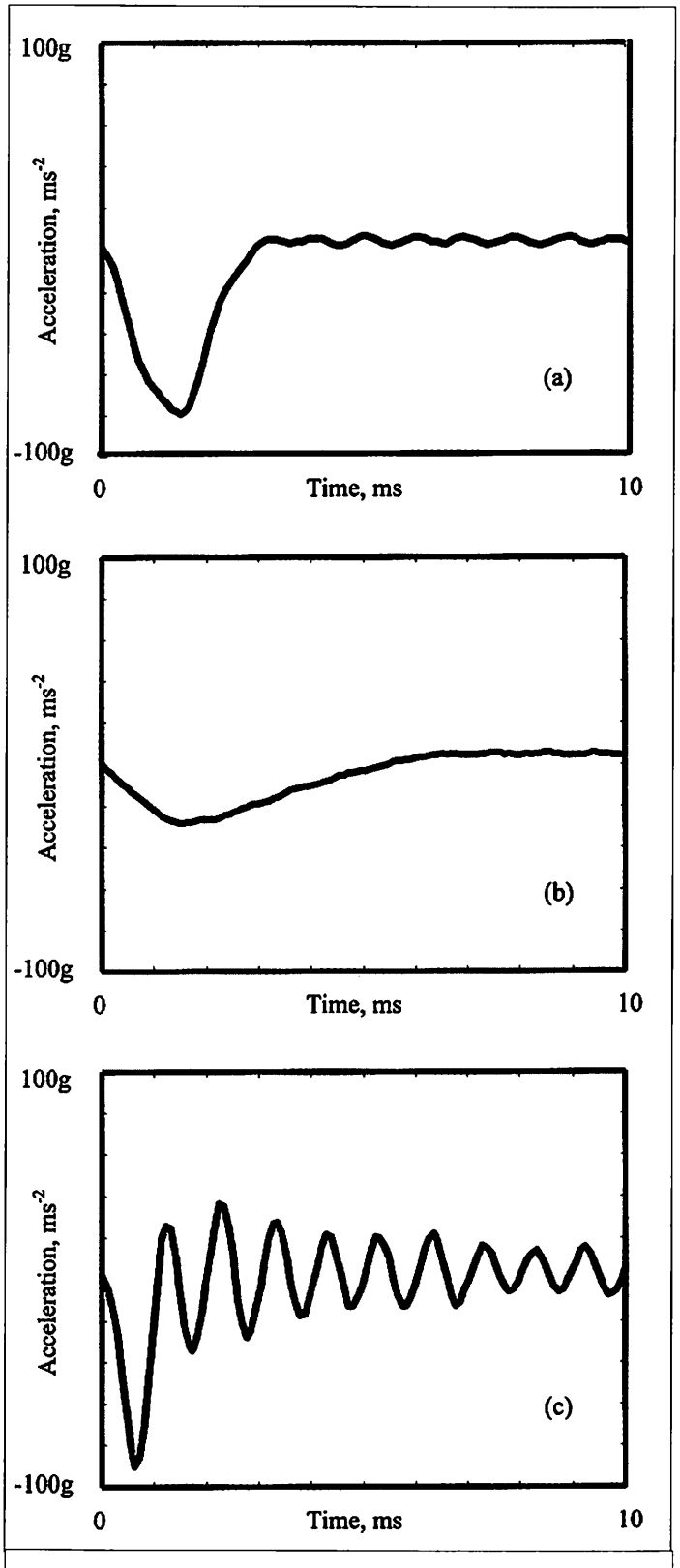


Fig. 2 Impact response graphs for: (a) a healthy sugar beet; (b) a deteriorated sugar beet; and (c) a rock (gravitational acceleration g=9.81 ms^{-2}).

Methodology and equipment

Although this new method for sorting sugar beet elaborates on some of the techniques and theories described above, the theoretical basis for sorting stones and deteriorated sugar beet from healthy sugar beet is quite different. In this method, the sugar beet and stones are caused to impact a sensor arm which is in the form of a rod. The response of the sensor is governed by the inertia of the object which causes the impact. The inertia of an object defines its reluctance to change shape or deform under force. This relates to the impulse involved in the contact between the object and sensor. Objects with a high inertia, such as stones, cause a near instantaneous impact. A soft, deteriorated sugar beet has little inertia and so remains in contact with the sensor for a longer period of time. The force of impact in this case is reduced, though distributed for longer throughout the contact time. It has been explained by Thompson (1993) that even small differences in an impulse waveform can cause very different responses in an excited body. Different impulse forces can excite some natural frequencies of a body yet dampen others. The sensor used for this invention is designed so that impacts from rocks and stones excite the sensor's fundamental natural frequency whereas those from sugar beet dampen the natural frequency. The quality of the sugar beet is determined by the quantity of inertia that provides for this damping.

The rod is made out of a steel bar of square hollow cross section. In a particular realisation, it's dimensions are 40 mm by 40 mm by 350 mm with a wall thickness of 3.2 mm. Inside the rod, there is a micro-sensor accelerometer resiliently mounted. Readings of the accelerometer are gathered through an analogue to digital converter (ADC) by a microprocessor. The rod is designed, with known characteristics, to allow its fundamental natural frequency to be known. The sensor rod in this equipment has a natural frequency of 970 Hz. The sensor is mounted on a fixed hinge and there are damped bumpers in position to maintain the rest position and to stop any over-swing. The hinge unit is mounted on shock absorbers in order to isolate any vibration from the conveyor and power machinery (Fig. 1).

Objects are conveyed at approximately 1.5 ms^{-1} to allow a sorting rate of 5 per second. After the objects have impacted the sensor, they are caused to clear a cavity between two conveyor webs. In the case where an unwanted item has been detected, a gate shuts to impede the object's trajectory. The unwanted item then falls between the two conveyors into a rejection area.

Results and discussion

The response waveforms obtained from the sensor rod indicate the different inertia of the three different objects. Figure 2a shows the response of the sensor upon impact of a healthy sugar beet. The sugar beet is in contact with the sensor for a relatively large period of time and so any excitation of the natural frequency is heavily damped. The deteriorated sugar beet response, shown in Fig. 2b, also dampens the natural frequency of the bar. The quantity of inertia is somewhat greater than that of the healthy sugar beet due to an even greater contact time. The discrimination between these two waveforms is developed from the definition of impulse. Impulse is defined as a force applied for a period of time. The force is proportional to the acceleration encountered. In the case of a healthy sugar beet, the impulse is in the form of a relatively large force applied over a short period of time. A deteriorated sugar beet impulse imparts a smaller force for a greater period of time. The ratio t_0 / f_p is therefore used as the inertia quality modulus of the signal

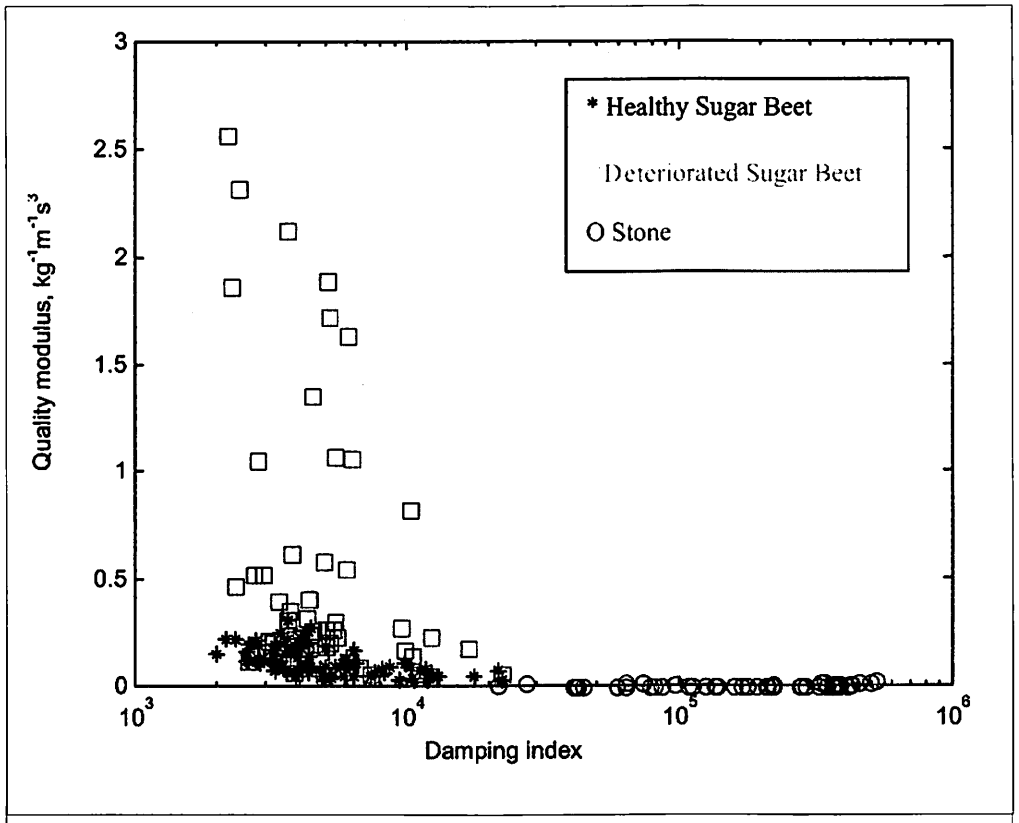


Fig. 3 Discrimination plot to show how large quantities of stone and deteriorated sugar beet can be removed from a random batch of harvested produce. Objects with a high quality modulus or a high damping index are removed to leave predominantly healthy sugar beet.

with units of $kg^{-1}m^{-}s^{3}$. The value t_0 is the amount of time that the signal exceeds an impact threshold value and f_p is the peak force displacement from the threshold.

Rocks and stones are very inert and so the impulse force is near instantaneous. This causes the sensor to vibrate at its natural frequency, giving a very different impact response (Fig. 2c). Detection of a rock is achieved by analysing the frequency power of the signal at the known resonant frequency. The technique of optimal phase binning is employed for the frequency analysis. Sweet (1999) developed optimal phase binning to allow real time frequency analysis of acoustic waveforms. This lends itself to all types of frequency analysis, which had previously been impossible in real time. The technique involves averaging sample data into three equally spaced time bins. The bins are one-third of the width of one cycle of the frequency being considered. The sum of the squared averages gives a spectrum power for the test frequency. This can be repeated for all desired frequencies to produce a frequency spectrum. In the case where the value of only one frequency power is required, this is an exceptionally rapid method for spectral analysis. The frequency power value at 970 Hz P_{970} has been used as the magnitude of damping index of an impact.

Batches of stones, healthy sugar beet and deteriorated sugar beet were tested with the sensor and the results are shown in Fig. 3. Freezing the beet for three days and then allowing the beet to thaw for three days simulated the deteriorated sugar beet samples. This would cause the sugar beet to be unprocessable at the factory. Figure 3 shows that the two discriminators allow quantities of stones and deteriorated beet to be sorted from healthy sugar beet.

Analysis of the plot shows that at least 95% of all stones can be successfully detected and removed by rejecting all objects which have an inertia index of greater than 12,000. Approximately 65% of the deteriorated sugar beet can be removed by rejecting all objects which have a quality modulus greater than 0.4 $kg^{-1}m^{-1}s^{3}$. Within these boundaries no healthy sugar beet will be accidentally removed. The reasons for poor classification of the remaining 35% of the deteriorated sugar beet are predominantly mechanical. Occasionally, a sugar beet causes only a grazing impact on the sensor. This is due to misalignment in the conveyor pocket or sometimes the beet are not stationary within the pocket. It has been seen that at lower operating speeds the sensor has a much greater accuracy, up to 90%, for deteriorated beet.

In the case of stones, grazing impacts do not cause a problem. In Fig. 3, the inertia index has been plotted on a logarithmic scale. This shows the vast difference in values between stones and sugar beet. Even a slight impact with a stone causes the sensor to resonate. Although this is associated with a lower frequency power than that of a heavy strike, it is still considerably greater than the resonant frequency power of a sugar beet impact.

The quality modulus t_0 / f_p and the P_{970} damping index should be investigated with respect to vegetable firmness or maturity if this equipment is to be used for any other fruit or vegetable classification. For sugar beet, however, the amount of deterioration is not so important. At present, beet are classified as either good or bad by the factory, so it is only necessary to consider beet which exceed a certain allowable deterioration. There is also, at present, no procedure to remove deteriorated beet from a factory delivered load. The factory simply decides if a 25 tonne load, say, is acceptable or not by a sample inspection. Therefore, the equipment to remove any quantity of deteriorated sugar beet or stones should be beneficial to sugar beet growers and beet refiners alike.

Conclusions

(1) A unique sugar beet sorting method has been developed and proved to reduce the quantities of unwanted objects in a sugar beet load. The method and equipment described can remove at least 95% of stones and approximately 65% of deteriorated sugar beet at an operating speed of 5 beet per

second.
(2) A more sophisticated mechanical transportation design, or operation at slower speeds, could improve the diseased beet removal to approximately 90%.
(3) At present, there is no automated procedure for removing unwanted objects from healthy sugar beet. The described equipment can remove quantities of unwanted items without accidentally removing healthy produce.
(4) The apparatus could be tested to give a correlation between the quality modulus, the damping index and vegetable firmness or maturity. This technology could therefore be used to grade many different types of grown produce or other items. Some such possibilities could be to grade apple maturity, sort dirt clods from tulip bulbs or to remove unwanted stones and metal objects from wood chippings.

References

Abbott J A; Bachman G S; Childers N F; Fitzgerald J V; Matusik F J (1968).
Sonic techniques for measuring texture of fruits and vegetables. Food Technology, **22**, 635 – 646

Asher M (1992).
Root rots – the sting in the tail. British Sugar Beet Review, **60**(2), 26 – 29

Bower D R; Rohrbach R P (1976).
Application of vibrational sorting to blueberry firmness separation. Transactions of the ASAE, **19**(1), 185 – 191

Chen Jie Yu; Miyazato M; Ishiguru E; Nanba N (1994).
Non-destructive firmness detection in agricultural products by power spectrum analysis of the impact force. Memoirs of the Faculty of Agriculture, Kagoshima University, **30**, 113 – 119

Delwiche M J; Mcdaonald T; Bowere S V (1987).
Determination of peach firmness by analysis of impact forces. Transactions of the ASAE, **30**(1), 249 – 254

Delwiche M J; Tang S; Mehlschau J J (1989).
An impact force response fruit firmness sorter. Transactions of the ASAE, **32**(1), 321 – 326

Dutton J V; Houghton B J; Shore M (1983).
Evaluation of deteriorated beet. International Sugar Journal, **85**(1012), 106 – 110, 136 – 139

Finney E E (1970).
Mechanical resonance within red delicious apples and its relation to fruit texture. Transactions of the ASAE, **13**(2), 177 – 180

Francis S (2000).
Biology of sugar beet storage rots. British Sugar Beet Review, **68**(1), 42 – 44

Shmulevich I; Galili N; Rosenfeld D (1996).
Detection of fruit firmness by frequency analysis. Transactions of the ASAE, **39**(3), 1047 – 1055

Sweet G W (1999).
A new method of locating sources of acoustic radiation in three-dimensional space. Proceedings of the Institute of Acoustics, **21**(8), 177ff.

Thomson W T (1993).
Transient vibration. In: The Theory of Vibration with Applications. Chapman & Hall. 92- 129

Yamamoto H; Iwamoto M; Haginuma S (1981).
Non-destructive acoustic impulse response method for measuring internal quality of apples and watermelons. Journal of the Japanese Society for Horticultural Science, **50**(2), 247 – 261

SURVEY

Survey to discover secrets of endangered beetle

A survey of 10 areas of limewoods in England and Wales to discover the secrets of the endangered lime bark beetle (Ernoporus tiliae) is underway, the Forestry Commission announced today.

The beetle, affectionately known as 'ET', is today considered an endangered woodland species and is a priority for conservation. The Forestry Commission has engaged Britain's top lime bark beetle specialist, Tony Drane, to carry out the £5,000 study of the beetle's distribution and status.

So far the survey has covered six counties and the beetle has only been found in two, confirming the rarity of the species. However, totally new records of its existence have been found in several woods in Essex, as ecologist, Tony Drane explains: "The small-leaved lime woods of Essex are mainly concentrated in an area between Braintree and Colchester. Many are being actively managed by re-introducing coppicing. It was exciting to find a totally new stronghold for ET. Of the six woods surveyed, four evidenced extensive colonisation. The next step is to make sure that both beetle and woods survive, and we'll do this by making sure that woodland management plans take their needs into account. Continuation of coppicing regimes and retention of dead and cut lime wood on site should safeguard ET's future."

The fate of ET is inextricably bound up with the conservation of our native lime woods, where it breeds in moribund branches in the treetops or in dying coppice poles. It is not a pest species and does no harm to the trees, only taking up occupancy once timber is cut or dying.

The survey will look at the distribution and habitat requirements of both the beetle and the woods, as well as their relationship. ET is considered the most suitable flagship species for encouraging coppice restoration of our special limewoods.

Coppicing is the repeated cutting of broad-leaved trees at intervals of several years depending on what the cut material is used for. Over time coppice stools form, from which multiple stems arise. Coppice stools can survive hundreds of years, and are some of our oldest trees.

The small-leaved lime was once a major part of our 'Wildwood' which existed 10,000 years ago. The dependence of ET on small-leaved lime, either as standard trees or more usually as coppiced stools, suggests the beetle is probably a relic from the past. Both limewoods and ET are priorities within the UK Biodiversity Action Plan (BAP) and are highlighted for special action by the Forestry Commission in England.

THE ORIGINS OF SUGAR BEET

Sugar cane provided sugar since ancient times, so why did sugar beet come into the picture? The answer involves a combination of scientific discoveries and historical events spanning three centuries.

The beet route

The first references to the family of plants known as Beta can be found in Greek literature around 420 BC. They were described as 'versatile garden plants'; dark and light varieties are mentioned. Beet growing gradually spread throughout France and Spain, often in monasteries but also by peasant farmers. By the fifteenth century beet was grown all over Europe.

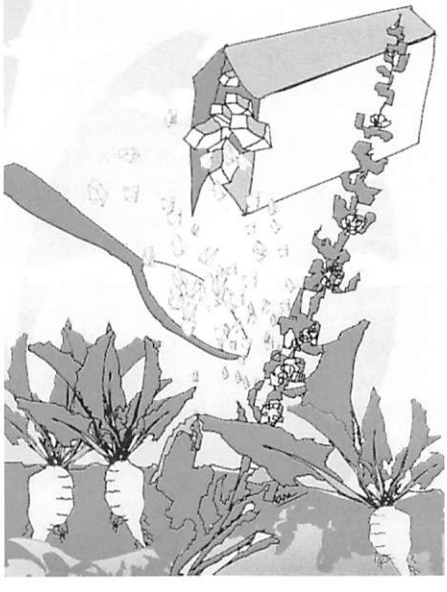
Originally the beet plant was grown for its leaves, which were probably the spinach or Swiss chard of their day. Later the root became a popular vegetable, especially the red type of beet known as beetroot. In 1600, the French agronomist Olivier de Serres reported 'this choice food yields a juice like sugar syrup when cooked'. At that time, nobody paid much attention to what gave the roots their sweetness.

Sweet discovery

The first milestone in the history of European sugar is a remarkable discovery by the German scientist Andreas Marggraf. In 1747, he demonstrated that the sweet-tasting crystals obtained from beet juice were the same as those from sugar cane. In 1801, the first sugar factory was built at Cunern in Lower Silesia.

Napoleon tastes beet sugar

Despite Marggraf's discovery, sugar cane was still the main source of sugar in the early nineteenth century. It took the blockage of French trade lines during the Napoleonic wars to give sugar beet the boost it needed.



By 1806, cane sugar had virtually disappeared from the shelves of European shops. In 1811, French scientists presented Napoleon with two loaves of sugar made from sugar beet. Napoleon was so impressed he decreed that 32,000 hectares of beet should be planted and provided assistance to get the factories established.

Within a few years there were more than 40 sugar beet factories, mostly in Northern France but also in Germany, Austria, Russia, and Denmark.

Once the blockade of continental ports was removed, cane sugar reappeared and many countries stopped beet processing. By contrast, the French government supported developments in both the selection of beet varieties with higher sugar levels and improvements in sugar extraction techniques. This two-pronged approach ensured that sugar from beet became a viable option.

European sugar supply

The beet industry has waxed and waned over the years but today Europe produces 120 million tonnes of beet every year, used to make 16 million tonnes of white sugar. France and Germany are still the main producers but sugar is produced from beet in all EU countries except Luxembourg. Almost 90% of sugar consumed in Europe is locally grown, a feat that would have seemed incredible only two hundred years ago.

FOR FURTHER INFORMATION

The Beet Sugar Crop (1993) Edited by Cooke DA & Scott RK. Chapman and Hall, London ISBN 0 412 25130 2

'FOOD TODAY' is published by the European Food information Council (EUFIC). The mission of EUFIC is to provide the media, education authorities, health professionals, and opinion leaders with balanced, science-based information on subjects surrounding health, nutrition, food safety, and emerging production methods, allowing them to effectively communicate to the general public. © EUFIC, 19, rue Guimard, B-1040 Bruxelles. Fax: +32 2 506 89 80 E-mail: eufic@eufic.org Internet: www.eufic.org and wwwcooifoodpianet.org

Marguerite Snijders

MIXED OPINIONS ABOUT 'PIG CITY'

This article is part of a series about intensive animal production in the Netherlands and is published by the Business Unit Agro Industry of Jaarbeurs Exhibitions & Media, organisers of the VIV Europe trade fair held recently.

This article examines the various opinions surrounding the proposed Delta Park in Rotterdam. This prestigious project, already popularly referred to as 'Pig City', is one of the possible future avenues of development for the Dutch agricultural sector. However, one of the opinions about the project is that production of pork chops certainly shouldn't take place in a mega production park on the Maas plain, even if the grunting porcines responsible for this tasty piece of meat actually have more living space than their country cousins.

Dozens of snouts explore the ground in search of irresistible titbits. At the same time the surroundings are surveyed by an equal amount of piercing eyes. Happy grunts accompany the first walk outside. The behaviour of this herd of swine hardly differs from the pleasure shown by animals allowed full outdoor access. Yet, their living environment is not one of open, green fields, but is dominated by the background of huge steel cranes continually hauling containers from the depths of gigantic ocean going vessels.

In the midst of this surreal scene the door to freedom opens on the fourth floor of a pig high-rise in one of Rotterdam's docks. The more than 300,000 residents can take turns to enjoy the air on one of the balconies. In the eyes of the Innovative Network Green Space and Agrocluster this Delta Park, already popularly referred to as pig city, is one of the possible avenues of development for the Dutch agricultural sector.

The philosophy behind this form of so-called industrial ecology rests on two pillars: "A symbiosis between agricultural and non-agricultural companies and the closure of mineral and energy cycles", explains the man in charge of the programme, Dr Ir. Jan de Wilt. "The idea is to relocate a number of existing greenhouses, pig and poultry houses in the Delta Park. This will improve the landscape quality and use the scarce space in the Netherlands more efficiently."

The Delta Park concept also means less transportation – 40 percent of all domestic transport is connected to the food chain. "Production will take place closer to the major consumer market – meat and vegetables for no less than one million people. This will have a positive effect on the frequency of transport", according to De Wilt.

This high-rise for pigs and three other ideas, based on the same principle, are contained in the report 'Agro-production parks: perspectives and dilemmas' from the Innovative Network Green Space and Agrocluster. The compilers hope to initiate a discussion about the future of intensive animal husbandry' and to stimulate knowledge exchange. The researchers have certainly succeeded in this respect; Pig City, an idea that was already proposed by an architectural engineering student in 1997, has stirred the waters and lead to many heated arguments.

The discussion has recently shifted to other sectors. Winny Maas, architect of the Dutch pavilion in Hanover, designed his own version of a high-rise for pigs. This concept is based on stacking various types of landscape. The Pig City exhibition was preceded by a forum evening for architects and (environmental) planners. De Wilt embraces these developments. "The whole discussion is now taking place on a broader level; the rough edges have been sanded down."

Colossus

The colossal six-storey building can accommodate a gigantic number of livestock: 1.2 million chickens and 30,000 pigs. This figure represents three percent of the 13 million pigs in total, raised in the Netherlands. This enormous monster also houses greenhouse gardeners, mushroom growers and salmon culture covering half a hectare. Initially the Delta Park is planned for the port of Rotterdam. A site of 30 by 100 hectares is the intended location for a mega complex one kilometre long and 400 metres wide. "Pig and chicken manure can be used in the greenhouses and for mushroom growing", De Wilt mentions one of the advantages of the system. "The animals' own body heat, methane from the manure, but also the CO_2 from the oil refineries can supply energy to heat the greenhouses. Organic waste from the greenhouse culture

can be used as pig feed, thereby closing the circle. This environmentally acceptable concept also includes energy supplies for windmills and water recycling."

De Wilt also argues that the risk of disease will be reduced if piglets are bred and fattened in a single unit. He also refers to the dilemmas mentioned in the report: social acceptance, the use of available space, managerial and administrative feasibility and finally the encroachment on the freedom of operation experienced by farmers.

The results of the social discussion following the presentation of the report will be processed in the feasibility study currently being carried out, subsidised by the Ministry of Economic Affairs. "The feasibility study will also include less drastic variations of the Delta Park. A stack construction is not definite; concentration in a certain area is also an option." He emphasises that Delta Parks must be a part of pluriform developments. "Small-scale country-based activities will still exist alongside large-scale complexes in urban industrial locations."

Government reaction

Innovative developments are essential in order to maintain the leading position of the Netherlands as a producer of food in the future. This was the reaction given to the report, by minister Brinkhorst of the Ministry of Agriculture, Food and Fisheries. He agreed with the writers of the paper that widespread social resistance to the idea of a high-rise for pigs was to be expected. This view was shown in his response to an email sent by the animal welfare pressure group Wakker Dier.

His answer explained that he was aware of the fact that ideas about agro-production parks would seem loathsome to supporters of natural production methods. This observation will not prevent him investigating new concepts, such as Pig City. A spokesman from the Ministry informed us that this applies even at the present time, when the agricultural sector is constantly plagued by one crisis or another and the full effects of the Foot and Mouth epidemic are unfolding. The minister sees largescale production parks as a perfect vehicle to encourage a discussion about essential developments in agriculture.

According to him, this report forces our attention to focus on the future direction of the agro-sector. "What kind of agriculture do we want in the Netherlands?" he wrote in a letter to the second chamber. His opinion is that ethical factors and considerations, especially, play a major role when it comes to the environment, animal welfare and the countryside. "Opinion-forming, about the subject of agro production parks, is the value of this report, in my view," writes the minister.

Research

Before we are aware of it, ideas tend to live their own life. The proposal of the Innovative Network Green Space and Agrocluster for the high-rise pig house is a good example. A report that was intended as an open investigation now, unintentionally, has the status of a serious plan. At least, that is the impression of Lydia Sterrenburg. She is a programme co-ordinator at the Rathenau Institute in the Hague, which investigates technological developments, including (intensive) animal husbandry and uses the findings to advise the government.

Sterrenburg doesn't consider that a fully-fledged debate can be held about Pig City. "The report is not fully founded on a number of points, such as financial feasibility, the actual operational running of such a huge complex and the risks of large concentrations of livestock in one place. Even if the incidence of disease can be reduced in a closed system", she remarks concerning the last point. "And what will happen if in spite of precautions an infectious disease does break out? A mass cull of animals will only jeopardise the social credibility of the project", she concludes.

"The recent Foot and Mouth crisis has already taught us that much. An outbreak of disease could also mean the economic deathblow for a high-rise pig unit. This risk has not been considered." The programme co-ordinator bases her reaction partly on the quantitative study carried out by the Rathenau Institute into the pig high-rise. Based on the video 'Pork Plaza', eleven debates were organised between consumers and farmers. Three research studies carried out into respectively, public health risks (namely food/nutritional safety), economical aspects and animal welfare provided additional information.

According to her, the total research results show that several aspects of large-scale intensive animal husbandry, of which Pig City is just one example, raises issues: "Such as the rate of growth, the limited living space available to each animal and the fact that young animals are weaned from their mothers at an early stage. The general public is not convinced that animals can be raised responsibly under such circumstances. Even if there is a balcony on each storey for fresh air and more space inside for freedom of movement".

The reactions to the survey clearly show Sterrenburg that animals will be degraded into a pure instrument of production by housing them on an industrial site. "That pigs housed in the high-rise have 1.5 square metres of floor space at their disposal compared to the 1.2 square metres usual for pigs on a farm is not seen as a deciding factor."

Total picture

How do we imagine an agricultural enterprise in a decade's time and what role does it fulfil in the total food chain? This vision must form the basis of new agrarian concepts. The Netherlands can only decide whether to opt for the spread or concentration of intensive animal husbandry once the discussion about the future of the sector

"The recent Foot and Mouth crisis has already taught us that much. An outbreak of disease could also mean the economic deathblow for a high-rise pig unit."

has run its course.

"Town and country planning and landscape management both play an essential role", says Gé Backus of the LEI (Agricultural Economics Institute). "The discussion is not only kept alive by the chronic lack of space within the sector." Henk Boelrijk, secretary of the Study Group for Animal Husbandry from the Dutch LTO, agrees with him. "The focus of the debate is too narrow if it only concentrates on the idea of Pig City."

LTO, the Netherlands, is not in favour of monster facilities, as illustrated by one of Boelrijk's remarks. "These production complexes won't be run by farmers. This raises the question of who will be running it: supermarkets or animal feed companies. "The organisational structure is one of the points requiring attention in the feasibility study: one of the variations proposed is renting the units to farmers. This idea doesn't reassure Boelrijk. The question of whom is actually responsible for day-to-day running is left unanswered.

"It certainly won't be the farmers themselves. These developments are too far removed from the family-run farms in the countryside which we want retain for the future. Plus, consumers don't want breeding factories on industrial estates", is his reaction based on the Rathenau Institute research and the reaction from social organisations such as the Animal Protection League. "The outbreak of Foot and Mouth disease shows that we must steer pig husbandry towards a more regionalized and closed form of operation. No more dragging animals the length and breadth of Europe", he states firmly.

"All the advantages seen by minister Brinkhorst in the pig city project can be achieved via regionalization, closed and long-term units who certify their products. Let him invest money in these processes rather than investing in systems which have no wide consumer support or acceptance."

According to Boelrijk it is for this very reason that the Netherlands is better advised not to follow the path of industrialising the agricultural process. "The number of farms is still falling – during the last decade the number of pig farms dropped by three percent yearly. This creates space in the countryside for the intensive animal operations to grow. This fits in with the LTO strategy of placing and keeping farming operations in rural environments."

Van Genugten – at the head of a huge enterprise with 30,000 meat pigs spread over seven locations – is also opposed to the development of too large-scale agricultural concepts. "This is at odds with the concept of active, living ruralism. I reject this; farmers are used to the current situation. If the government decides to U-turn its policy, it must provide some form of compensation. This is only possible if change takes place gradually."

However, he foresees that concepts such as Pig City will eventually be a real part of the future. "Because I think that there are people who are open to this kind of idea. And I think that consumers will link the idea of Pig City to high quality and safely produced meat." This view is supported by the reactions to Marcel van Dam's column on the Internet, which preceded a discussion about Pig City in the VARA television programme 'Het Lagerhuis' (The Lower House). Approximately forty percent of the respondents were in favour of the idea.

Advantages and disadvantages

Environmental management, food safety and animal welfare are the subjects summed up by Boelrijk of LTO and Backus of the LEI as the advantages of the high-rise for pigs. Backus also draws attention to the scale of the operation. "The larger the scale the more profitable the investment will be per unit compared to conventional pig husbandry. Certain other factors can also be better regulated, such as manure disposal and processing", he continues "with more advantages". In all honesty, Backus admits that it has not (yet) been proven that the pig high-rise will actually result in lessening of the load placed on the environment.

A disadvantage is that if any diseases break out, all the animals will be affected. "But still today companies in rural locations don't all follow a uniform strategy in the event of epidemics, this also involves great risks. During the Foot and Mouth crisis the movement of animals was one of the greatest risk factors. "According to Backus, this risk will be far less due to the integral health management possible in large concentrations of animals such as in the pig high-rise.

In spite of this, Boelrijk thinks that the disadvantages outweigh the advantages. "We'd like to be involved in an open discussion about other concepts. In my opinion one of the starting points should be a combination of, for example, pigs and horticulture on agricultural industrial estates, on condition that these are located in rural areas."

Consumers and green pressure groups

Contented, grunting pigs and black and white cows grazing happily together in a sundappled meadow. The average consumer associates this image with the origin of that delicious piece of meat on his plate. "Consumers think that meat is produced traditionally; they don't connect it with an industrial production process", says Dr. Sandra Schalk, a policy making official for the Consumer Organisation. "Awareness of the origin of meat products is rising, however. And with it, resistance to large scale methods of production ", something she notices increasingly in her work.

Despite the possible controversy, Schalk doesn't completely dismiss the idea of the pig high-rise. "We can appreciate the advantages, such as less transport, better regulation of the environment and an improvement in the conditions in which animals are raised. But is this a way forward for food production that will gain support from consumers? This is the million dollar question." Schalk has her doubts.

According to her, reason enough to fully inform consumers about large-scale intensive animal husbandry and food production. "Only then can we gain a complete picture of the opinions of the consumer market". This must

"Awareness of the origin of meat products is rising, however. And with it, resistance to large scale methods of production"

happen before even more money is spent developing the idea of the pig high-rise. "Perhaps the whole concept will turn out not to be viable and will never be realised in practice. Good money will have been invested that could have been better spent elsewhere."

Gijs Kuneman, policy official European Agricultural Policy for the Nature and Environment Foundation, doesn't want to let it get so far. "Pig City is the exponent of intensive animal husbandry. We have been keeping it at bay for years now due to manure and environmental problems and animal welfare. Massive production in intensive farming already leaves a huge impression on the world. Don't forget that the production of animal feed for these 130 million beasts – eight for every inhabitant of the Netherlands – requires globally two to three times more land than the total area of land used for agriculture in the Netherlands."

He certainly expects further intensification of animal husbandry if the Netherlands decides to keep livestock in flats. "This is the complete opposite to developments towards the more extensive, field-based forms of farming that we propagate. We want to silence the discussion about 'Pig City' before it can even get started." The fact that animals in their new high-rise would actually have better living conditions can't change his mind. "Pigs were not created to live on slatted floors."

Kuneman does agree that with more technical measures the environmental load can be lessened. "But, ultimately, extremely far reaching measures will be needed to save our nature from over-manuring and acidification. This state of affairs can only be achieved by exporting less, in other words by farming less animals." This philosophy includes a sharp cut in the numbers of livestock. "The number of dairy cattle must be decreased by 25 percent and the number of pigs by preferably 50 to 60 percent."

Nature & Environment explains this proposal in its vision on agriculture up to the year 2030. This paper from the nature organisation is a reaction to the concepts contained in the Fourth Environmental Policy Plan. Kuneman doesn't think that the proposed reduction in the livestock numbers will have an effect on the Dutch economy. "We have already calculated that after that time, the Netherlands will maintain its position as a major exporter of meat, dairy produce and eggs", he concludes.

CONTACT

P.O. Box 8500, 3503 RM Utrecht, Netherlands. Tel: +31 (0)30 295 56 62. Fax: +31 (0)30 295 57 09. Email: viv.europe@jaarbeursutrecht.nl Web: www.viv.net

INSURANCE

£5 million windfall lifts land-based learnings

Home-based learners in the land-based sector are set for a huge boost following the announcement that the Environment and Land-based Sector Hub has been awarded £5 million in a bid to further enhance learning within the sector. The money, provided by the Learning and Skills Council (LSC) in England, will cover up to 10,000 new and existing learners and will help enormously in improving skills and knowledge within the sector.

Derek Hartshorne, Environment and Land-based Sector Hub Development Manager, said: "This is a fantastic boost for the hub and the sector as a whole, the £5 million could potentially equate to 10,000 new learning opportunities." Currently, there are over 600 courses available in the portfolio provided via learndirect, of which over 100 are provided via the Environment and Land-based Sector Hub, although IT training is by far the most popular subject for current learners.

The provision of the IT courses is as a direct response to Lantra's own research into the sector, where 'Action plan for farming' found that most land-based industries required further training in the use of Information Technology.

For the first time also, specialist products have been developed for the sector, including 'Spreadsheets for Farmers and Growers' and the soon to be introduced 'Farm Diversification' package.

Learndirect offers learners the opportunity to develop their skills on-line, without the need to leave home, with the only requirement being access to the internet.

CONTACT

For further details on learndirect and the courses on offer, contact the website etraining@lantra.co.uk

CELEBRATIONS

Year-long party planned to celebrate Scotland's trees, woods and forests

Efforts to rebuild the rural economy in the wake of foot-and-mouth disease received a boost when Forestry Minister Rhona Brankin announced that Scotland is to celebrate its rich heritage of trees, woods and forests with a festival of events throughout next year.

The festival, known as 'Treefest Scotland 2002', will also boost the growing phenomenon of 'eco-tourism', which promotes sustainable ways of enjoying environmental attractions, such as woodlands.

Noting that 2002 has been nominated 'International Year of Eco-Tourism' by the international tourism industry, Ms Brankin said: "What an important time it is to take advantage of our natural assets. Foot and mouth, as any tourist operator will tell you, has enormously affected the tourism business, particularly in rural areas. I believe that the forestry sector, working together with the tourism industry under the Treefest banner, can be a major part of the recovery strategy in 2002 and lead the way in demonstrating how to combine visitor and natural resource management in a sustainable and profitable way."

"But Treefest is not just about visitors and recreation; it is also about raising the profile of Scotland's growing forestry sector and its increasing importance. At a time when sustainable development is fundamental to any economic policy, it is gratifying to think that after a long period of public and private investment, Scotland is about to become a net exporter of timber."

"By pushing all the advantages of timber as a 'green' product and emphasising the contribution that woodlands make to the quality of life in Scotland, we can create a 'feel-good' factor about Scottish timber that will encourage more people to use wood and help safeguard and increase the 10,000 or so jobs that depend on Scotland's forests."

Treefest will comprise dozens of events ranging from small local guided walks in woodlands, to major international events lasting several days. Organisations taking part include environmental organisations, the forestry and timber industries, and government departments and agencies, as well as local enthusiasts.

Among the highlights will be:

- the seven-day 'International Forest Fest' in Lockerbie in September 2002, which will include the World Logging Championships and other events;
- the Scottish Wood Fair in Perth in May, promoting the uses and benefits of wood;
- a nation-wide hunt for Scotland's 'trees of distinction' to find and record the country's most famous and remarkable trees.

MORE INFORMATION

More details on the events of Treefest Scotland 2002 are available. Tel: 0131 314 6444. Web: www.treefestscotland2002.org.uk.

DECISION TREE

Study points the way for better industry information

A lack of relevant sectoral information means gut instinct and personal knowledge, rather than any formal indicators, may be driving decision making in the forestry industries. According to the first stage of a wide-ranging study aimed at improving forestry trade information, this approach is not only used in short to medium term trading but also in longer-term decision making.

The study, jointly funded by the UK Forest Products Association, Forestry Commission and Scottish Enterprise was carried out by a team from the University of Wales, Bangor. It was designed to gauge the requirement in the UK forestry and forest products industries for regular trade information, and the level of interest among commercial organisations which might benefit.

It found that the vast majority of businesses rely upon their own understanding of the market place rather than the use of any formal key indicators. Many businesses develop personal networks and conduct ad hoc surveys for data collection when making investment-planning decisions. This fact is not surprising, given that a comment frequently made was that relevant information was not easily available. Market led companies with strong links to the ultimate end user were more likely to have in place formal mechanisms for gathering trade information. These companies also had a more holistic awareness within the supply chain.

Those surveyed recognised that there was a significant amount of information available to assist the long term planning decision processes and preliminary desk research established some of the potential sources of information currently available. However, concerns were raised over issues such as accuracy, timeliness and ease of use. Overall, the survey has indicated that pricing information is seen to be an important issue in day to day trading amongst the timber growing, forest contracting, sawmilling and timber trading sectors. Whilst differences between sectors were seen, overall the information deemed to be most important regarded raw material and product price, and the availability of materials.

Timeliness and accuracy of pricing information was also considered to be very important. Concerns surrounding the reliability of data and its accuracy were frequently raised and it is thought important that any future system for the collection and dissemination of trading information adequately address these. Overall, the preferred mechanism for the collection of such information would be by regular questionnaire. It is, however, recognised that common units must be agreed by the different sectors to ensure clarity.

MORE INFORMATION

Copies of the report 'Trade Information for the UK Foresty and Forest Products Industries: A Scoping Study' are available on the Forestry Commission's website: www.forestry.gov.uk/industry

Quarterly WINTER 2001

MEMBERSHIP MATTERS

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

'WORLD FORESTS AND TECHNOLOGY'

REPORT ON ROYAL ACADEMY OF ENGINEERING CONVOCATION - HELSINKI JUNE 2001

Twenty five Academies of Engineering and Science from around the world met at the International Council of Academies of Engineering and Technological Sciences (CAETS) Convocation in Helsinki to discuss international forestry policy and practice and how engineering can assist development in agreed directions. Forestry is a world industry employing millions of people and good management and engineering input can have a significant impact on social and environmental targets.

The convocation began with a welcome by Dr Jaakko Ihamuotila, the President of CAETS and was officially opened by Tatja Halonen, the President of the Finnish Republic who stressed the value of technology in the forestry industry. The keynote address by Paavo Uronen, Rector of Helsinki University, covered international education in engineering and technology and stressed the need for global coverage and universal high standards in the interests of economic development. He cited engineering education as "the primary driving force for development" and listed the skills needed for the future. Forestry depends on engineering for its economic future and it is heartening to see that in our country, the Scottish forestry cluster is investing in Engineering education in forestry to ensure timber finds new profitable markets.

The conference theme was to take reports on the best international current practice in forestry and use that evidence and the foresight of some of the most eminent academics and professionals in the world to predict the likely developments over the next 50 years.

Global energy

The first academic paper was on Global Energy Perspectives by Nebojsa Nakicenovic of Austria. He stressed the value of forestry as a supply of fuelwood and biomass making the point that they provide "20% of the global energy needs" and biomass is the only source of energy for 2 billion people. In a later paper Dr Josef Spitzer showed examples of advanced techniques deployed in Austria for wood burning with efficiencies as high as traditional energy sources. He showed convincing models of carbon pooling and subsequent cycling through growing and combusting wood for energy, proving timber to be the only truly non polluting fuel. One conclusion from Austria was that technology will be more important in determining social and economic development than the normally assumed factors of population growth or economic development.

Dr Krister Ahlstrom explained the importance of the European Forestry Cluster in terms of economic development. Forestry is big business but cannot flourish in isolation. However, in an established cluster, it can become "profitable and environmentally sustainable". Although it is the world's leading cluster it must improve its image to attract investment and the brightest young people if it is to sustain its development.

Tree factories

Plantation forestry can reduce the demand on old growth forests and they can be managed as an integral part of the ecosystem. This was the core of Dr David Canavera's statement in his paper on Augmenting World Fibre Production. His company, Westvaco, are investing heavily in the southern hemisphere where they see the non-native species adapting well to local environments. He foresees major benefits through biotechnology, which was covered in detail later by Professor Steven McKeand also from the USA. Forestry will be affected in 3 basic ways through:

- increased biological growth rates;
- improvements in wood quality e.g. higher densities, tree forms, lignin extraction, etc; and
- genetic improvements in seeds that imparts resistance to herbicides, insects, etc.

It is the belief of these scientists that the public will come to accept the new strains of genetically improved trees especially when the benefits of 7 years growth to full maturity of planned quality timber shows significant reductions in costs. These advances will result in more of the indigenous forests being available for social and recreational use but will still have a balanced timber production programme. As population increases and fibre demand grows the northern hemisphere forests will not be

able to cope with demand so these new 'tree factories' will be required. One statistic to support this view is that currently 22% of the world's industrial roundwood comes from plantation forests which are only 3% of the total forest cover.

The value of GIS to assess the forest asset was explained by Prof. Erkki Tomppo. He explained how new imaging systems identify species and how much ground work is required to interface with the satellite information to give the full picture. The following discussion elicited a fear for a country eg Australia. These systems are inevitably going to lead to a world inventory, perhaps linked to Kyoto, and they will be much more expensive to carry out in large sparse areas of forest than small dense areas.

Biodiversity

"We do not use science and technology enough to make the balance with the environment. Ad hoc statements and lobby arguments outdo scientific facts and scientific analysis in the environmental debate of forests and the forest industry". This was the basis of Prof. Pekka Kauppi's address on Forests and the Environment. The Kyoto protocol has warmed the debate but increased fruitless rhetoric. Modern forests in developed countries are carbon sinks and will help in the control of the atmosphere but they must be allowed to operate economic forestry at the same time. There is a need to build a confidence between the scientific community and the general public so that honest sensible environmental policies can be operated openly. Forests have a large part to play and they will in spite of the view of many environmentalists that what is good industry is bad for the environment.

Biodiversity within forests is now strictly controlled and in good hands in the developed world. Dr Kjell Sjoberg explained how important the "natural disturbance regimes" are to maintaining the full width of diversity in forestry. For example, it is not now good enough to stop ditching to encourage the development of species which thrive in waterlogged areas. Now we need to leave rotting trees and encourage controlled forest fires to give a survival window to every type of life which could have ever lived in the environment.

Fibre farm transporters

Day 2 began with an excellent panel session on the 'Use of Higher Technology for the Forest Industry' by professors from USA, Finland and Japan. Steve McKeand said "plantation management of 'fibre farms' has a bright future and will impact on forestry management world-wide". He sees a great future in tree improvement by breeding and genetic manipulation to supply the growing need for wood fibre. Control of density and lignin are two examples of designer trees for specific markets.

Pentti Hakkila and Erkki Kare discussed wood procurement and harvesting systems showing that social and economic drivers had asked difficult questions of the engineers over the last 50 years and they have come up with answers. Working conditions have improved, accidents have halved and efficiencies improved tenfold. Systems vary depending on product with 90% of small roundwood being Cut To Length while globally 75% of all cuttings utilise Whole Tree methods. Another recent modern development is the bundling of residues and chipping at the factory. Transport is a most important economic factor. Sweden and Finland use 60 tonne vehicles, 24 metres long, which carry about 40 tonnes of timber per trip. The rest of Europe is restricted to a maximum of 44 tonnes carrying about 24 tonnes per trip. The costs are thus higher per tonne and the environmental pollution factors greater. If 60 tonne vehicles were allowed on preferred routes from forests to mills in the UK, new economic life would flow through the home industry. Engineers will have a continuing input in improving the efficiency of this, the materials handling part of the forest operations, and thus add value to the industry.

Satohiko Sasaki impressed upon the delegates the importance of the biomass value of the world forests. Statistics such as:

- the forest ecosystem accumulates over 90% of the biomass on earth
- the total energy stored in the forests is twice the estimated oil deposits of the world
- the forests are the largest energy source on earth
- if the stored carbon were released it would double the CO_2 in the atmosphere
- trees produce fuelwood, fibre, feed, chemicals and essential oils

Putting scale into the subject brought an abrupt realisation on how important forestry is to mankind and the value of adding technology to improve efficiencies.

Stressed timber

Kirk Grundahl from the USA showed how timber could fulfil the needs of the construction market and thus achieve its highest added value. The markets for fibre are saturated by the plentiful supply of small roundwood in the temperate zones whereas the construction market shows enormous potential. Timber construction is common in the USA and Nordic countries but masonry is still preferred for fire protection and durability. This means that for increased market share research and development is necessary to prove that the material is capable. Timber has many advantages over its competitors but solutions are required to deal with its weaknesses. The timber suppliers need to invest in the high added value products and markets as have other successful materials like steel and concrete. One of the biggest unexploited advantages which timber has is its adaptability to modular component framing for factory production of housing units. Large investment in this area will reap large rewards for the timber industry but much has to be done.

- Technological advance in timber engineering has been stagnant for 50 years.
- Public attitudes to timber rot and fire need to be changed.

In the UK, we must invest in research into timber engineering to ensure the trees being harvested now can satisfy the structural markets. The home construction industry is on the doorstep and timber can compete if adapted innovatively.

Hekki Malinen, CEO of Jaakko Poyry Consulting, a household name in the forest industry, presented a lecture on the link between paper use and the standard of living. There is a direct correlation between economic health – standard of living – population and paper use. The predictions for world consumption are bright for the next 10 years.

Wind is very damaging especially to plantation forestry and Prof. Yves Birot gave an excellent account of the recent devastation in France and the lessons learned. The UK are leaders in this field of research but much needs to be done especially in the area of risk management and optimisation of silvicultural treatments.

Prof. Graham Farquhar from Australia showed us the

currently accepted model defining the carbon sink and greenhouse effect governed by forestry. In context the contribution of plant life is important but it is a small sink compared to the soil, atmosphere and the oceans. Interacting mechanisms compensate for changes in atmospheric carbon which are outwith our control but the Kyoto protocol only asks us to control the human induced carbon releases known as anthropyrogenic. Graham warned against Kyoto type agreements demanding expensive measurements which may show little benefit.

Paperless society

The convocation was drawn to a close with a panel session discussing the future. Heikki Huhtanen spoke up for the future of paper, while Dr Yrjo Neuvo, Senior Vice President of Nokia made the case for electronic communication. The final paper was from Prof. William Crossman, USA, who projected an interesting future for society in 2050. He is a respected philosopher who predicts VIVO's (voice in voice out computers) will replace written language and text within 50 years. He sees the illiteracy of 80% of the world's population as a main driver as well as today's younger generation of the western world rejecting newspapers. His predictions make some sense so the forestry industry must keep track of these developments which today may seem outwith its scope but tomorrow could be its demise.

The UK has a modest forest industry although it is one of the main cluster industries in Scotland. The social and environmental aspects of UK forestry are vital but can be enriched by a compatible commercial sector. We compete in an international market and cannot afford to ignore operations in other countries. Many of the convocation conclusions are entirely relevant to UK forestry and we ignore them at our peril. Forestry is a sophisticated industry supplying a hi-tech world and unless the UK keeps pace we will not compete. The best example of our present demise is that we are perhaps 15 years behind in research into timber engineering and thus missing opportunities to penetrate the highest added value markets for the product. The suppliers of the product must invest in its conversion to marketable products as have steel and cement in the past. Engineers can provide that service.

Geoff Freedman
President

ENTREPRENEURIAL SPIRIT

The talk was entitled 'From HND to MD – how I developed my turf care business' and was presented at the Herts and Essex Branch Meeting on 18 Oct 2001 by Austin Jarrett, managing director and co-owner of 'Turfmech'. Austin began by saying that he left Writtle in 1985 after his agricultural engineering course, and took up a post in Fiji straight away. Fiji is an ex-Colony of Britain, the population is about the same as Leeds, and the GDP was 450 (Fijian) dollars/annum when he was there. A series of slides was shown to illustrate the talk.

Austin was posted to a school set up by the Colonial British, which was something very different for him. One of the main crops grown there was sugar. Discipline in the school was very good, with customs and rules very different from those with which he was familiar. Interpersonal gifts are very important in that society, and his assessment was that they were sports mad! Interestingly, there existed an extended family system in the community. There was no TV or radio, but there was access to 'World Service'. He said that farmers are based around the coast, due to the existing climate. Austin explained that he was arrested twice, both under false pretences he claimed!

On returning to the UK, he was looking for a job when he saw an advert in a paper for a salesman with 'Turfland'. He got the job, kept it for 3 years and learned a good deal. In January 1990, he began his own business, which was a huge step to take. He started with a giant vacuum cleaner for turf imported from Canada; he was importing and distributing to begin with. A stone burier was the next machine he dabbled in.

He sees himself as an 'entrepreneur' (one who takes risks to make a profit), and not a great engineer. Austin continued and bought some secondhand tools in 1994 and started making 'blowers' to sell. He lost money in one year on a trailed mower, which was, on reflection, too wide for the UK market. He carried on importing a wide range of products, and for instance a one-man harvester for turf was sold. His company made a debris cleaner unit, and he believes there is a good future in this. A pneumatic seeder was made by their company, together with an aeration unit of which they sell around 700 machines per year. At the moment there are around 350 turf customers in the UK.

The speaker commented that the power to display a product is very important, and this was emphasised strongly. At the moment the company, Turfmech, has a turnover of £4 million, and employs 43 people. Austin said that he has ambitions to increase the company turnover to £10 million.

In August 2000, the company took over an aircraft hangar nearby, which was considered an ideal space. Some 50% of their turnover is now from exports. They now have a laser cutter, with a 4 kW beam, which is extremely accurate. They have had this for a year, and invested around £0.3 million on it; it now works 24 hours per day, 7 days per week. In the factory they also have a robotic welder, which on reflection was perhaps a debatable decision. On a question about staffing, Austin said that the company had, surprisingly, experienced difficulty in getting graduate engineers.

The presentation had been stimulating and interesting, and after concluding remarks by Chris Bishop, warm appreciation was shown.

Richard Langley

IAGRE MEMBERSHIP CHANGES

Admissions

Member

David Kirschner (Warwickshire)
Peter I Mgbeahurike (Middlesex)

Associate Member

Robin Cole (Norfolk)
Neil D Evans (Cleveland)
Mark J Osola (Bristol)
Ralph J Thompson (Staffordshire)

Students

Hamad A H Al-Hajry (Writtle College)
Edward J Amsden (Harper Adams University College)
Jonathan M Anders (Harper Adams University College)
Richard Aymes (Writtle College)
Neil M Bainbridge (Harper Adams University College)
Henry W Bosman (Writtle College)
Paul J Cairns (Harper Adams University College)
Paul A Carson (Harper Adams University College)
Mark G Cox (Harper Adams University College)
Damien Cronin (Harper Adams University College)
Trevor J Cronin (Harper Adams University College)
Tris Curgenven (Harper Adams University College)
Mark F Curran (Harper Adams University College)
Alan G Davies (Harper Adams University College)
Barbara Diamond (Harper Adams University College)
Bruce P Dixon (Writtle College)
Damien Donoher (Harper Adams University College)
Nicolas Garzon (Writtle College)
Michael O Gillen (Harper Adams University College)
Peter J Goodge (Writtle College)
Ianto J Guy (Harper Adams University College)
James H Hammett (Writtle College)
James Heanue (Harper Adams University College)
Leonard Hovenden (Harper Adams University College)
Emyr W Hughes (Harper Adams University College)
Charles R Jeffrey (Harper Adams University College)
John G Jones (Harper Adams University College)
Richard J Jones (Harper Adams University College)
Patrick Kenny (Harper Adams University College)
Matthew J Lancaster (Writtle College)
Calum T McBain (Harper Adams University College)
David M Morris (Harper Adams University College)
Alexander Naper (Harper Adams University College)
Gavin R Neate (Writtle College)
Edward O'Donnell (Harper Adams University College)
Robin M Owen (Harper Adams University College)
Cedric Parentelli (Harper Adams University College)
Andrew T M Parry (Harper Adams University College)
Colin Peavoy (Harper Adams University College)
Richard J Purdy (Harper Adams University College)
Trevor R Ryall (Harper Adams University College)
Nathan E Seymour (Harper Adams University College)
Mark B Sienesi (Harper Adams University College)
James A Stevenson (Harper Adams University College)
Matthew D Thacker (Harper Adams University College)
Nicholas R Thompson (Harper Adams University College)
Samuel C Thompson (Harper Adams University College)
Samuel E Thompson (Harper Adams University College)
Mark W Thompson (Writtle College)
William S Tuer (Harper Adams University College)
Neil Warren (Harper Adams University College)
Rowland Whatton (Harper Adams University College)
Oliver G White (Harper Adams University College)
Edward C Williams (Harper Adams University College)
Gareth W Williams (Harper Adams University College)
James A Williams (Harper Adams University College)
Crawford J Wilson (Harper Adams University College)
Gavin W Winters (Harper Adams University College)

Transfers

Fellow

Ralph Alcock (Staffordshire)
Andrew P Casebow (Guernsey)
E David Chesmore (East Yorkshire)
Richard Earl (Buckinghamshire)
Michael J Hann (Buckinghamshire)

Member

Colin J Friedman (Israel)
Devathasan Paul (London)

Associate Member

Alex D Brawn (Hertfordshire)
Joseph E G Cook (York)
Stephen J Hunt (North Yorkshire)
Warren S Legg (Zambia)
Andre Paul (Guyana)

Engineering Council

Registrations

IEng

A David Gregory (Hertfordshire)

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

NOISE POLLUTION

MIRA supports the quieter environment

Life outdoors is about to become more peaceful for millions of people thanks to a new EU Directive that sets rules to protect the environment from noisy machinery.

MIRA, the world-class engineering company that has served the automotive industry for more than half a century, will be supporting the manufacturers and importers who will have to certify the sound power level of their products. Some products will merely need to have their noise levels marked; others will have to meet prescribed limits. Those that are too noisy will have to be made quieter.

The list of products covered by the rules, which effectively come into force on 3 July 2001 and become mandatory from 3 January 2002, covers 57 categories of equipment. Products in 22 of those categories will have to meet newly-introduced noise limits.

Because of its established track record in controlling the internal and external noise characteristics of vehicles, MIRA has both the skills and facilities to quantify noise outputs from machinery. In recognition of that capability, the Department of Trade & Industry has appointed MIRA as a Notified Body under the UK Statutory Instruments that implement the particular EU Council Directive - 2000/14/EC on noise emission in the environment by equipment for use outdoors.

Measurement of noise emissions can be undertaken by the manufacturers or by companies like MIRA. However, all measurements and records must be checked by a Notified Body. MIRA is currently one of just four Notified Bodies in the UK able to verify noise measurements and one of only two able to provide a comprehensive service supporting manufacturers.

A number of manufacturers have already sought MIRA's assistance to ensure their products meet the new rules. These include refuse-collection vehicle manufacturers, a major construction equipment maker, a company importing tracked vehicles and power generator manufacturers.

Andrew Walker, Engineering Manager of MIRA's Dynamics & Refinement Group, said: "This is the latest European Directive that is aimed at improving products for the benefit of the environment, making life more enjoyable not only for those affected by nearby outdoor machinery but also the operators.

"We expect that manufacturers will be keen to approve their products in this way because it gives them a significant showroom advantage. We anticipate being very busy in providing these new services to manufacturers and their agents."

Mr Walker explained that one of the key reasons that MIRA was able to offer an approvals service for European legislation was its approved Quality System. "In view of this and the relatively small number of Notified Bodies currently appointed, we felt it was important to advise equipment manufacturers that help is at hand during the coming six-month transitional period when they, or their representatives within the EU, may apply either the provisions of this Directive or apply the existing noise emission legislation."

Products covered by the new Directive include lawnmowers, hedge trimmers, motor hoes, compressors, concrete breakers, excavators, loaders, mobile cranes, power generators, building site saw benches and band saws, chain saws, concrete mixers, drill rigs, highpressure water jet machines, leaf blowers, leaf collectors, lift trucks, mobile waste containers, paver finishers, power sweepers, refuse collection vehicles, road milling machines, shredders/chippers, snow-removing systems, truck mixers and water pumps.

CONTACT

Keith R Read, MIRA on 024 7635 5455 or e-mail: keith.read@mira.co.uk

AWARDS

Double whammy as Yorkshire disinfectant mat manufacturer wins two awards

Thirsk-based Power Plastics Ltd have picked up two top prizes at a recent industry awards ceremony. The awards, given on behalf of MUTA (the Made-up Textiles Association, founded in 1919 and currently with over 300 member companies) were handed out at the Imperial Hotel, Blackpool. They were set up to recognise innovation and excellence in the UK's industrial and technical textiles industry.

Power Plastics were first voted Section Winner of the Manufacturer's Section by a panel of judges and industry consultants. They then went on to receive the top award of Made-Up Textiles Association Overall Industry Award Winner 2001 beating all the other section winners.

The company, founded in 1969 and based in Thirsk, North Yorkshire since 1989, manufactures a large and varied range of products from plastic materials. In the farming and agriculture sector they produce disinfectant vehicle and stockman mats which have been in extensive use recently throughout the country due to foot and mouth, but were previously sold purely to protect stock from hoof problems and guard against general infection around the farm.

Managing Director David Price said: "I am immensely proud that our company has received not one, but two awards. They are a recognition of our ability to handle a wide diversity of commissions successfully, and our willingness to tackle new challenges."

MORE INFORMATION

Contact John Spencer or Andy Beetles at Power Plastics Ltd, Station Road, Thirsk, North Yorkshire YO7 IPZ UK. Tel: 01845 525503 Fax: 01845 525485 Email: info@powerplastics.co.uk. Or visit their Web site: www.powerplastics.co.uk.

RECREATION

West Midlands leads the way on regional forestry agenda

A regional forestry forum being piloted in the West Midlands is beginning to take shape, Simon West, the Forestry Commission's new Implementation Manager for the region, confirmed today. Following a consultation event for all stakeholders and interested parties in June, the Commission's team is now drawing together ideas for a working group to take forward the agenda. It hopes to be in a position to make a further announcement shortly.

Taking up his new post based in Government Offices in Worcester, Simon West said: "This is a tremendously exciting time for all those involved in forestry and woodland management in the West Midlands. We have just moved offices and we are now working more closely with our fellow government partners. Forestry isn't just about trees. It's about what trees can offer people by improving their environment and offering a healthier lifestyle. Woodlands are places where we can take a breath of fresh air, a stroll, or do something more energetic like mountain biking. They can transform derelict landscapes and offer habitats for wildlife. Forestry cuts across government departments. We have known for a long time that partnership is the key to a successful forestry agenda."

"We're also working with Advantage West Midlands and the Countryside Agency to undertake an important study on how to develop woodland related industries to benefit the local economy. And there are major opportunities to promote economic regeneration within and outside the designated Regeneration Zones with trees and woodlands helping restore the region's derelict land and encourage inward investment. I also want to work with partners to develop a regional wood fuel programme, which will both contribute to rural development and help meet the region's commitments to renewable energy."

Mr West will be responsible for overseeing Forestry Commission grants and delivery mechanisms, working with regional partners and for securing funding within the region to ensure that forestry contributes fully to the regional agenda and is sufficiently resourced in the West Midlands.

CONFERENCE

Fats and oils congress

The World Conference and Exhibition on Oilseed and Edible, Industrial, and Specialty Oils: Sources, Processing, By-products, Utilisation and Feed Formulations, Applications and Functionality will be held August 12-16, 2002 at the Military Museum in Istanbul, Turkey.

This congress is the ideal opportunity for industry professionals to learn the most up-to-date information on sources, processing, by-products, utilisation and feed formulations, and applications and functionality of oilseed and edible, industrial, and specially oils. Peace treaties, political reforms, and emerging open markets all over the world, especially in Eastern and Central Europe, the Middle East, South East Asia, and Latin America, have created tremendous growth opportunities in oilseed and edible oils processing industries. The majority of developing countries have a growing number of highly dynamic, import/export-oriented, well-managed companies that are eager to establish joint ventures with developed countries to increase production, improve the quality of their products, modernise their facilities, and consequently feed their populations.

The conference will include both invited and volunteer speakers, presenting lectures and posters in the following sessions:

- preparation and extraction technologies
- oil refining technologies
- oils and fats modification technologies
- edible oils from seeds and plants
- specialty and marine oils
- antioxidants and nutraceuticals from edible oil sources
- alternative fuels from fats and oils
- biobased lubricants
- oleochemistry
- biocatalysis and biotechnology
- by-product utilisation and applications I and II
- poultry/aquaculture feed nutrition and processing

FURTHER INFORMATION

Visit, www.istanbul2002.org, or contact: S. Sefa Koseoglu, General Chairperson AOCS, P.O. Box 3489, Champaign, IL 61826-3489 USA. E-mail: meetings@aocs.org

STANDARDS

Lantra NTO and industry sets the standards for horticulture

Lantra National Training Organisation has received positive feedback from the horticulture industry on the development of the new National Occupational Standards and NVQs (National Vocational Qualifications)/ SVQs (Scottish Vocational Qualifications).

The feedback received will help the new draft standards to be finalised before discussions with the industry led working group. Following this, the final draft proposals will be submitted for approval by the end of the year in line with the QCA/ SQA (Qualifications Curriculum Authority/ Scottish Qualifications Authority) timescales. Lantra will then be working with the various awarding bodies to ensure that the new suite of NVQs/SVQs 'designed for industry, by industry' will be widely available.

MORE INFORMATION

Lantra website: www.lantra.co.uk

E-COMMERCE

New forestry adviser on access to woodlands

Increasing access to woodlands and improving the quality and range of information about access opportunities will be the job of one of the Forestry Commission's new recruits in England. Helen Partridge, 33, has moved on from the Institute of Leisure and Amenity Management, where she was Director of Policy, to join the Commission's National Office policy team as Recreation, Access & Tourism Advisor.

Helen will be responsible for developing and driving forward policies on access to woodlands in the light of the Countryside & Rights of Way Act (CROW). She will ensure that woodlands play an increasingly prominent role in achieving the Government's wider economic and social policies, and are are also seen as key contributors to the wider leisure and cultural industry.

Helen said: "I am really looking forward to this new role. It will be my job to increase the provision of opportunities for people to enjoy visiting woodlands. With the introduction of the Countryside and Rights of Way Act, I will need to engage with our partners and a range of organisations to develop policy. Green space is at a premium and our woodlands are a precious asset to us in England.

With people increasingly having more leisure time and with people needing to become more health conscious, woodlands have a lot to offer. Woodlands have the ability to absorb people, and fulfill a variety of recreational needs. They are a healthy place to relax in where you can enjoy gentle activities like walking. If you feel more energetic you can pursue more adventurous sports such as mountain biking. This is a new post, a new challenge and a very exciting time for me."

After graduating from Loughborough University with a degree in Human Biological Sciences in 1991, Helen took up her first post as Fisheries Inspector with the National Rivers Authority (NRA) in Somerset. Fifteen months later she transferred to Head Office to work in the Fisheries, Recreation, Conservation and Navigation department.

In 1996, when the then NRA became a part of the newly formed Environment Agency (EA), Helen became the Agency's Recreation and Navigation Officer.

After eight years with NRA/EA, Helen left to take up the post of Director of Policy with the Institute of Leisure and Amenity Management (ILAM) and worked to influence the development of policy in relation to leisure and cultural services. She drafted policy and consultation papers, represented ILAM on a national level and appeared in front of three House of Commons Select Committees. She also managed the development and delivery of the Institute's Professional Qualification Scheme. In May, she joined the Forestry Commission.

Helen enjoys most outdoor sports, especially white water kayaking and mountain biking. She retains her interest in the aquatic environment and is a member of the Environment Agency's Thames Regional Fisheries, Ecology and Recreation Advisory Committee (RFERAC). She also sits on the British Canoe Union's Access Committee as the Regional Access Officer for the BCU Southern Region.

GRANTS

Royal Society Partnership Grants scheme

The Royal Society's Partnership Grants scheme aims to maintain and develop links with schools. The scheme awards grants of between £250 and £2500 to schools to cover the costs of projects involving pupils (aged between 5 and 16) and engineers/scientists. In supporting these partnerships between teachers and engineers/scientists, the Royal Society aims to inspire young people and to aid the professional development of all partners.

In February of this year £70k was awarded in grants to 45 schools around the UK, meaning that over 4000 pupils across the UK have already had contact with a scientist or engineer as a result of their school being awarded a Royal Society Partnership Grant. Of these successful schools, 62% were Primary schools - a critical stage in science education. A number of universities are involved with the scheme already, plus scientists and engineers from companies such as GlaxoSmithKline, Pfizer, BT and Roche Pharmaceutical.

It is hoped the scheme will encourage new teachers and engineers/scientists to reap the benefits of developing investigations together, and that it can support many of the partnerships which organisations such as the Institution of Agricultural Engineers has worked hard to establish. If you are be interested in the scheme there are several ways you might offer support. Maybe you have:

- a newsletter where you could feature articles;
- a wall or noticeboard were a poster could be displayed;
- an event that a representative of the scheme could attend;
- an area on your website where you could link to the Royal Society Partnership Grants scheme web page.

Click here for the Royal Society Partnership Grants
Linking schools with scientists and engineers

CONTACT

Ginny Page, Assistant Education Manager, The Royal Society, 6 Carlton House Terrace, London SW1Y 5AG. Tel: +44 020 7451 2577. Fax: +44 020 7451 2693. Email: ginny.page@royalsoc.ac.uk
Web: www.royalsoc.ac.uk
New! www.sc1.ac.uk - putting the life back into science for 16-19 year.

S W Burrage and M Cutler

A LOW COST IRRIGATION CONTROL SYSTEM FOR THE MEDITERRANEAN REGIONS

One of the more important tasks of horticultural production is the application of water to growing plants. Water stress of the plants resulting from inadequate water application leads to a reduction of both yield and quality. To avoid this, plants are often watered to excess to ensure adequate water is given. This is both costly and can lead to wastage, loss of fertility and downstream problems of pollution. The Mediterranean region is a good example of this and instances exist where four times the plant water requirement has been used. Over the last few decades, this region has seen a rapid expansion of the horticultural industry. The supply of water is limited, however, and the development of the industry may be inhibited. There is also strong competition with the developing tourist industry for the available water supplies.

The aim of the project described in this paper was to develop a simple irrigation system based on a weather station and a well proven formula for the calculation of water requirement (Penman) that would improve the use of water in the region. The objective was not only to calculate water requirement but also to operate valves to deliver the appropriate amount of water to crops.

Details of the controller and weather station are given and a comparison of the water calculated by the controller to water used in a nutrient film system is made.

Utilizing the latest low cost sensor and microprocessor technology the system described is fully automatic reducing the growers need to monitor the situation on a day to day basis. It also does not require the development of a large scale advisory infrastructure. As much of the protected crop development in the Mediterranean region is low cost, it is important that the system is simple and inexpensive so as to appeal to the greatest number of growers.

Introduction

Efficient use of water is an essential part of horticultural production. The rapid development of protected cultivation the industry in the Mediterranean has meant the efficient use of water has become increasingly important. The present profligate use by the industry and the competition with the tourist industry for the same limited supply is putting considerable pressure on the sustainability of the horticultural industry in this region and may eventually limit its development. Many techniques to improve water use efficiency have been suggested. The development of water efficient crops through biotechnology may assist where survival of crops is required but the savings in water usage are unlikely to exceed 25%. A more important area of water saving is in better water management. The present ad hoc approach used by many of the growers leads to considerable wastage. More efficient water management could reduce water usage by a half and in some cases to one quarter of that presently used.

There are many approaches to water management. In some areas, such as the United Kingdom and California, large scale centralized schemes have been developed. These require the existence or the development of a large information infrastructure with rapid communication systems for the dissemination of information. An alternative to this is the development of a simple automatic system based on a weather station that can function as a stand-alone controller in each protected structure. This type of system utilizes existing well proven evaporation formulae for the calculation of water requirement, similar to those used in the larger centralized programs, and the latest low cost sensor and microprocessor technology. The main advantages of this approach is that there is no need to develop a large scale information infrastructure and being automatic reduces the growers need to monitor the situation on a day to day basis. Further the systems can operate at very much more frequent intervals than can be operated by manual control minimising plant water stress and improving plant yield and quality. Further benefits of this approach would be a reduction in fertilizer use and a reduction in salinization of underground water supplies.

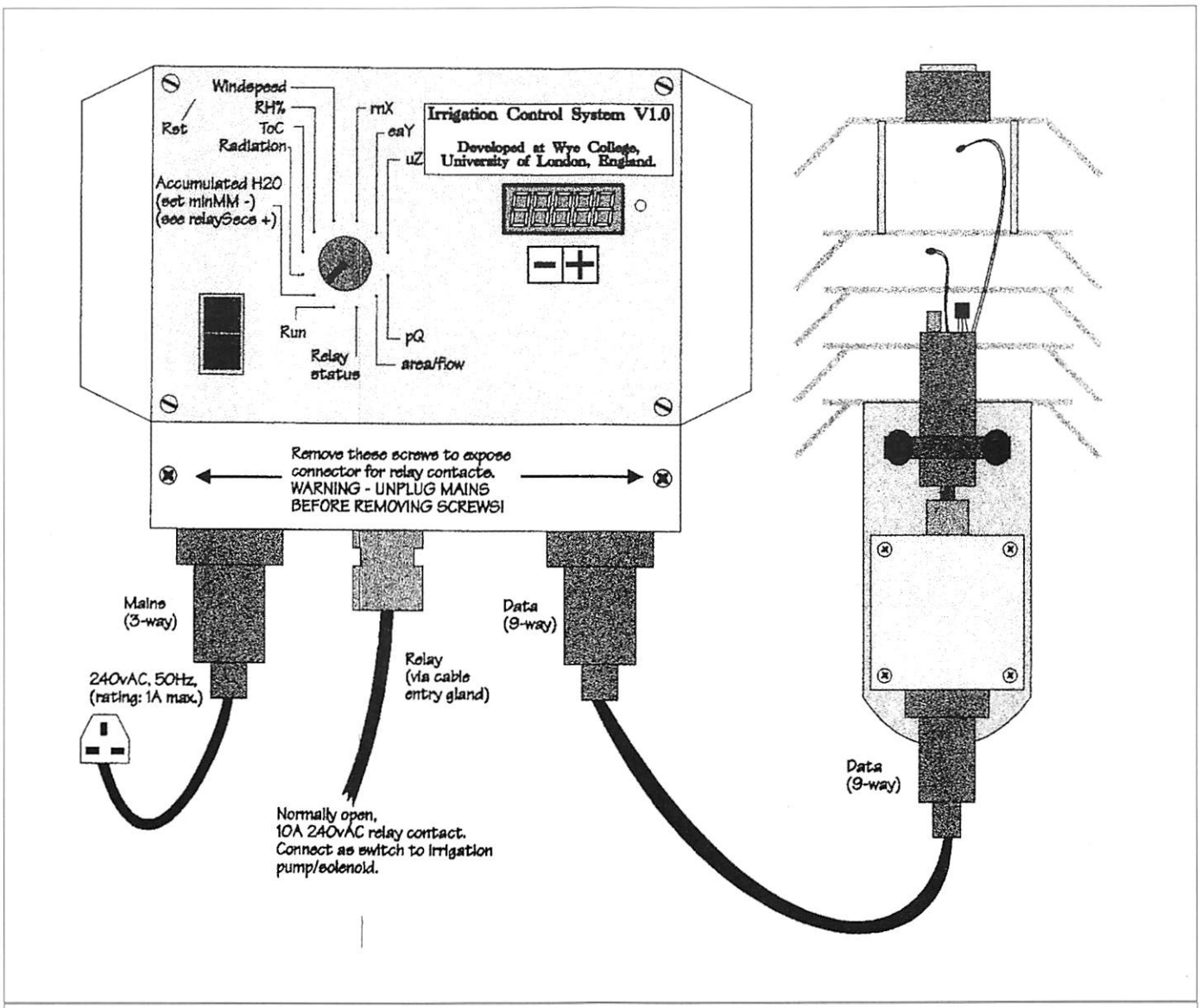
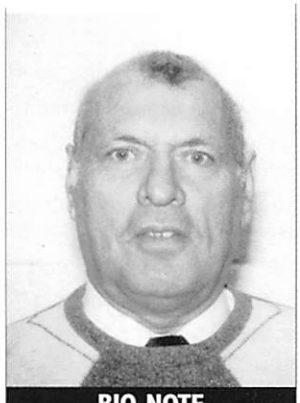


Fig. 1. Irrigation control system



BIO NOTE

This paper was presented at the IAgrE Annual Conference entitled 'Information Engineering for Agriculture and Horticulture' held at Silsoe Research Institute, Bedford on 15 May 2001. Stan Burrage and Mike Cutler are at Imperial College at Wye, Wye Kent, UK. The work was funded by the EU for project: INC-DC ERBIC 1 8CT-96-0082.

The controller developed for the EU project, INC-DC ERBIC 1 8CT-96-0082 was of the later design as this was more appropriate to the industry of that region.

System requirements

Plants grow by utilizing solar energy to combine carbon dioxide and minerals from the soil. Plant growth is directly related to the radiation received, increasing linearly with accumulated radiation. The higher levels of radiation in the Mediterranean regions mean they have much greater potential to produce crops than the mid-latitudes of Northern Europe. For this reason we have seen the shift in production of horticultural crops from Northern Europe to the Mediterranean regions in recent years.

The plant however utilizes less than 1% of the radiant energy it receives in the growth process and therefore has to dissipate the remainder by transpiration, sensible heat (advective energy) transfer and radiation to maintain growing temperature. If this is not achieved, the plant temperature rises and, if that exceeds 35 – 40°C, the plant begins to respire more than it photosynthesises, reducing growth. Depending on the availability of water to the plant, 50 – 60% of the excess energy is lost through transpiration, the majority of the remainder by sensible heat due to air movement over the plant. When irrigating a plant the main concern is to provide sufficient water to maintain the cooling process at its optimum (only a relatively small amount is used to transfer ions through the plant system and to maintain plant turgor) and thereby maintain optimum growth of the plant. The close relationship between radiation and plant growth and radiation influx and irrigation demand means there is almost a linear relationship between water used and crop yield. A reduction in water use therefore generally results in a reduction in plant growth. This is perhaps an over simplification of the situation but provides a good practical base for understand-

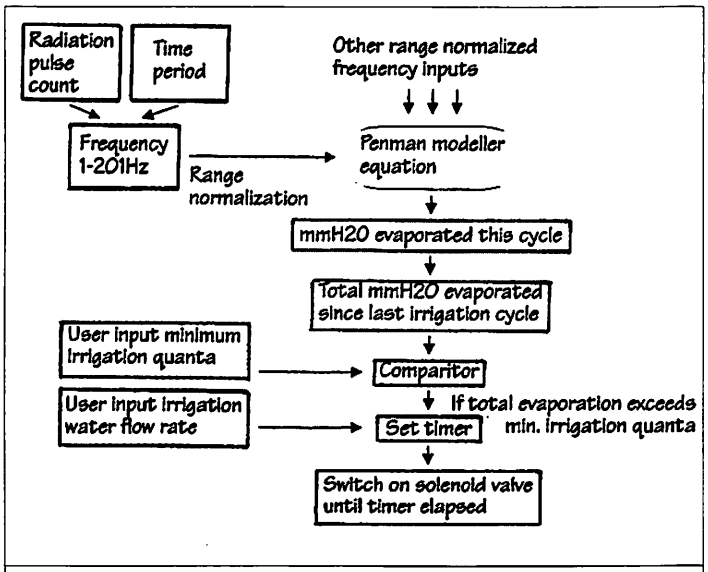


Fig. 2 Block diagram of the proportional integral controller (PIC).

ing irrigation requirements. What would appear to be required is an irrigation system that can follow closely the evaporation demand put on the plant by the enviromnent and capable of maintaining a balance between supply and demand. This would minimizes stress on the plant and allow growth to be maintained at its optimum. To achieve this an irrigation system that might have to operate 2 or 3 times a day which is difficult to achieve manually.

A number of systems have been developed based purely on accumulated incoming radiation and are in use in the UK and other glasshouse industries. They work adequately during the winter months when ventilators are shut and there is minimal air movement in the house. In the summer when air movement is increased considerable errors can arise in the estimation of the water requirement due to the failure to monitor the advective energy component of the energy balance. The Mediterranean situation is more like summer conditions in the UK and a more sophisticated form of control is required taking into account both the radiation and advective energy. Using the Perunan

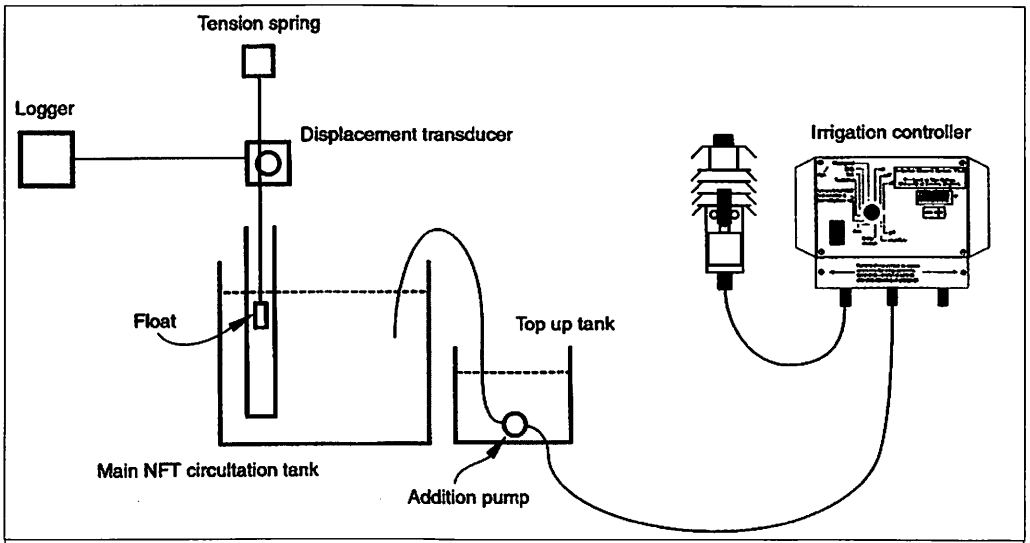


Fig. 3 Schematic of water addition system.

calculation for potential water requirement, the irrigation controller developed in this project takes into consideration both the radiation and advective losses taking place in the calculation of water requirement. The system also provides control for a valve or pump to deliver an amount of water equivalent to the calculated evaporation.

Irrigation controller

The irrigation controller consists of a small weather station (Fig. 1) mounted in the roof of the glasshouse and linked to a microprocessor control unit outside. The block diagram of the proportional integral controller (PIC) processor is given in Fig. 2. The weather station contains sensors for the measurement of temperature, humidity, radiation and wind speed; the parameters required in the Penman calculation. The microprocessor unit continuously compiles the meteorological data and calculates the potential evaporation of the crop. The accumulated evaporation in mm is displayed on the unit and the values of the environmental components can be selected by operating a rotary switch. The operator can set the calculated value of evaporation in mm at which irrigation is initiated. At this point, the irrigation system actuates a relay which is held on for as long as required to deliver the appropriate quantity of water. This is derived from previous measurements and appropriate factors such as pump delivery rate, area of crop etc. which were programmed into the controller. The system is flexible and can be adapted to any protected structure.

The first unit was constructed in 1998 and after modification was put on trial in a cubicle of the glasshouses at Wye College in 1999 -2000. The tests were carried out on a sweet pepper crop grown by nutrient film technique (NFT). The nutrient film technique, being a closed system, was chosen because it enabled the close monitoring of the water usage by the crop. An outline of the system is given in Fig. 3. The efficiency of the irrigation controller was monitored by measuring the changing height of water in the main circulation tank of the NFT system. This was monitored with a displacement transducer connected to a 'Tinytag' logger. As the water evaporated from the plants, the height of the water in the main tank fell. This was detected by a reduction in the signal output from the displacement transducer. When the irrigation controller detected that the required water had been evaporated, it would operate a pump in a subsidiary tank, pumping nutrient solution into the main tank equivalent to the calculated evaporation.

The output from the height detector produced a saw tooth graph (Fig. 4) showing a decrease in output as evaporation took place and an increase in signal as the main tank was replenished. If the saw tooth maintained a hori-

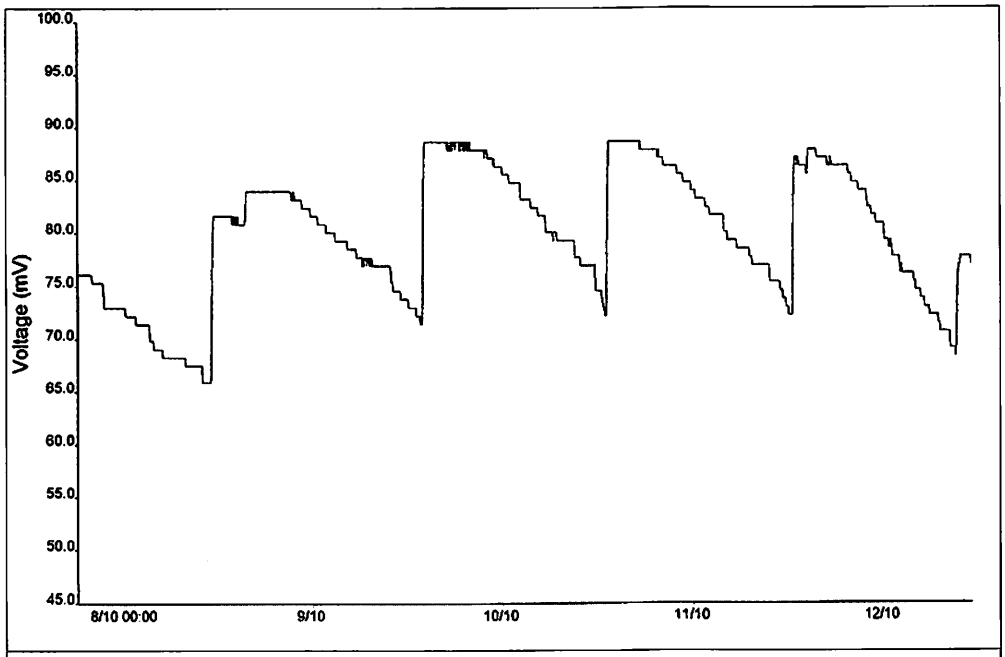


Fig. 4 Float sensor voltage against time showing water loss and addition to the main nutrient film technique (NFT) water tank.

zontal line the input of water from the irrigation controller compensated for the transpiration losses by the plants. If it rose, too much water was being added, and if it fell, then too little. In general, we found that with the default settings put into the system, the line was kept horizontal. This suggested good compliance of the calculated with actual evaporation. Had there been any deviation then it is possible to adjust the response by varying the standard settings of the controller via the front panel keypad. This can be carried out by the operator at the controller and allow the controller to adapt to particular requirements.

Conclusion

Tests have shown the controller functioned well under experimental conditions. There would seem to be little reason to feel that it would not succeed under commercial conditions. The next step will be to carry out field trials at the centres of the project in the Mediterranean region and if possible in a commercial operation.

References

Penman H L (1948).
Natural evaporation from open water, bare soil and grass. Proceedings of the Royal Society, London A, **193**, 120-145.

Doorenbos J (1984).
Irrigation and drainage. Paper 24, FAO, Rome. 144p.

POWER LINES

Is it a bird? ... Is it a plane? ... No, it's SID!

Skylines across Britain could change forever thanks to an ingenious device engineered by two schoolboys who won the prestigious title of Young Engineers for Britain 2001 in London recently.

Brendan Quinn and Enda Young both aged 18, from St Partick's College, Maghera in Northern Ireland beat 28 other finalists from all over the UK to win the competition which showcases the wealth of innovation and creativity amongst 11 to 19-year-olds.

Their winning idea called the Self-sustained Induction Deferrer, nicknamed SID, is an automatic pod that scares off birds sitting on power lines by using power from the line to propel itself up and down the cable.

Droppings, from birds perching on overhead power lines, have long caused environmental and health problems. The birds' corrosive droppings cause damage to property and car paint work in particular, along with health problems when droppings from power lines fall onto people's washing.

Both Enda and Brendan came up with the solution after being inspired by the problems faced by Northern Ireland Electricity with starlings on its power lines. The company is so impressed with their invention that it may use it once further tests have been completed.

Juliet Upton, of the competition organisers the Engineering Council, said: "Young Engineers for Britain has again demonstrated the quality of inventiveness of Britain's young engineers. SID, the winning project, is an ingenious solution to what appears on the surface to be a simple problem. Every finalist highlighted the huge contribution engineering can make to solving or improving some of life's daily problems."

Enda and Brendan, who were presented with the prestigious title by Pat Symonds, Executive Director of Engineering of Benetton Formula Limited, said: "We are absolutely elated to have won. It's a great honour – especially considering how good the other inventions were."

They both share a prize of £2,500 while their school receives £2,500 to spend on engineering equipment.

Commercial Members

Autec Design Ltd
Stockley Road
Heddington
Calne
Wiltshire
SN11 0PS

Douglas Bomford Trust
16 The Oaks
Silsoe
Bedford
MK45 4EL

Bomford Turner Limited
Salford Priors
Evesham
Worcestershire
WR11 5SW

John Deere Ltd
Harby Road
Langar
Nottinghamshire
NG13 9HT

Farm Energy Centre
NAC
Stoneleigh
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

Rotomation Ltd
Summerwood Lane
Halsall
Ormskirk
Lancashire
L39 8RH

White Horse Contractors Ltd
Lodge Hill
Abingdon
Oxfordshire
OX14 2JD

Academic Members

Cranfield University
Silsoe
Bedford
MK45 4DT

Harper Adams University College
Newport
Shropshire
TF10 8NB

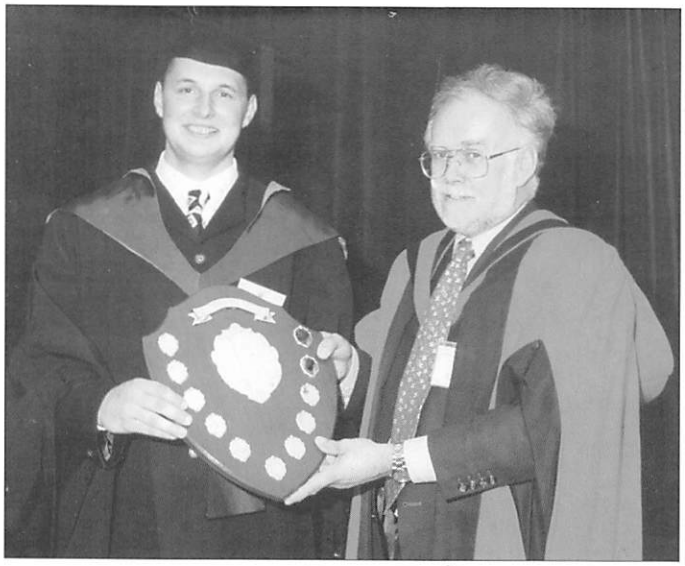
Oatridge Agricultural College
Ecclesmachan
Broxburn
West Lothian
EH52 6NH

Pencoed College
Pencoed
Bridgend
CF35 5LG

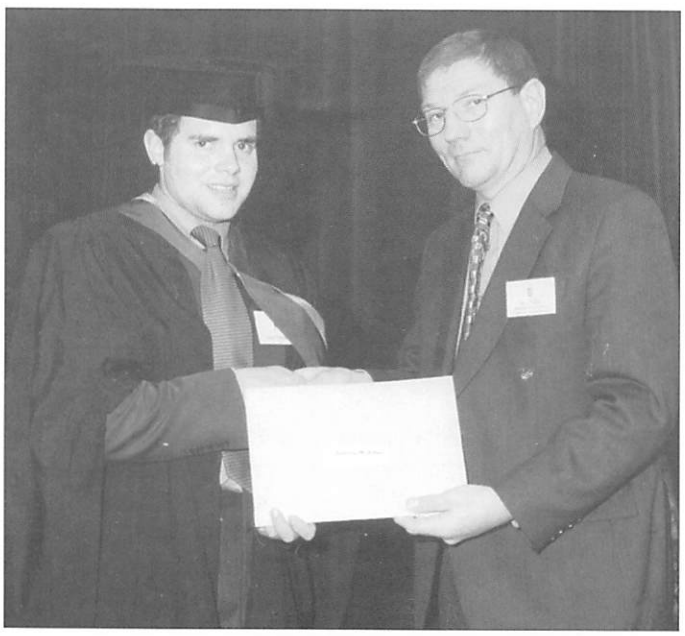
Sparsholt College
Sparsholt
Winchester
Hampshire
SO21 2NF

Wiltshire College – Lackham
Lacock
Chippenham
Wiltshire
SN15 2NY

Writtle College
Chelmsford
Essex
CM1 3RR



Richard Nankervis was named 2001 winner of the Benford Shield awarded annually at Harper Adams University College to the student who produces the best engineering design project. He received the trophy for his design of a wastewood chopper from Dr Dan Mitchell, Reader in Engineering and President Elect of IAgrE.



Ashley McAdoo, of Aghabog, County Monaghan, Ireland received the 2000 IAgrE Wrekin Branch prize from Branch Chairman Alastair Taylor, following postponement of the earlier presentation. The award is given for the best performance during the final year of the HND Engineering courses at Harper Adams University College.

FLOOD MANAGEMENT

Communique to Government on flood management

The Chartered Institution of Water and Environmental Management (CIWEM) urges the Government to make the following changes to legislation and policy in order to help people who live, work and invest in flood risk areas.

(1) There must be a 'one stop shop' service provided to people to cover all matters of flood management especially during and after a flood emergency. A joined-up co-operative approach is essential between all parties and the costs need to be underwritten for all public sector agencies.

(2) People need to know that they are at risk from flooding or will be if they move into a house in the floodplain and must understand what that risk means.

(3) There should be a greater emphasis on managing flood risk over a catchment rather than on providing local flood defences as the only solution.

(4) Responsibility for maintenance of all solutions to flood risk must be allocated to an organisation with long-term responsibilities particularly, for example, the adoption of sustainable urban drainage systems.

(5) There needs to be a significant increase in funding – an additional £100 million per annum – for flood management to meet existing and future need, considering likely climate change scenarios.

(6) There is a skill shortage within the industry due to failure to attract good quality graduates into the profession. Help from Government is needed in the public sector to recruit and retain high calibre staff as has been done for teachers and medical staff. The Institution's members were at the forefront of helping people during the recent floods and their work over many years prevented far greater damage and loss of life. The Institution is concerned that without Government help the professionals of tomorrow will not be competent to meet the challenges of nature.

(7) There needs to be clarification of 'main river' and 'non-main river' designations, with more flexibility to change the designation of watercourses locally. The current legislation is cumbersome.

(8) There should be a reduction in the number of organisations involved in flood management.

(9) The standard of service to be provided needs to be based on human needs and not just tangible economic benefits at the national level. Regional and local impacts have social, environmental and economic consequences at all levels. These need to be given appropriate weighting with other factors in the justification of schemes.

(10) Flood management is about people. Policy should reflect this. Policy on aftercare for flood victims needs to be improved.

This communique was agreed to in principle by 160 environmental professionals attending a meeting entitled "Autumn and Winter 2000 Floods. A Wake Up Call For Change?" on 10th May, 2001 to debate the issues.

ECOLOGY

Ecological site classification goes hi-tech

A new, PC-based decision support system (DSS) for Ecological Site Classification (ESC) has just been made available by the Forestry Commission.

The ESC-DSS is designed to match key site factors with the ecological requirements of different tree species and woodland communities anywhere in Great Britain.

ESC-DSS can provide information to assist species choice if the user supplies a grid reference, an elevation and a soil type. It then accesses sophisticated climate data to establish suitable options for the site. More-precise advice is obtained if the user supplies more-detailed site information, such as rooting depth, soil texture, stoniness, lithology, humus form and plant indicator species, or a combination of these. ESC-DSS makes the application of ESC, previously only available through complex manual calculations, a straightforward and rapid task.

The software is compatible with Microsoft Windows 95, 98 and NT operating systems, and the £100 package includes a user's manual and an on-line help system.

"Creating sustainable forests requires the selection of the right tree species and establishing woodlands that are ecologically suited to a particular site type, rather than selecting the species and modifying the site conditions," said the program's developer, Duncan Ray, of the Woodland Ecology Branch of Forest Research.

"ESC-DSS will help in the forest planning process. It is designed as a user-friendly tool to help managers and owners select tree species, identify native woodland options and identify the constraints imposed by site conditions."

Training courses for ESC are being organised at various locations by the Forestry Commission's Forestry Training Services, priced £300. The courses cover ESC survey techniques, soil and plant identification, and tree species and native woodland community suitability.

CONTACT

Further technical information about the software is available from Duncan Ray. Tel: 0131 445 6980. Email: esc.support@forestry.gsi.gov.uk Web: www.forestry.gov.uk/esc
To order the ESC-DSS package, or to obtain details of the training courses, contact Forestry Training Services. Tel: 01387 860637 /668. Email: forestry.training.services@forestry.gsi.gov

FERTILISING

New machine is major advance in fertiliser injection

Direct injection of fertiliser into the soil has significant advantages compared with conventional granular or liquid applications. As fertiliser is placed directly into the root zone of the plants, losses into the atmosphere and through run-off are avoided and there is no risk of scorching the crop.

Various machines have been used in the UK for fertiliser injection, but all have had disavantages. The Knight machine has a 3000 litre tank from which fertiliser is fed to 24 injection wheels spaced at 300 mm centres along a rear toolbar. Spikes on the wheels, 50 mm long, inject the fertiliser into the soil, and the 600 mm diameter wheels are individually spring-loaded so they follow the ground closely. Fertiliser can be applied at rates up to 2000 litres/ha.

The 7.5 metre toolbar is hinged in the centre for transport, and folding is performed by the electro-hydraulic system on the machine.

The machine is based on the same chassis as Knight's EU series of high-capacity trailed sprayers and has an electro-hydraulic auto-steering drawbar to reduce crop damage when working in maize. The steering system also improves the turning circle of the machine for fast turn-round at the end of each bout. Axle suspension and brakes are fitted for safety and efficiency when working on difficult terrain or travelling on the road.

Many of the features found on Knight sprayers are included, for example, multi-stage filtration, a clean water washing system for purging the injection lines, and anti-drip control to stop scorching at the end of each bout. An RDS Delta 3-rate controller is also fitted, linked to a printer supplying hard copy records.

Applied to grassland at rates of up to 375 kg/ha, one application has been found to provide enough nutrition for a whole season. Grazing and conservation leys have given high overall yields and have recovered quickly after grazing or cutting. Used post emergence on forage maize crops, the system has also been found to improve cob size and fill significantly.

As only one application is needed each year, time and costs are considerably reduced compared with conventional granular or liquid applications.

CONTACT

Knight Farm Machinery Ltd, Wireless Hill, South Luffenham, Oakham, Rutland LE15 8NF. Tel: 01780 722200. Fax: 01780 722201.

MARKETING

Competitive opportunities for McCormick

McCormick Tractors International Ltd, the new farm equipment business based at Doncaster, South Yorkshire, has been given a head-start in its quest to become an established player in the global farm machinery industry.

It has a well-known product range, open access to a top-class dealer network, and a degree of competitor protection in its home and other European markets. Moreover, thanks to the wide-ranging agreement negotiated between McCormick's parent company, Landini SpA, and CNH Global NV, it will quickly be able to expand its product offering with higher power tractors.

The agreement arises from European Commission concerns that a merged Case-New Holland business would hold an excessive share of key tractor markets within Europe which might deny fair competitive practice. Before approving the merger, therefore, the Commission required CNH Global NV to sell the Doncaster tractor plant as a going concern, as well as all rights to the CX and MX-C models made there. It also required important undertakings with regard to distribution and competition.

Under the terms of the agreement between Landini SpA and CNH Global NV, Landini acquires:

- the tractor plant located in Doncaster, including the training centre and all design, engineering and manufacturing staff, plus key members of other important departments;
- all technical and commercial rights to the CX and MX-C model tractors;
- the 'McCormick' brand name.

In addition, the agreement includes:

- a contract for McCormick to build CX and MX-C tractors in Case-IH livery for sale outside Europe;
- a contract for McCormick to produce MX Maxxum 75 kW to 124.5 kW tractors for sale by CNH Global NV through Case-IH dealers;
- an agreement enabling McCormick to produce its own re-engined and re-styled version of the MX Maxxum tractor.

'These are all important elements of a comprehensive agreement that lays sound foundations for McCormick Tractors International and its future development,' says Mike Edmond, sales & marketing director. 'It ensures that production volumes will remain at economic levels during the early stages of the business, and provides for future development of the McCormick range into other important market sectors.'

The production elements of the agreement are backed by conditions governing distribution and parts support.

- Case-IH dealers within the European Economic Area (EEA) plus Switzerland, and New Holland dealers in Denmark, are free (if appointed by McCormick) to sell the McCormick CX and MC tractors for as long as they wish.
- CNH Global will provide parts support for McCormick CX and MC tractors sold through Case-IH dealers.
- In Austria, Belgium, Luxembourg, Denmark, the United Kingdom and Iceland, CNH Global is obliged for two years not to supply Case-IH dealers with tractors that directly compete with the McCormick CX and MC tractors.

Mike Edmond comments: 'CNH Global's co-operation with parts and service support for Case-IH dealers selling McCormick products will reassure potential dealers and customers that they will have good back-up from the start. This is obviously very important for a new business such as ours.'

CONTACT

Vikki Morley, Communications Manager, McCormick Tractors International Ltd, Wheatley Hall Road, Doncaster, South Yorkshire DN2 4PG. Tel: 01302 733393. Fax: 01302 761826. email: vikki.morley@mccormick-intl.com

TRAINING

Lantra Professional Register all set for lift-off

Lantra National Training Organisation is set to launch the land-based industries' most comprehensive sector-wide register for training and business support professionals in the shape of the Lantra Professional Register.

The register, currently covering 739 of the sectors' best training providers, instructors, lecturers, mentors, tutors and assessors is rapidly nearing its official launch date, when the project really begins to show its worth to the sector.

The Lantra Professional Register is a landmark development in the provision of quality training for the land-based sector in the UK. It offers invaluable access to a pool of training and business support practitioners whose expertise is quality assured.

Managed by Lantra National Training Organisation, the register is set to be the foremost quality assured association of training and business support practitioners for the UK land-based sector. It ensures that individuals and organisations involved in land-based industries have access to the highest quality training whenever or wherever they choose to learn.

Stewart Jardine, Director of the Lantra Professional Register spoke of the exciting times ahead, saying: "Combining the best of web-enabled intelligent support systems with that of hands-on experience, the Professional Register is geared to advance the quality, professionalism and relevance of the sectors learning and skills provision."

CONTACT

For further information on the Lantra Professional Register or to request an application form, please contact the Lantra Professional Register's registrar. Tel: 0845 707 8007 (option 1). Fax: 02476 696732. Email: theregistrar@lantra.co.uk

PRECISION FARMING

Trimble adds portable computer to AgGPS product line

Trimble has introduced a new addition to its line of agricultural field information solutions – the AgGPS® 160 Portable Computer. Suited for handheld or vehicle-mounted use, the AgGPS 160 can significantly increase productivity of growers, custom applicators, contractors and agribusiness consultants by adding enhanced guidance, field mapping, soil sampling and data logging capabilities to their existing Trimble agriculture equipment.

Trimble's agricultural products have been designed with flexibility and ease-of-use in mind. Users can choose any of Trimble's AgGPS receivers as well as the AgGPS Parallel Swathing Option (PSO) to work with the AgGPS 160 Portable Computer to build a complete field management system. This modular set of components allows AgGPS users to expand their hardware investment and add Trimble precision applications, as they are needed. Growers and agribusiness can increase efficiency and productivity by using precise GPS-based field management records, guidance and computing technology to strategically map, measure and manage crop performance while improving crop and operational traceability.

The AgGPS 160 is a reliable and rugged – waterproof and drop-proof (1.2 metres) – top-of-the-line computing solution built to operate in extreme agriculture conditions. The computer can operate in temperatures ranging from -20 to 60 degrees Celsius and has up to 40 hours battery life.

A sunlight-readable backlit display provides a clear view while mapping fields, applying agricultural materials or planting, day or night. The computer uses the Microsoft® Windows® CE operating system for mobile applications, providing users with a graphical interface while running Trimble precision agricultural software. It can also run third-party WinCE software. The portable computer can be quickly and easily installed and transferred between vehicles, leveraging the user's investment across multiple applications.

When used with the AgGPS 214, the AgGPS 160 Portable Computer can record elevations and create field topographic maps; these maps can determine the layout of drainage or levelling, which can improve water management and increase crop yields.

When an AgGPS lightbar is attached, the AgGPS 160 provides enhanced field guidance, including straight line, curve, spiral and headlands patterns. The system can also provide guidance down line features which have been mapped in the field, or imported from a Geographic Information System (GIS), greatly improving productivity in laying tile drainage and planting trees or vines.

When connected to an external spray switch, the AgGPS 160 Portable Computer can record where agrochemicals are applied, automating the creation of spray reports and maps. On-screen application coverage lets operators find any skips and avoid costly callbacks. The AgGPS 160's software also allows logging of data from barcode readers, environmental sensors and weather sensors.

AgGPS 160 users can quickly determine accurate areas for billing by easily mapping field boundaries and subtracting non-productive areas. Attributes for field events are fully user-customisable, enabling users to record anything from products applied to weather conditions for spray reports, plant varieties or even product ID tracking. The system's software makes soil or other sampling practices easy.

All data is stored in ESRI Shapefile format for efficient integration with existing agricultural data. Data is stored on an internal flash disk and is easily transferred to a PC using Windows Explorer and Microsoft ActiveSync where it can be loaded straight into most office GIS packages.

The AgGPS 160 Portable Computer is available now through Trimble's Agriculture Dealer network. Trimble is a leading innovator of Global Positioning System (GPS) technology. In addition to providing advanced GPS components, Trimble augments GPS with other positioning technologies as well as wireless communications and software to create complete customer solutions. Trimble's worldwide presence and unique capabilities position the Company for growth in emerging applications including surveying, automobile navigation, machine guidance, asset tracking, wireless platforms, and telecommunications infrastructure. Founded in 1978 and headquartered in Sunnyvale, California, Trimble has more than 2,000 employees in more than 20 countries worldwide.

FURTHER INFORMATION

Trimble Navigation Ltd, 645 North Mary Avenue, PO Box 3642, Sunnyvale, CA 94088-3642. For an interactive look at company news and products, visit Trimble's website at www.trimble.com

ENGINE PROTECTION

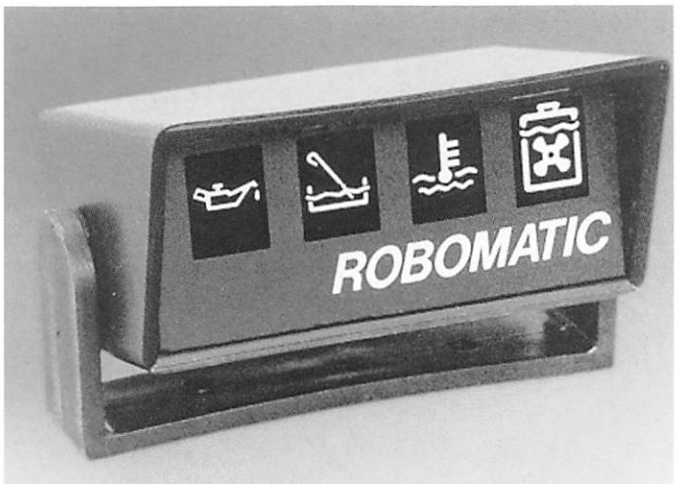
'Robomatic' cuts out engine failure caused by overheating

With growing 'stop-go' on motorways and hold-ups on other routes due to ever increasing UK traffic levels, engine overheating is fast becoming a major cause of engine failure.

Thanks to Agriemach's new 'Robomatic' Mark 5 Engine Control System, a practical solution to engine overheating risks is now available.

The four-function 'Robomatic' System monitors oil pressure, oil level, water temperature, and water level. The malfunction of any one of these can lead to engine failure.

Housed in a swivelling display unit and mounted above the dashboard, the Control System provides both visual and audible warnings of malfunction. These are given by a flashing light on 'Robomatic's' display panel showing the relevant international function symbol and a linked buzzer. This tells the driver which of the four functions is at risk. And after a delay of 35 seconds, electrical power is cut and the engine shutdown.



'Robomatic' is a new engine protection system from Agriemach that monitors oil level and pressure, water level and temperature, and warns of overheating risks that could otherwise lead to engine failure

Where engine shutdown leaves the vehicle exposed, further 35-second re-starts, as required, allows the driver to move the vehicle off the highway so the cause of the failed function can be safely attended to.

For those not requiring the shutdown facility, an almost identical 'Robomatic' simply acts as an Indicator System with flashing light and buzzer. Another version is the 'Robomatic' Interface Control Module developed to utilise the existing vehicle monitoring switches and warning lights plus using the as-fitted electrical shutdown unit.

The display unit is neat and compact and comes with 600 mm lengths of connecting wire and is available in either 12 volt or 24 volt versions. Detailed fitting instructions and a wiring diagram are provided with each Control System.

CONTACT

Agriemach Ltd, Wayfarers, Domewood, Copthorne, Crawley, West Sussex, RH10 3HD. Tel: 01342 713743. Fax: 01342 719181. Email: agriemach@hotmail.com Web: www.agriemach.com

TREE MARKERS

Sylvamark – aerosol sprays for forestry marking

French company Soppec, which specialises in the design, manufacturing and sales of aerosol marking paints, has dedicated its Sylvamark range to timber industry professionals.

This new Sylvamark range is used to mark and identify trees from exploitation to the sawmill and meets the strictest criteria regarding product performance, hygiene, user safety and respect for the environment.

The Sylvamark range is divided into three products with three different types of use: 'Fluo Marker', fluorescent paint which improves marking visibility by 30% compared with non-fluorescent paint; 'Standard Marker' for stencil marking and 'Strong Marker', especially formulated for long-term marking. All products in the Sylvamark range provide optimum performance including at low temperatures. Certified to ISO 9002, the quality of Soppec product manufacturing is guaranteed. All Sylvamark products have an ergonomic cap for simple and clean use with a whole range of accessories: pistol handles, spray holders, special nozzles.

As an industry, Soppec respects the environment both through the formulation and the method of production. It takes on its responsibilities and supplies its customers with products free from toluene, chlorinated solvents, lead and CFCs. This enables users to work with products respectful of men and environment.

Likewise, all safety data sheets can be consulted on the Internet.

Soppec's objective is to extend its trading presence to all forestry countries and maintain its leadership in technical innovation and respect for the environment thanks to regular contact with its users. Soppec is looking for distributors throughout Europe.

SEED DRILL

New Nokia 6250 – perfect for outdoor workers

If you're looking for a mobile phone that's going to stand up to the rough and tough of your job, then the new Nokia 6250 is the handset for you.

The first in a new category of Nokia 'tough' products, the Nokia 6250 has been specially designed to withstand the most demanding conditions. Built hardy from the inside out, the new handset is water, shock and dust-resistant, just what you need if your job involves spending lots of time braving the elements on building sites, oil rigs or on the road!

Built for a hard day's work!

The dual-band, WAP compliant Nokia 6250 contains many unique additional features that ensure the handset works properly in rugged environments.

- Shock absorbers protect it from bangs and scrapes and drops of up to 3 m onto a hard surface.
- Waterproof membranes, and water-tight sealing of the covers means it can survive immersion in water up to 0.5 m deep for up to one minute.
- Clear battery monitors and signal strength indicators enable users to keep track of their handset's power capabilities whilst out in the field.

And its WAP capabilities means outdoor enthusiasts can easily access weather and news reports on the move, whilst businesses can use its WAP technology to receive instructions on jobs, report into company databases or keep customers up to date on job progress.

Alison Brolls, Head of Marketing at Nokia Mobile Phones UK said; "The Nokia 6250 is a truly outdoor mobile phone. If your job requires you to perform well under extreme conditions then this is the mobile phone for you; it's a tool you can count on whatever the weather, whether you're climbing up scaffolding or repairing a car on the roadside!"

The Nokia 6250, weighs 174 g, has a talktime of up to 3 hours 15 minutes to 5 hours 50 minutes or a stand-by time of up to 72 hours to 336 hours depending on levels of use. The Nokia 6250 also provides data connectivity either via infrared or a cable at a data speed of up to 14.4 kbps (network dependent). Available at mobile phone retailers now, the Nokia 6250 costs approximately £150 with a network connection.

FURTHER INFORMATION

Nokia Mobile Phones. Web: www.nokia.com

BALER TWINE

Be aware of false economies on twine warns expert

A leading expert on twine and bale packaging has issued a stark warning to farmers and contractors about the risks of selecting twine purely on economic terms.

Graham Robson, technical manager of crop packaging specialists UAT, is warning operators of the pitfalls of buying cheaper twines for this season's baling. "Some poor quality twine manufactured by some producers can be made of two or three thinner twines and twisted together after production in order to meet lower production costs. Unfortunately it is very often impossible to twist the twines completely uniformly and loops may be left. This can cause uneven feeding through the twine guides and perhaps more seriously, can cause the knotter to be fouled for the next knot, that in turn may prevent correct twine feeding to the knotter via the needles. Such a situation can quite easily lead to bent needles, causing serious damage to the baler."

Twine spools wound tightly in the spooling machine during production, leaving only a small hole in the centre, will also cause the twine at the beginning of the spool to be kinked. The only way round this is to remove the first 20-30 metres from the spool to allow a more free movement. If left unchecked, the twine can jam in the spool creating uneven tension through the twine guides, causing knotting problems, or cause twine in the spool to be pulled out in a 'bunch' jamming the twine guides altogether.

However, as Graham points out one manufacturer, Cotesi, has devised an 'easy feed' system, where the spool centre is wider allowing the twine to flow freely from the start of every spool. "Despite the fact that the spool centre is wider in the Cotesi BigBale 72XL there is a guaranteed extra 5% per pack over the standard 7200' type twine for the same knot strength which, on average, is the equivalent of four more eight foot bales from each pack of twine."

Over a season's work of 20,000 bales, up to an extra 1,000 bales would be possible from the 72XL, compared to standard 7,200' type twine, not only leading to savings in downtime when reloading the baler but also in potential downtime due to damage caused by inferior twines.

CONTACT

Graham Robson, Technical Manager – UAT. Tel: 01420 545800. Fax: 01420 549549. Email: Graham.Robson@uat.co.uk

Better timeliness at half the cost with AGCO Spra-Coupe

Growers can cut application costs by half and improve the effectiveness of spray programmes by using a fast light-weight sprayer, claims AGCO Spra-Coupe distributor Richard Price.

He calculates that a grower with 800 ha of cereals can reduce annual sprayer costs by more than £11,000 by using the fast, lightweight AGCO Spra-Coupe instead of a larger, traditional self-propelled machine. In addition, crops are likely to benefit from more timely application and more effective use of agrochemicals, with better coverage of the crop. That can provide an even greater saving, with reduced rate applications cutting chemical costs by a further £20,000 per year.

"With cereal profits under serious pressure, cost savings of this order can make the difference between whether a business develops and grows in the future, or stagnates and declines," says Mr Price, managing director of Chavtrac, UK distributor of the AGCO sprayer. "As well as reducing costs, high speed spraying with the Spra-Coupe ensures spraying is carried out in optimum weather conditions and at the correct growth stage, and that a higher percentage of the product adheres to the crop. That can only have a beneficial effect on yields."

Mr Price also points out that on arable farms, outside the sowing and harvesting season spraying is the most pressing operation. It is often a job carried out by the owner or manager, and because Spra-Coupe can reduce the time spent spraying by 30 days a year on 800 ha of cereals, it leaves more time for managing and marketing crops.

The £11,000+ annual savings in spray applications costs available by using a SpraCoupe machine rather than a traditional self-propelled sprayer are spread across all areas of ownership and operating costs (see table). They include lower depreciation, servicing and repair bills, fuel and labour costs.

The costings are based on the Spra-Coupe giving double the workrate of a traditional self-propelled sprayer, covering 20 ha/h compared to 10 ha/h, with actual spraying hours accounting for two-thirds of each machines' operating hours. Servicing is according to the manufacturers' recommendations and fuel cost is based on Spra-Coupe using 15 litres/hour and the traditional sprayer using 30 litres/hour. Repair costs are for carrying out similar work on each machine.

As well as doubling the work rate and reducing costs, high-speed operation produces more effective spraying. The greater forward speed results in spray droplets taking a diagonal path through the crop canopy. Trials at Morley Research Centre, Norfolk, have shown that when operating the Spra-Coupe at 20-30 km/h, even at application rates as low as 55 l/ha there is greater plant coverage than when using 210 l/ha at 8 km/h.

"This offers considerable scope for using reduced application rates of contact products," says Richard Price. "On 800 hectares of wheat, annual agrochemical costs for residual and contact herbicide, fungicide, growth regulator and insecticide can add up to £108,000. By operating a Spra-Coupe at 20 km/h, it is possible to reduce usage of all chemicals, apart from residual herbicides, by a quarter, giving a saving on the agrochemical bill of almost £20,000. "At higher speeds – the Spra Coupe has a top speed of 33.5 km/h – it may be possible to reduce application rates even further."

More than 25,000 Spra-Coupe machines are working worldwide. The US manufactured machine joined the AGCO stable in 1998, and the two latest models in the range – the 4440 and the 4640 – are optimised for use in European conditions with powershift transmission, larger 1,500 litre tank, and booms and suspension sourced in Europe.

The machine's high operating speed is achieved through a combination of a light weight (with full tank, 5-6 tonnes according to model), all-round suspension and a 83 kW Perkins turbo diesel supplying ample power and torque. Features such as the automatic transmission option allow the operator to concentrate on the work by automatically returning the machine to a pre-selected operating speed after headland turns.

Spring suspension on the front wheels and heavy-duty coil springs and dampers at the rear provide the stability and smooth ride needed for fast working. The machine's light weight minimises soil compaction and means that the Spra-Coupe can work when weather conditions are suitable for spraying yet soil conditions keep heavier sprayers of the land.

Included in the advanced technology equipment available for Spra-Coupe are:

- a direct injection system allowing up to five different products, individually controlled, to be applied simultaneously;
- the Fieldstar precision farming system for variable rate application according to application maps and precise record keeping; and
- the Energised Spraying Process using an electrostatic charge for more uniform coverage and less drift.

Sprayer cost over 5 years - spraying 800 ha five times per year

	Spra-Coupe 4440 model 1,500 litre tank 24 m boom	**Traditional Self-Propelled 2,000 – 3,000 litre hydrostatic sprayer**
Purchase cost	£50,000	£65,000
Value after 5 yrs	£20,000	£20,000
Depreciation	£30,000	£45,000
Servicing	£900 (1500 h)	£9,000 (3,000 h)
Fuel (@ 20 p/litre)	£4,500 (15 l/h)	£18,000 (30 l/h)
Repairs (inc. one major	£3,000	£10,000
transmission repair)	(£2,000)	(£8,000)
Labour @ £8/h	£12,000	£24,000
Total cost	**£50,400**	**£106,000**
Annual cost	**£10,080**	**£21,200**
Annual saving	**£11,120**	
Cost of each application	**£2.49/ha**	**£5.24/ha**

CONTACT

Paul Lay, AGCO Ltd, PO Box 62, Banner Lane, Coventry, CV4 9GF. Tel: 024 7685 1209. Fax: 024 7685 1182. Email: paullay@uk.agcocorp.com

SLURRY HANDLING

Fast and clean filling from Lynx's new coupler

Developed to help reduce the time taken to fill a vacuum slurry tanker and contain spills and odours, the automated Fast-Fill filling system from Lynx Engineering has overcome some of the design problems associated with existing products.

The Fast-Fill is a remote slurry tanker filling system. It has been developed to help reduce the time that is taken to fill a vacuum slurry tanker.

The Fast-Fill comprises a portable ramp connector base and tanker mounted suction foot. The suction foot is hydraulically lowered onto the connector, a compressible grommet on the foot ensuring a perfect seal between the two. To further reduce the chance of spills, both the base connector and foot incorporate sealing valves. Once a pre-set pressure has been reached between the foot and connector, hydraulic rams automatically open the valves. If the foot is incorrectly positioned, the valves cannot open. This eliminates the chance of spills.

Once the tanker is filled, the connector and foot valves close automatically. This prevents slurry draining from the filling hose as it is removed and also seals the base connector. A valve in the base connector also allows the system to operate with above ground slurry stores.

To help make it easier for the operator to align the suction foot, the towing tractor is driven over the base connector to ensure the tanker is correctly aligned. From the cab, the operator can clearly see the connector base and can lower the foot to the correct position. With only a little practice, connecting becomes a simple process.

"Remote slurry tanker filling systems are not new, but where the Fast-Fill scores is in its ease of operation and reliability," says Nick Ewbank, senior partner at Lynx. "Some existing designs can leak and leave a puddle of slurry around the base connector and cause dribbling from the suction foot. A key advantage of remote filling is meant to be that the operator should stay clean with smells and mess virtually eliminated. The Fast-Fill really does meet these requirements."

Suitable for use with 150 mm and 200 mm suction pipes, the Fast-Fill is designed to fit most modern slurry tankers. The connector base is picked up by the foot for transport and held in place by a simple chain. This makes moving between slurry stores quick and easy.

A Fast-Fill kit can be purchased from £2,130.

CONTACT

Nick Ewbank, Lynx Engineering, Wharf Works, Long Buckby, Northampton, NN6 7PP. Tel: 01327 843215. Fax: 01327 844341.

UTILITY VEHICLE

Trail Gator gets a farming facelift

Ruggedly designed with farmers and countryside users in mind, John Deere's new Trail Gator is a six wheel, four wheel drive, two seater utility vehicle suitable for a wide range of load-carrying and off-road applications.

'Gator' stands for General All-purpose Turf and Off Road vehicle. The Trail Gator features a Yanmar 13.5 kW three cylinder diesel engine, heavy duty tyres and a continuously variable transmission, providing speeds of up to 29 km/h without the need for gear shifting or clutching.

Gators were first introduced to the grounds-care market in 1990. A range of petrol and diesel models are widely used in parks and sportsgrounds, on golf courses, construction and transport sites – even motor racing circuits and in the Antarctic, where they are used by the British Antarctic Survey. A concept version of the Trail Gator was first seen on the John Deere Customer Support stand at the 2000 Smithfield Show.

Gators combine high flotation with low ground pressure (0.5 bar fully loaded), and a wide front end with a low centre of gravity for safety and stability, making them equally at home in heavy mud, on hilly terrain or on amenity turf areas. The standard highway kit allows the vehicle to be driven safely and legally on public roads.

The Trail Gator has a total payload capacity, of 636 kg and the same towing capacity; the tipping cargo box holds 454 kg. Standard specification also includes a front bumper and brush guards, a hand operated diff lock, rack and pinion steering and internal wet disk brakes.

The new Trail Gator utility vehicle, which is sold and serviced through the John Deere agricultural dealer network, costs £8700 plus VAT.

MORE INFORMATION

John Deere Ltd, Langar, Nottingham, NG13 9HT. Tel: 01949 860491. Fax 01949 860490. Web: www.johndeere.co.uk

DRIVE SYSTEMS

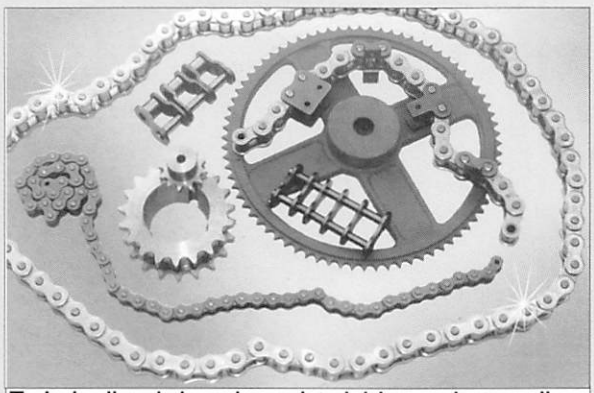
Roller chains on 24-hour call

Roller chains provide the essential links in many drive systems and Challenge Power Transmission plc can supply a wide range of size options. Manufactured to the highest standards, these products combine excellent wear resistance with strength, durability and optimum load bearing performance. British standard roller chains from 4 mm to 75 mm pitch can be supplied, with stainless steel versions covering 8 mm to 25 mm pitch. ASA standard chains are also available in pitch sizes from 9.5 mm to 62.5 mm. All products are available from stock, supplied in five metre lengths as standard or cut to size as required. A wide range of other transmission products including leaf, attachment and conveyor chains can also be supplied on short order delivery from their factory/warehouse in Western Europe.

All products are suitable for OEM installations, but to cater for the needs of the repair/maintenance/replacement markets, a 24-hour call-out service is also available to cover emergency breakdowns.

A wide range of associated BS plate wheels and sprockets can also be supplied. These include both pilot bore and taper lock sprockets in either steel or cast iron and including even numbered tooth options. Sizes cover from 9.5 mm to 38 mm in simplex, duplex and triplex varieties with 8 to 95 teeth configurations. Double simplex pilot bore sprockets in 12.5 mm, 15.9 mm and 19 mm sizes are also available. Prices for bore and keyway machining are available on request.

Pulleys, bushes, hubs and couplings can also be supplied from an extensive local stock of transmission products in excess of £750,000, backed up by an even wider range of equipment warehoused overseas.



Typical roller chain and associated drive products available from an extensive stock on 24-hour call from Challenge Power Transmission plc

CONTACT

Challenge Power Transmission plc, Unit 4, Phoenix Road, Wednesfield, Wolverhampton, West Midlands WV11 3PX. Tel: 01902 866116. Fax: 01902 866117. Email: uksales@challengept.com

ROTARY MOWER

Topper 5 pasture topper & roller mower

The latest addition to the Teagle range of rotary mowers and pasture toppers is the Topper 5. The new machine is a high quality, stylish, single rotor unit having a 1.52 m cutting width. The size and 15 kW power requirement of the Topper 5 makes it well suited to compact tractors and smaller agricultural tractors. It is an ideal machine for a wide range of amenity, smallholding and fruit applications.

The Topper 5 is an in-line machine, running on skids to give a height adjustment of between 12 mm and 130 mm. A flexible top link post is incorporated to allow the machine to follow ground contours.

The spring steel blade holder is mounted onto the gearbox output shaft and carries a pair of specially designed swinging blades running on hardened bushes. The blades are cranked to minimise stone damage and the corners are turned up to create turbulence for better cutting and spreading. A rear angular deflector is incorporated to ensure an even scattering of cut material.

The basic machine runs on skids, but optional screw adjusted roller kits are available for use where close cutting without scalping is required. The roller kits also give a neat 'striped lawn' appearance to the mown area.

The Topper 5 has a recommended retail price of £1030. The Topper 5 is British designed and built alongside the rest of the range in Teagle's modern UK factory.

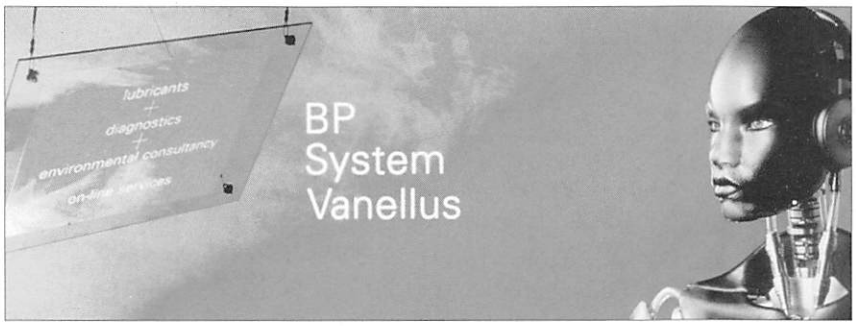
MORE INFORMATION

Teagle Machinery Ltd, Blackwater, Truro, Cornwall, TR4 8HQ. Tel: 01872 560592. Fax: 01872 561166. Email: sales@teagle.co.uk Web: www.teagle.co.uk

OIL CHOICE

BP launches system Vanellus in the UK

First ever products and services-based lubricants programme available for commercial users



BP Lubricants has launched the first complete programme of lubricant products and services for operators of agricultural equipment and vehicles. Called System Vanellus, it will help operators reduce costs, improve environmental performance and add value to their overall business.

Now being launched across Europe, System Vanellus has four key elements.

- Lubricants - a new range of Vanellus lubricants surpassing all diesel engine oils currently available. In addition to engine oils, System Vanellus includes products to meet all operators' lubricants requirements.
- Diagnostics - With tight operating margins and higher equipment utilisation rates, unscheduled maintenance is no longer acceptable. System Vanellus provides an essential preventative maintenance service for the latest equipment and engines to give operators maximum service intervals.
- Environment - a specialised environmental programme helping UK businesses meet and exceed current legislation, eliminating costly spills and fines.
- Online - a range of intranet and extranet services including online ordering, product and service information, safety and environmental.

"The strength of System Vanellus is that equipment/vehicle operators can choose as little or as much of the System Vanellus programme as they wish," says Virginie Bahon, UK Commercial Lubricants Marketing Advisor. "Users benefit as every part of our innovative offer adds value to our customers' business – large or small, regardless of the customer being an operator, dealer or distributor. All of which demonstrates our focus on generating customer profitability."

The new, reformulated, Vanellus lubricants range helps minimise fuel costs and maximise the productive working life of an engine with less equipment downtime and lower repair bills. The range includes mineral oil, part and full-synthetic formulations that are approved by Original Equipment Manufacturers and meet ACEA and API specifications.

The new Vanellus product range is now available in the UK together with diagnostic, environmental and online services and will steadily grow during the year.

CONTACT

Virginie Bahon, UK Commercial Lubricants Marketing Advisor. Tel: 01908 853442. Fax: 01908 853720. Email: BahonVM@bp.com Web: www.bplubricants.co.uk

FERTILISER SPREADING

Electronics and hydraulics tighten spreading patterns

Amazone Ltd has developed a hydraulically driven fertiliser spreader, the Hydro, which through the combination of electronic shutter control and hydraulic disc drive is the first part-width shut-off control system available for a centrifugal broadcaster. This new system means that farmers will have more control when spreading fertiliser on their headlands and field boundaries, according to Simon Brown of Amazone.

Available on Amazone ZA-M maxiS and ZA-M profiS spreaders, the Hydro hydraulic drive option also provides for very operator friendly fertiliser spreading. The lack of a PTO shaft and boundary spreading disc, means that the operator will no longer have to leave the tractor seat to make the necessary adjustments.

"Due to the electronically operated hydraulics, it is possible to alter the disc speed and thus switch from normal broadcasting to boundary spreading from the comfort of the cab," says Simon. "The AMASET controller is- programmed for headland spreading to accept both-side spreading, right up to the hedge bottom or spreading boundary where an unfertilised strip is left around the field margin where open water courses are involved. The electronic switching equipment also allows fine tuning of the disc speed in steps of 10 rpm to set both the border spreading setting and the normal spreading disc speed which still does not exceed 720 rpm, even at 36 m, to ensure that the fertiliser is not shattered."

"If used in conjunction with an LBS controller, such as Fieldstar the possibility is introduced of 6 part width section shut offs at the press of a button which means that even spreading irregular field sides is not a problem."

"When the throwing width is reduced, to allow uniform spreading on wedge shaped fields, the spread rate is also simultaneously reduced by the action of the electronic shutter control. This allows the fertiliser to be spread at a constant rate across the whole field. The electronic control box also includes a hectare counter and an integrated calibration routine."

CONTACT

Simon Brown, Amazone Ltd, Blyth Road, Harworth, Doncaster, S Yorks, DN11 8NE. Tel: 01302 751200. Fax: 01302 751202.

Vogel & Noot Terraclean keeps crumbler rollers free of soil

The hassle of soil-plugged crumbler rollers, commonly used on power harrows and tine cultivators, should be a thing of the past thanks to the new Terraclean design from Vogel & Noot. This crumbler roller has a unique scraper system that prevents the build-up of sticky soil, and helps break down any clods that accumulate within the roller.

"Farmers are all too familiar with the problem of gummed-up cultivator packers, especially this past autumn," notes Charlie Dyke of Vogel & Noot (UK) Ltd, Dilham, North Walsham, Norfolk. "Whether using the open cage type, single coils or steel rings to consolidate the seedbed, it is a real pain when conditions are OK for the cultivator but a bit too sticky for the roller."

In this situation, farmers are often forced to use a solid packer equipped with scrapers. But this heavier and more aggressive finishing tool is often inappropriate when trying to produce a light crumbly finish to the seedbed, and 'drag' from the scrapers increases power requirement.

Vogel & Noot's Terraclean design is like a conventional open-cage crumbler but has a full-length scraper blade attached to a central tube. Because the tube is connected to the crumbler mounting frame, rather than to the crumbler itself, it does not rotate as the crumbler cage goes round. Soil beginning to accumulate on the inside of the crumbler is scraped away with a shearing action that creates little or no drag. Clods find their passage blocked and are broken up. Spring-loaded pivots on the scraper allow it to deflect away from large stones.

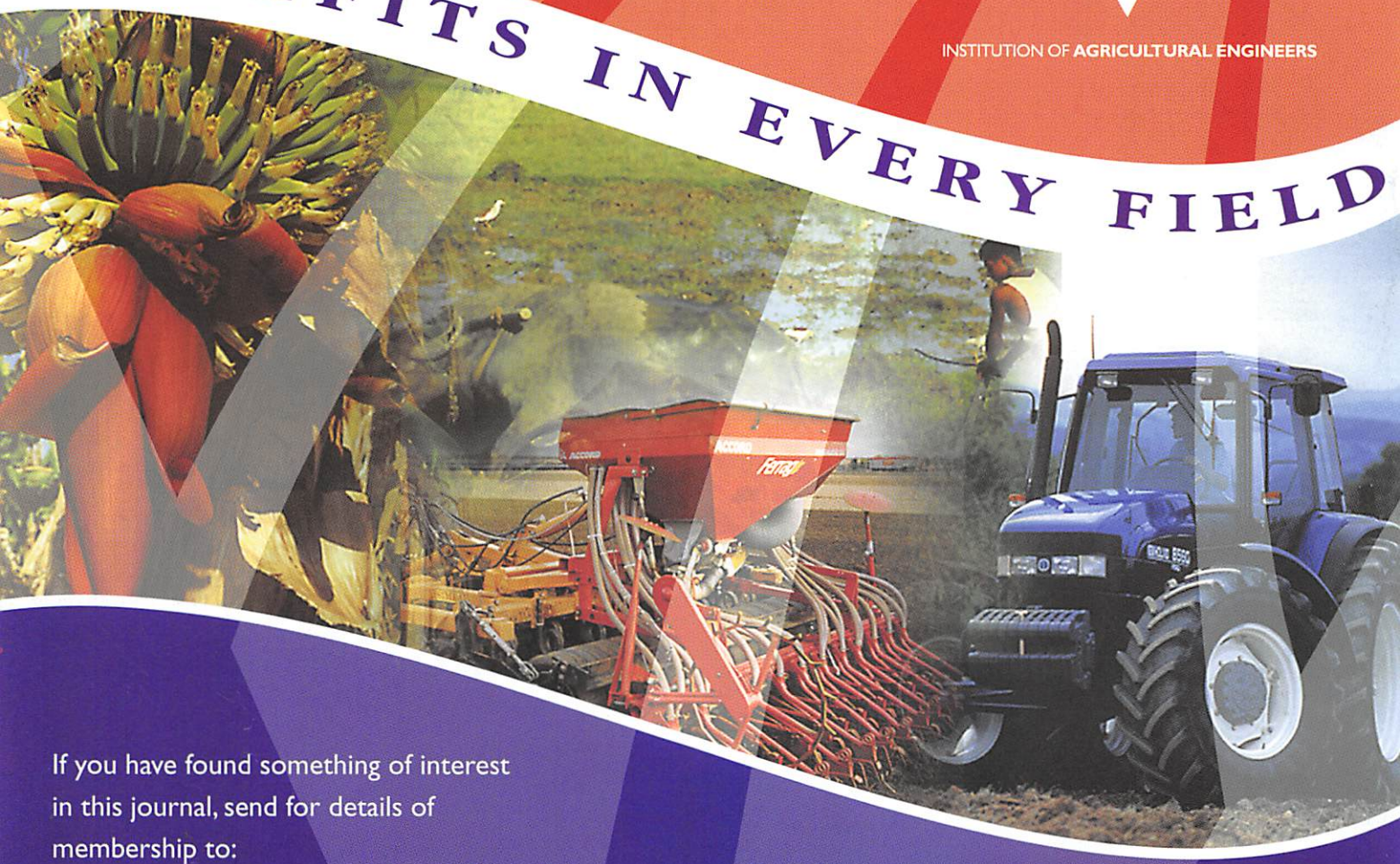
Terraclean crumbler rollers are available on Vogel & Noot's range of stubble and seedbed cultivators. They can also be bought separately for mounting on other makes of such implements.

CONTACT

Charlie Dyke, Sales Director, Vogel & Noot (UK) Ltd, Dilham, North Walsham, Norfolk, NR28 9PN. Tel: 01692 534300. Fax: 01692 534311. Email: sales@vogelandnoot.com Web: vogelandnoot.com

BENEFITS IN EVERY FIELD

INSTITUTION OF **AGRICULTURAL ENGINEERS**



If you have found something of interest in this journal, send for details of membership to:

The Secretary,
Institution of Agricultural Engineers,
West End Road, Silsoe, Bedford,
MK45 4DU.
Tel: 01525 861096
Fax: 01525 861660
E-mail: secretary@iagre.org

Professional Contacts

Network with national and international experts from many fields in the industry for help to solve your problems. IAgrE, through its professional and technical committees, provides a regular forum for members' views.

Professional qualifications

Many employers recognise the value of IAgrE membership and the professional registration with Engineering Council that it provides.

Professional registration

IAgrE is a body nominated by Engineering Council to register members as Chartered Engineer (CEng), Incorporated Engineer (IEng), and Engineering Technician (EngTech). Chartered Engineers may also be registered as European Engineer (EurIng).

Professional meetings

Participate in meetings suited to the wide and varied interests of members at national conferences, regional branch meetings and specialist group events.

Free publications

Every member receives their own personal copy of the IAgrE journal, Landwards, covering research, technical developments and applications, company and product information, and the IAgrE Newsletter, Membership Matters, with news of Institution activities and members' registration, provides a guide to engineering competence at national and international level.

Other entitlements

Education and Careers advisory service; Appointments Register and advisory service; extensive technical library facilities.