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LANDWARDS

Late Summer 2003

- Midgeater
- Calf Feeder

Energy management

IAgrE JOURNAL Volume 58 No.4 www.iagre.org

HOSPICE APPEAL

The world's oldest, working, internal combustion tractor

Dan Albone, the inventor of the Ivel agricultural motor, literally set in motion a revolution in mechanical farming, a decade ahead of Henry Ford and Harry Ferguson. Nominated in 1903, the Ivel was awarded the Silver Medal the following year, and went on to win a further 36 gold and silver awards around the world.

The centenary celebration

To mark this special occasion, a 100 mile drive was organised from its birthplace in Biggleswade to the Royal Show at Stoneleigh Park, Warwickshire in July. On arrival, the Ivel was displayed at the RASE's Machinery Award Scheme presentations (see separate article in this issue).

Help the Hospices

John Moffitt's special centenary Ivel tractor drive is in aid of an Appeal to raise £100,000 for the hospice movement in the UK. Hospices strive to offer dignity, freedom from pain, peace and calm at the end of life. Help the Hospices is the national charity for the hospice movement, supporting over 220 hospices in the UK. The vast majority of hospices are local independent charities and they provide their care free of charge. Every year UK hospices care for approximately 200,000 people. But this care also extends to and affects their relatives, colleagues, and friends. This means that the hospice movement touches the lives of literally millions of people, every year. To find out more about hospice care and to locate local hospices, visit **www.hospiceinformation.info** or call Hospice Information on tel: 0870 903 3903.

John Moffitt relaxing on the Ivel after the centenary drive to the Royal Show as part of an Appeal to raise funds for the hospice movement

The opportunity

There is still time to help reach the target by the end of 2003. Kindly make cheques payable to Help the Hospices and send to:

Help the Hospices, c/o John Moffitt CBE, Westside Farm, Newton, Stocksfield, Northumberland, NE43 7TW Tel: 01661 843651 Fax 01661 843940 E-mail john.moffitt@westsidefarm.co.uk

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USE OF PROCESS INTEGRATION TECHNOLOGY IN GREENHOUSE ENERGY SYSTEMS

Andrew Marchant, Frank Ward and Gerry Hayman

Summary

This paper introduces the concept of process integration techniques, as developed by others, for application to commercial greenhouse systems. Process integration was originally developed by Linnhoff *et al* (1984) within the chemical process industry and subsequently successfully applied in many other sectors. The technique involves comparing energy streams in a qualitative and quantitative manner to produce a theoretical minimum energy input value, with options for assessing various changes to plant functionality for maximum energy savings. This has been extended over the years to permit economic factors to be built in to the whole.

The system developed is designed to be operated as either a stand alone item for an audit purpose, or in the future to be linked to the environmental computer such that an on-going analysis can be maintained showing actual performance against the theoretical minimum.

The software described has been developed as a holistic one, considering all system inputs and outputs. The former inputs are primarily raw energy (gas, electricity, *etc*), but include secondary items such as fertiliser, water and packaging. System outputs are mainly in the form of product, packaging and waste materials. Energy streams are considered to be as one of three types - conventional Temperature Enthalpy (T-H) streams (*eg*, heating), quantitative input streams (*eg*, water), and energy consumption (process) - enthalpy - product quantity streams (*eg*, volumetric output). In addition to these complications, there are several external restraints, for example limitations on recycling of water due to pest and disease issues. Some elements, such as thermal buffer tanks, effectively take multiple roles depending on state. The software has been developed using Object Orientated Programming (OOP) techniques in C++ using Microsoft Foundation Class (MFC) for the Windows front end and ChartFX for graphing. Data exchange to environmental computers is at present via Excel sheets, but it is proposed that XML be adopted for this purpose.

The programme outputs are in the form of a theoretical minimum energy input, the current energy input and the practically achievable one. Suggestions for improvements to energy efficiency are listed and ranked in order of energy saving potential, but with no linking to economic considerations as yet. These are via the output screen, with options for graphical representations in terms of data summaries and reports.

Data from environmental computer systems in commercial blocks for both edibles and ornamentals have been used to undertake initial evaluation of this approach, and results with these test data sets are given.

The need for benchmarking and for objective assessment of energy efficiency has recently been highlighted within the UK by the need for the industry to demonstrate efficiency improvements in order to maintain the Climate Change Levy (CCL) reduction. This currently presents obvious difficulties in comparing year on year data without taking into account meteorological and cropping variations. The approach outlined permits such an objective assessment although is to a certain extent dependent on more subjective data in terms of yield response to different cropping regimes.

Description of Process Integration Technology

Process Integration is a well known procedure which has been used successfully for several years in many industries where there are inputs which are both qualitative and quantitative, with the original example being distillation processes with heating and cooling.

Process Integration (Pinch) Technology allows the theoretical minimum energy input to be determined and the key heat exchanger to be identified for the process - the 'Pinch', and identifies the critical component in the process and the theoretical minimum energy use, allowing objective assessment of energy efficiency and subsequent improvements. The technology has also been successfully applied to water use, considering various qualities of water, cogeneration systems, mass transfer networks, multiple refrigeration plant and even quality assurance protocols. The initial application within multiple distillation columns is the simplest for illustration purposes.

The various heating and cooling processes may be considered in graphical form,

with the temperature at the start and end of process, and the energy used within it plotted as a series of curves (composite curves), one for heating and one for cooling. The key heat exchanger can then be determined, and the affect on total cooling and heating load predicted for any change in temperature difference for the heat exchanger.

Application to commercial greenhouses

The system outlined below considers the inputs/outputs in their component values within a software package that has been developed with output in the form of theoretical minimum energy inputs for a particular site as a comparison to actual use, achievable minimum energy inputs and recommendations. The justification for this is multiple: for conventional energy savings due to economic returns; for satisfying audit protocols; for evidence of true energy reduction for CCL exemptions; for objective rather than subjective comparisons with other growers; and for identification of the most significant processes for improvement. This will then allow the development of a coherent improvement strategy with quantifiable goals and objective comparisons year on year and with other sites.

Inputs can be considered as the primary energy ones, such as gas and electricity, and secondary in terms of materials. For example water has an energy value in terms of catchment storage, processing and delivery which is reflected in the purchase price, and can also be defined both qualitatively and quantitatively. Crop residues also have various values in terms of direct energy (locked carbon) and secondary energy, for example that required to produce the nutrients locked in them. Likewise, fuel burnt for heating also produces CO_2, of which a proportion is currently used on many sites to aid plant photosynthetic activity.

Literature review

Basic studies and descriptions of Process Integration and Pinch Technology are numerous, and reviews are periodically written by Linnhoff and others, and such foundation material is not considered here. It is interesting to note that as far back as 1991 the potential for applying Pinch Technology and Process Integration to "accomplish multiple process improvement objectives" was realised (Rossiter *et al*, 1991). The list of possible issues included reduction of wastes and emissions, 'debottlenecking', reduction of capital and operating costs, and improved operating flexibility. With regard to this project, there are several components for which further studies of literature have been undertaken, which are detailed below.

Batch processes

Most glasshouse processes are time variable, and therefore although a continuous process, they have many time dependent variables which make them fit within the definition of batch processes as opposed to continuous fixed ones. Within the definitions offered by Linnhoff *et al* (1993), glasshouse production would be considered as an amalgam of several, having some of the characteristics of both designated and multi purpose production and cyclic and random processes. Of the authors' definition of main parameters, only two are pertinent to this scenario: heat flow and equipment capacity.

Early work by Kemp (1991) describes three methods for handling batch processes: Time Average Model; Time Slice Model and Time Dependent Heat Cascades. Only the latter is likely to be suitable for the processes under consideration here. It is interesting to note that Kemp discounts this procedure on the basis of heat storage costs and recognition that energy costs are minor compared to product yield and quality. Stoltze *et al* (1993) did consider heat storage systems, and included cost benefit analysis, with some options claiming a 28% energy saving, but with optimal savings of 16%.

Cogeneration

There are some sites with cogeneration plant installed, and there is undoubtedly scope for such plant in energy terms, although current UK economics are having an adverse affect upon new installations and operation of existing ones [*cf*, UK Government consultation over combined heat and power (CHP), 2002]. Sarabchi and Polley (2002) attempted to consider full integration of the gas turbine cogeneration plant with the whole process, also evaluating individual component streams of the turbine unit.

NOx and other emissions from gas turbines or scrubbed reciprocating units are low enough for utilisation in glasshouses, and can therefore be considered both in the cogeneration stream and also mass transfer (CO_2) (Marchant *et al*, 2000).

Mass transfer

Mass Exchange Networks (MENs) are relevant insofar as the CO_2 enrichment of the glasshouse environment is concerned. The parameters that are relevant are the internal and external composition of air, and the CO_2 enrichment system (either exhaust gases or pure CO_2). The system proposed by Halwagi and Manousiouthiouthakis (1989) is difficult to apply to the problem considered here, as the streams are limited both in number and location, and such an approach would be over complicated for minimal results.

Water conservation

This can be considered alone (*eg*, Tripathi, 1996) or in conjunction with energy use (*eg*, Cripps, 2000). The latter suggests a first step of considering flow streams and simulation of heat and material balances prior to undertaking pinch analysis.

Water consumption and associated energy use can be reduced dramatically in some cases, for example a 60% reduction on raw water use and 65% reduction in effluent discharge was achieved in the Kiwi Dairies plant (Peng *et al*, 2002). Various processes were considered (Rutkowski & Karp, 2001) including steam and direct heating, along with cogeneration, at a paper and pulp mill and also included marginal costs of utilities.

Total site integration

Linnhoff *et al* (1984) recognised early on in the development of this technology that whole site systems needed to be considered, rather than just single process systems. Total site profiles are one method of achieving this, linking together

BIO NOTE

This paper was presented at the IAgrE Annual Conference entitled 'Energy and the Land-based Industries' and held at Silsoe Research Institute on 13 May 2003. Dr Andy Marchant is Managing Director of Hennock Industries Ltd, Church Rd, Hennock, Newton Abbott, Devon TQ13 9QE, UK Tel: +44 (0)1626 834059 Fax: +44 (0)1626 832115 E-mail: andy@hennock.co.uk His co-author, Frank Ward is also with Hennock Industries, and Gerry Hayman is a Crop Consultant specialising in tomatoes and based at Trethinnick, Lamorna, Penzance TR19 6XW, UK

Fig. 1. Chart of program for commercial greenhouse systems; basic call routine with interfaces for user input/output (I/O) and data inputs

many different processes as a thermodynamic representation of the whole. Another element of such an approach is the possibility of considering global site CO_2 emissions (*cf* Linnhoff *et al* 1993). Fuel switching was considered (Axxelson *et al*, 1999) as part of such a CO_2 minimisation analysis, a possibility on some glasshouse sites.

Low temperature processes
Refrigeration shaft power was investigated (Dhole & Linnhoff, 1994) as a means of considering this system as a part of the wider whole. This is a method for avoiding detailed analysis of the actual refrigeration system itself and as such can offer a useful tool for approximating energy flows.

Quality assurance
Some larger companies are now seeing the environmental management audit protocol ISO 14001 as being a valuable standard to achieve and, as part of this, have undertaken Pinch Technology analysis of operations (Makino & Asano, 2000). This considers water use, wastewater discharges and contaminant levels, volatile organic compound emissions and waste utilisation. Although this is not a likely scenario for many UK growers, it is one that larger ones may consider and also links in with audit protocols for supermarkets.

System methodology

Conventional stream tables were developed for main energy items, with separate high, medium and low temperature streams designated. As a part of this process, it became clear that the following aspects of total site integration need to be considered in a special manner within the methodology.

Buffer tanks
These need to be thought of as a heat exchanger taking with primary water temperature entering at input temperature and leaving at output temperature and secondary water vice versa, with exchanger efficiency of 100%. This method allows for stream flows to be considered in the normal manner. The time dependent manner and capacity of the system has been included by splitting the unit into two high and low temperature Heat Exchanger Networks (HENs), with reversal of flow direction considered by means of having two sets of units, available exclusively.

System buffering
Greenhouse systems sometimes operate on aggregate temperature rather than specific target temperature, since plants have a good averaging and aggregating ability. This allows the greenhouse total thermal mass to be considered as further buffering.

Linking
Several component streams need to be considered holistically, *ie,* their values are not restricted to one energy activity, *for example* irrigation water has an energy value due to its production, due to its delivery (pumping) and also associated with the feed. There is also a mass factor considered in the mass exchange network.

Restraints
Certain streams have non-energy linked constraints which will typically effect quality or other production matters, for example irrigation water recycling can also pass on pests and diseases, and recirculation can cause sodium toxicity problems after a period.

Electrical efficiency
There needs to be a method of

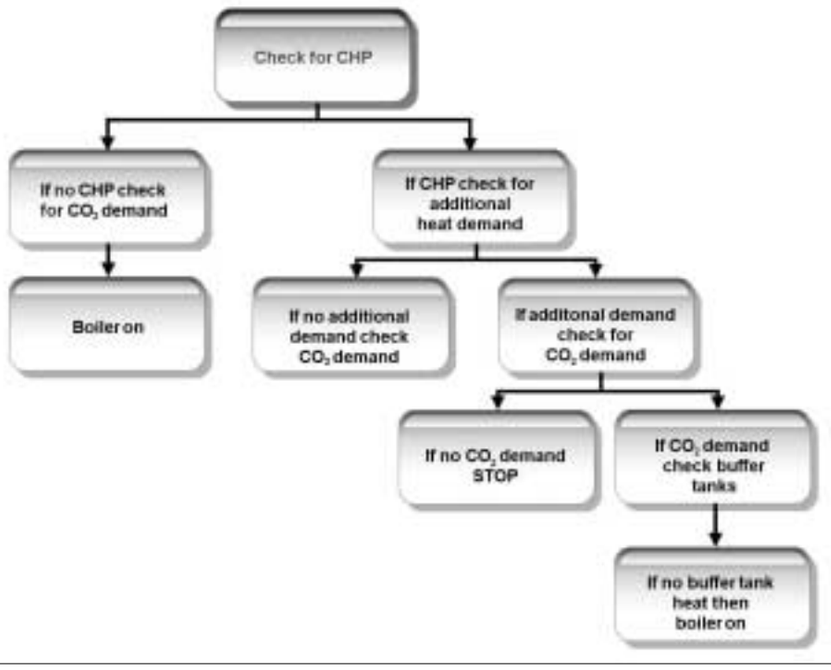

Fig. 2. Chart of program to mimic control strategy for an environmental computer; first step is to check for combined heat and power (CHP)

Fig. 3. Charts demonstrating the object orientated (OO) programming approach adopted

considering electrical efficiency of generation. This is relevant when considering on site cogeneration on greenhouse sites where under certain circumstances not only is the heat and power used at ain excess of 90% efficiency but also part / all of the CO_2 is sequestered by the crop. A base level of efficiency for grid supplied electricity has been assumed taking into account generation and distribution efficiencies.

Time variability

The system needs to be considered along the lines of a 'Time Dependent Heat Cascade' within the definitions discussed previously and this time dependency has to be extended, beyond the controlled processes to consider external time dependent variables which in holistic energy terms play a key role.

In summary, streams will need to be considered in a number of categories, principally derived from the ornamentals sector model, since this has the greater number of streams. The edibles sector will effectively form a subset of this. The streams categories are as follows.

Temperature enthalpy defined
Streams within this are:
- hot water (3);
- irrigation feed water;
- boiler flue gases;
- condenser;
- CHP exhaust
- buffer tanks (2 off);
- system thermal buffering;
- conduction/convection/ radiation;
- venting.

Quantitatively defined streams
Streams defined in this way include:
- primary fuel;
- water;
- compost;
- crop yield;
- crop waste;
- packaging.

Energy consumption defined energy streams
These include:
- lighting;
- shading;
- CHP electrical power output.

Mass streams - water
This type of stream includes:
- irrigation;
- services;
- roof water;
- run off.

System structure

The structure of the program is as outlined in Fig. 1 below, comprising a basic calling routine, with interfaces for user I/O and data inputs from stored files.

The main calling routine sets the input values; it runs through the following sequence:
- instantiate and initialise objects;
- calculate existing theoretical energy consumptions and log results;

- calculate theoretical minimum results with various optimisation routines;
- compare theoretical to actual results.

The routine then calculates the energy (T-H) and mass streams under the following parameters:

- temperature integration;
- time integration;
- plant optimisation - energy sources;
- plant optimisation - energy sinks.

All data results are logged in a data storage object, and this is analysed as part of the output routine. Quantitative energy streams are calculated and optimised at the end of the stream program.

Calculations of the various energy streams are carried out in the flowchart function.

Flow chart

The code in this section is based on a flow chart which mimics the control strategy of an environmental computer, shown in Fig. 2.

The main operations undertaken are as below:

- initialise streams;
- obtain meteorological data;
- carry out integration;
- calculate and set T-H energy streams;
- analyse CHP operation, CO_2 streams, buffer tank operation and boiler operation;
- balance T-H streams;
- calculate and balance mass streams.

Description of processes within flow chart

The following summarises the main functions within each section:

Temperature enthalpy stream

- Calculation of:
  structural thermal transfer stream due to radiation, conduction and air leakage;
  light requirements;
  photosynthetic activity;
  energy stream for CO_2 production.
- Stream matching- sources and sinks.

Quantitative streams

- Calculation of energy streams for inputs and energy streams for outputs.
- Stream matching.

Mass stream

- Calculation of water streams, CO_2 mass streams and energy within mass streams.
- Stream matching - sources and sinks.

Integration

Temperature integration is modelled by specifying aggregate temperature values, time periods and de-minimus values, with actual temperature data from the meteorological files used and internal results calculated accordingly.

Optimisation

Optimisation in the demonstration version is limited, and is achieved by comparing the energy requirements of the various options, and then selecting that with the minimum - the pinch in effect. At this stage the optimisation routine is at a fairly basic level, but there is far greater potential for this than has been utilised so far.

Object hierarchy

The benefits of an object orientated (OO) programming style have been known for many years and are well documented. The main class hierarchies employed are outlined in Fig. 3. This this does not include the MFC class hierarchy employed within the I/O system which is of a more general nature and not specific to the technical development of the project.

Mass and quantitative streams are implemented on a similar basis, as shown in Fig. 3.

Data encapsulation is critical for all applications such as this one, since there is a need for onward development and compatibility. The OO approach adopted assists greatly with this, and will also aid in future developments. This can be illustrated in the 'Log class', which holds data from all the various runs, and an unlimited number of runs can be constructed by simple changes which promulgate through the entire program. This will allow an artificial intelligence (AI) approach to be adopted in the future to these areas. Classes relating to other annual inputs and production outputs are generally of multiple inheritance as they relate to quantities and site/system inputs.

Input/output design

The user input can be divided into two main types. Firstly, annual data such as crop output figures and secondly, site specific data such as glasshouse dimensions and energy plant description. The class 'Site data' is used to hold this, with internal objects derived from the associated classes for the specific elements (glasshouse, crop, boilers, buffer tanks, reservoir at this stage). Once the software has been set up for a specific site the second part will not be required, subject to infrastructure changes. In terms of future development, this allows for replication of these items with the benefits of encapsulation, thus a second glasshouse object can be created with associated dimensions, heating system, cropping, *etc*.

The front end for manual inputting of data is designed around the conventional Windows operating system environment and has been programmed using the MFC library. The bulk of the data processed by the program comprises stored data from environmental computers on site, and in the current development version file handling for accessing such data has not been taken beyond a basic calling routine for Excel .csv format files.

At present, the output is in the form of dialog boxes and message windows, all MFC derived, with graphical output through ChartFX, and an internally generated report.

Long term I/O development –data transfer

Many horticultural environmental computer systems offer an output for general access, often with Excel .csv format files produced. Whilst this provides one level of solution it is not ideal, and it is clear that the industry is in need of a interface protocol, and an XML based approach would appear to be a logical and universal one. The advantage of an XML approach is that there is a considerable weight of commitment to it from other sectors, plus it is a reasonably robust platform which can tie in with both inputs and outputs, in addition to being web based for future platforms.

Results

Benchmarking may be seen to be subject to variation due to weather, yield and cropping type, as follows.

- *Meteorological data*
  The weather affects not just energy inputs but also productive output, *ie* cold weather increases energy cost, but if cold and wet then light transmission is down and thus yield will also fall.
- *Crop yield*
  Energy use may be reduced but at the expense of yield, thus energy use per unit product may actually rise despite a decrease in site energy use. A problematic issue is that of disease, for example pepino virus in tomatoes can cause the crop to be pulled out and re-planted.
- *Change in cropping*

Different varieties or production systems (for example organic) will give different yields per unit area, with different energy inputs. Since many growers are contracted to supermarket buyers their cropping pattern may change from year to year.

Indicative figures on data collected are: 6.4 kWh per standardised 10 cm pot for ornamentals; and 10.7-14.5 kWh/kg for tomatoes.

The range (26%), in tomato benchmark figures, shows clearly that benchmarking purely on energy per unit yield is not sufficiently robust to demonstrate energy efficiency improvements or otherwise and the more sophisticated approach as offered by process integration will be a valuable tool to true benchmarking.

Initial data runs with the first version indicate that total site inputs are running significantly above theoretical minimums, although a degree of complexity remains to be resolved in terms of feasible operating parameters for system guidance. Realistic achievable theoretical minimum energy requirements are in the order of 60 - 75% of common levels and theoretical minimums may be as low as 25% of current usage depending on boundary conditions.

Conclusions

The transfer of technology into the glasshouse sector has been demonstrated to be possible, despite the complexity of inputs and more batch nature of many operations and processes.

Conventional benchmark figures are too vulnerable to external inputs to be useful in all but the crudest sense.

A solution based on Process Integration Technology, combining certain elements of various approaches and with novel solutions to other problems, has been developed. Preliminary indications, with limited data sets, show that theoretical minimum energy inputs are substantially lower than current ones, with achievable levels being 60 -75% of current.

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A team of scientists, headed by Dr Alison Blackwell, from the Centre for Tropical Veterinary Medicine chose Laggan, in the Scottish Highlands, as one of the areas to test the Midgeater; well protected against the 'Culicodes Impuntatus' or 'Highland Midge'

NEW DEVICE LAUNCHED TO BITE INTO MIDGE PROBLEM

Collated by: Melissa K. Witney-Hunter

Scotland's economy set to benefit as a result

The scourge of the midge, a seemingly insurmountable problem which for many years has been a major irritation to thousands of people and costs the Scottish economy millions of pounds every year, has been given a major boost. The launch of a new device called the 'Midgeater' will help reduce local midge populations and has the potential to significantly boost Scottish tourism.

The Midgeater, a 1.5 m tall device, fuelled by Calor Gas, was launched to a crowd of tourism industry representatives on Tuesday 27th of May at the Loch Lomond Visitor Centre. It was there, in summer last year, Her Royal Highness Princess Anne, Princess Royal, highlighted how much of a problem the midge is, stating: "Visitors to Scotland see the country as near perfect, apart from the X-factor of course – the midge".

Around 14 million tourist trips are made to Scotland each year, worth a total of £2.5 billion. Visitors to the Highlands alone spend £400 million per year in the region, providing a vital income to Scotland's economy.

The device, aimed primarily at commercial establishments, was developed especially to catch midges and was supervised by the world's leading authority on midges, Dr Alison Blackwell of Edinburgh University. Research undertaken by Dr Blackwell's team indicates that over half the tourists visiting Scotland for the first time are discouraged from returning because of the midge and 86% would warn friends against visiting Scotland in the key summer months of July and August. Another more recent survey conducted by Dr Blackwell, among tourists in camp-sites, bed and breakfast accommodation and youth hostels, indicated that two-thirds of the visitors felt that midges had put them off returning to Scotland at that particular time of year.

The Midgeater is the result of considerable research and development, undertaken jointly by Dr Blackwell and Calor Scotland, together with Scottish owned engineering company Texol and funding from Scottish Enterprise.

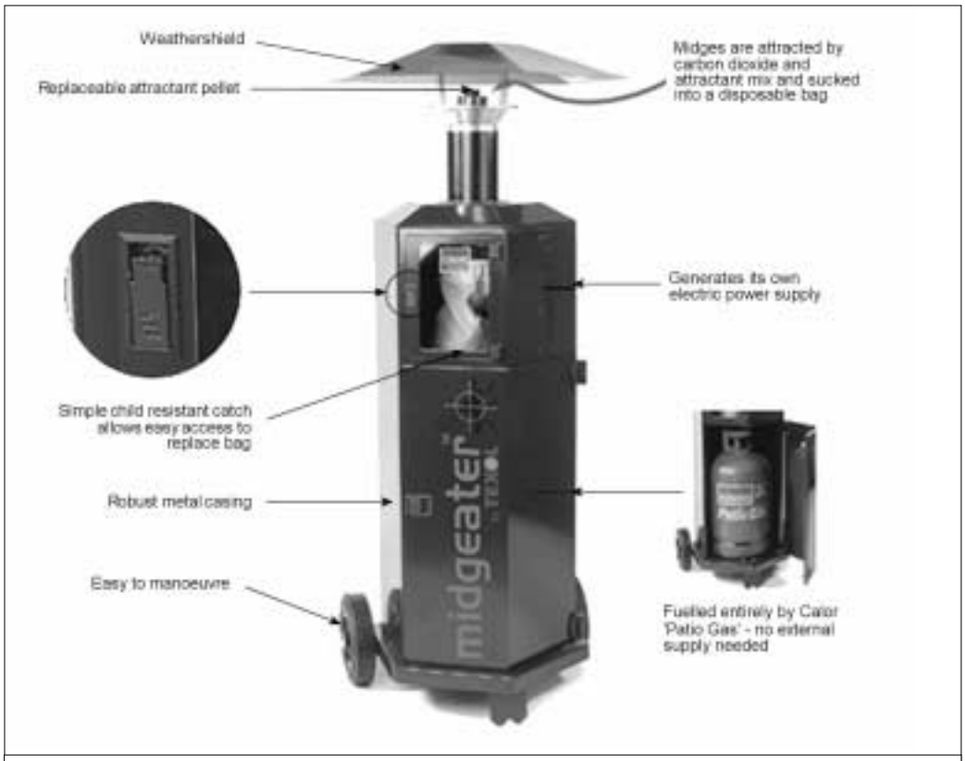
"If visitors stay just one more day, an extra £286 million is generated for the country's economy," points out Calor Scotland Communications Manager Gavin Tomlinson, "so the launch of this device clearly has major positive implications."

"There is one immediate opportunity for Scotland's tourism industry here," adds Gavin Tomlinson. "With concerns over the spread of Severe Acute Respiratory Syndrome (SARS), fewer than the usual number UK holiday makers are likely to travel abroad. With control over the

INFORMATION

For more information, in the first instance, please view the following websites: For Calor's information on the Midgeater: www.midgeresearch.org.uk and CVTM's 'Vector Biology' pages: www.vet.ed.ac.uk/ctvm/Research/Vector Biology/Insect ecology behaviour & control.htm. Alternatively contact: Dr Alison Blackwell, Centre for Tropical Vetinary Medicine, University of Edinburgh. Tel: +44 (0)131 650 6266 E-mail: alison.blackwell@ed.ac.uk

For contributions to this article are also gratefully acknowledge BBC News Scotland and The PR Partnership (Scotland) Ltd on behalf of Calor Scotland and Textol, Bon Accord House, Riverside Drive, Aberdeen, AB11 7SL. Tel: 01224 588900 Fax: 01224 588200.



The 'Midgeater' uses a combination of carbon dioxide and other attractants to draw the midges towards it; from where, they are sucked into a disposable bag.

midge population, Scotland could be well placed to attract those very people."

The Midgeater is self-contained, running off a Calor Gas supply, housed within the device. A flame-free catalytic process creates a mixture of carbon dioxide and naturally occurring chemicals which are emitted by the device to emulate human or animal expelled breath and therefore attract the midges. Once attracted, the midges are sucked inside in a process similar to that of a vacuum cleaner and collected in a bag.

The chemical mix has been specially formulated, by Dr Blackwell, to attract Scottish biting midges.

"The Midgeater is designed to run continuously throughout the midge season," comments Dr Blackwell. "Every midge caught not only reduces the current midge population but also means fewer available to breed which should result in a smaller population the following year."

The device is to be manufactured in Scotland at Texol's facility in Dundee and will be sold exclusively through distributors appointed by Calor and fuelled by Calor's unique 'Patio Gas' propane cylinder with a, simple to use, clip-on regulator. The device also benefits from Calor's experience of liquid petroleum gas (LPG) specification and appliance retailing.

Background Information

Facts and figures

- Independent research among tourists visiting Scotland and staying at campsites, bed and breakfast accommodation and youth hostels conducted during the midge season indicated that the majority would not return to Scotland at that time of the year in future, because of the midge. The peak midge season of June to August directly matches the Scottish tourist season.
- It is estimated that in some parts of Scotland, one single hectare of land may host up to five biting midges for every man, woman and child in Scotland – a rate of 10 million midges per acre.
- Midge attacks can result in the loss of up to one-fifth of all forestry working days in Scotland.
- Midges are likely to increase their range and length of season, as Scotland's climate changes due to global warming
- The majority of Scottish midges don't bite – only the females – and of 34 different species only five bite people with 90% of midge bites coming from just one species – *Culicodes impunctatus*.
- Midges cause 'Sweet-itch', a debilitating and incurable problem which affects up to one in twenty of the UK's horses and ponies.
- Children's summer camps in the Highlands have on occasions had to be abandoned because of midges and outdoor activity centres frequently have to re-plan their programmes around midge activity.
- One leading firm of chartered surveyors is believed to advise clients not to put their property on the market during the midge season.
- Midges have been around in Scotland for some 8000 years

Creation and operation

Recognising that there would clearly be a market for a product that could reduce the likelihood of midges ruining peoples holidays, Calor enlisted the support of Scottish Enterprise to help fund a study of the potential of a propane device to control local midge populations.

A team of Edinburgh University scientists led by Dr Alison Blackwell, a world leading authority on biting insects and in particular the Scottish Biting Midge, were appointed in Spring 2002. It was Alison who had previously led the independent research on the impact of the insects on Scottish tourism.

Stories about a midge control device quickly started circulating and Calor had enquiries from people throughout Britain and further afield seeking any way they could to combat midges. These enquiries included people living in midge-infested environments, tourists, business owners, yachtsmen and horse owners, plus celebrities including Sir Jimmy Saville, who even volunteered his Glen Coe retreat as a test site.

To cope with the number of enquiries, Calor launched a website www.midgeresearch.org.uk which has generated interest from throughout Scotland, the UK and as far afield as Brazil.

The Midgeater will not eradicate midges in the area in which it operates and will have no noticeable impact on the

overall Scottish midge population, but it will however reduce local midge populations and decrease the likelihood of people getting bitten by them.

During the tests Dr Blackwell counted more than half a million midges emerging from a two square metre area in just one night at Laggan around 12 million insects were caught in just 10 days of continuous testing.

All other gas fuelled insect traps are designed specifically to catch mosquitos, but this is the first to be purpose built. Because the actual size of a mosquito is greater than a midge, the volume of midges is substantially higher, creating new challenges for the designers.

The Midgeater is independent, with no external electrical supply. The device uses a catalytic process to produce carbon dioxide (as in exhaled breath) which is mixed with a scented bait which makes midges think there is a bovine animal around – the favoured snack of the biting midge. Midges are then drawn to the source of the CO2 and when they arrive at the Midgeater they are sucked into the machine and collected in a disposable bag.

Once the machine is started, it can be left unattended until either the bag is full or the 13kg Calor Patio Gas cylinder is empty.

The midge trap gives off the carbon dioxide output equivalent of a cow, along with other associated scents and then sucks up any midges it attracts. "The machine can detect carbon dioxide from about 100 m away. It draws midges in with these smells and once they get close it sucks them up into a collecting bag where they will eventually die," said Dr Blackwell.

"Their favourite host is actually a cow or a horse or a deer not, strangely, people. So what we've done is mimic the smell of a cow, which is CO_2 plus some other attractants, so instead of flying towards you they will fly towards the trap."

Dr Blackwell added that "anti-insect devices already on the market have mainly been designed for bigger mosquitos."

This is the latest successful attempt at finding an effective local control for the Highland midge.

The 'Highland Midge' or 'Culicodes Impunctatus'; of the 34 different species of midge in existence it is largely unknown that only five species bite humans, with 90% of midge bites coming from this species (female only).

Centre of academic excellence

The Faculty of Veterinary Medicine, together with the Faculty of Medicine, Division of Biological Sciences and Department of Chemistry, at the University of Edinburgh, forms a leading European centre of academic excellence. Edinburgh is one of the largest and most successful research universities in the UK, with key interests in biology, veterinary medicine and medicine. In total, more than 1,000 postgraduate, postdoctoral and faculty researchers are employed directly on biomedical research projects at Edinburgh, generating research income in excess of £45 million per annum.

The Centre for Tropical Veterinary Medicine

Dr Alison Blackwell leads a team of scientists at the Centre for Tropical Vetinary Medicine (CTVM). The CTVM is one of four departments of the Royal (Dick) School for Veterinary Studies. Facilities available cover all the major scientific disciplines associated with veterinary medicine in the tropics. Laboratories at the centre are fully equipped for the techniques associated with immunological and molecular biological studies in protozoology, entomology, helminthology, virology, bacteriology, immunology, nutrition and research on draught animals.

Facilities are available for containment of certain categories of dangerous pathogens and genetically manipulated organisms. Specialist facilities include equipment and accommodation for exercise, physiological and climatological studies on equids and large ruminants, including draught animals, an isolation unit for studying vector borne diseases of ruminants in the tropics, small engineering and electronic workshops and provision for the production of audio-visual aids, including video. On-line and CD-ROM library facilities are used to provide an information service for veterinarians and agriculturalists working in tropical countries.

The CTVM Abroad

The Centre also has the remit to provide animal health, wealth and the production in developing countries through research and training, to foster sustainable development, alleviate poverty and improve quality of life. They maintain a portfolio of research projects aimed at improving control and diagnosis of infectious diseases of domestic stock and wild animals. Immunological and molecular biological studies are aimed at vaccine development. We are involved in research and training programmes in over 16 countries, mostly in Africa, but also in South America, India and the Far East. Senior staff are seconded to Bolivia, Kenya and Vietnam on projects to improve delivery of veterinary services.

GLOBAL MARKET FORCES

Global farm leaders call "time" on special preferences

Political corruption, excessive profits for traders and continuing poverty for farmers in developing countries are some of the very good reasons why the time has come to dismantle the system of special preferential access to developed markets, say farm leaders from around the world.

The system, such as the agreement which grants preferential access to the European sugar market for African, Caribbean and Pacific countries, has locked developing countries into producing specific commodities at protected prices for prescribed trading partners. This 'lock-in' shelters them from market forces – but it also prevents them taking advantage of new market opportunities and new production technologies.

"These countries have no incentive to reduce costs of production, so their competitiveness in real world markets diminishes," says Ann Tutwiler, president of the International Food and Agricultural Trade Policy Council (IPC). "The traders may benefit from higher profits – but there's no guarantee that the higher prices reach the poor farmers. Preferences feed corruption in developing countries, as the right to export is not freely available but must be obtained from the government. And countries which have no preferential arrangements, even though just as poor, are heavily penalised.

"The IPC believes that the time has come to dismantle these 'special preferences', which have encouraged developed countries to retain trade-distorting tariffs and quotas, and replace them with a more general system of preferential access for all commodities and all developing countries," she said.

"As tariffs fall and quotas expand, the value of special preferences will decline," she said. "Developing countries must be encouraged to evolve economies which are not dependent on a single commodity and a single market, by granting them access to a wider marketplace for the crops their farmers want to grow. As countries move away from special preferences to more general preferences and begin to diversify their economies, they should be assisted in their efforts by developed countries that have granted these preferences and by the international lending institutions."

UNIVERSITY PARTNERSHIP

EMP centre of excellence at Bath

The Engineering Management Partnership and The University of Bath School of Management have announced plans for a new collaboration to establish a centre of excellence in engineering, science and technology management. The centre will be based at the university's Oakfield campus in Swindon and will be the lead provider of specialised and flexible management education for individuals within the engineering and technology sectors.

This new collaboration will see The University of Bath take the lead status in the EMP partnership, and will bring the number of university partners to six. The University of Bath's longstanding reputation for excellence in the field of engineering, science and technology combined with the expertise of its School of Management (ranked for the last seven years by *The Times* as one of the UK's top five business schools), means that it is well placed to take the lead in the EMP and in the development of its management programmes. From September 2003, the Executive Bath MBA programme at Swindon, will be offered as an option to EMP students on the postgraduate programme.

As lead partner within the EMP, Bath will become responsible for the award of the postgraduate certificate and will offer options for MSc and MBA degrees tailored to meet the growing demand for management education from engineers, scientists and technologists throughout the UK. The new collaboration will enable further academic development of the EMP programme.

The coming academic year will also see the introduction of a number of academic developments to the EMP programme. From September 2003, a new one-year certificate stage will be introduced replacing the existing Stages One and Two. This will comprise six modules and will offer increased flexibility and a rolling intake.

Whilst the new developments will apply to the new intake in September, the transition for current students will be seamless with the existing Stage One students progressing to Stage Two in line with the current arrangements,

The Centre of Excellence is a very exciting prospect for EMP and will present a wide range of new opportunities. It will provide an important focus for the professional institutions and supporting employers and will enable greater participation from industry and partner organisations both in the UK and internationally.

Speaking this week Professor Brian Bayliss, Director of the University of Bath School of Management said: "We are delighted that our association with the EMP will provide the opportunity to meet the growing demand for management education from individuals across the range of engineering, science and technology professions. The development of a programme of study supported by so many professional and academic institutions will draw together Bath's strengths in an exciting new development for our expanding campus at Swindon."

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PUBLICATIONS

New Book Available from IAgrE Free of Charge*

The Mechanics of Tractor - Implement Performance
Theory and Worked Examples
by Ross H Macmillan FRMTC (MechEng); BE (Agr); ME (Agr); MIE (Aust) CEng

Ross, well known in Australia for his work at the University of Melbourne, has deposited his book ***The Mechanics of Tractor - Implement Performance*** with the University of Melbourne ePrints Repository (UMER).

The book is **only** available electronically and can be downloaded free of charge from UMER at **http://eprints.unimelb.edu.au/archive/00000204/**

However, as a service to those without fast internet access, Ross has kindly granted permission to IAgrE to distribute the book in CDROM format. IAgrE has in turn agreed to charge only for postage, packing and CDROM duplication.*

Abstract

Chapter 1 gives an outline of the subject, a justification for its study and an overview of the main systems in the power train of both the conventional and two wheeled tractor.

The analysis of performance starts in **Chapter 2** with the engine performance as a 'given' and extends this, via a simple mechanical analysis, to give the ideal performance of the tractor.

The results of tests that are performed by the testing stations following procedures such as those used by the OECD are presented graphically and explained in **Chapter 3**. This approach is shown to confirm (within appropriate limits) the analysis presented in Chapter 2.

Chapters 4 and **5** treat both traction theory (Bekker, Reece, etc) and empirical analysis (Wismer, Dwyer, etc) in terms of the relevant parameters. Both are required for students to understand the subject and to break into the extensive research literature based on these analyses.

Chapter 6 on chassis mechanics covers the fundamentals of the subject appropriate to tractor performance and includes material that has not previously been published in a readily accessible form.

In **Chapter 7** all of the factors that determine tractor performance are brought together and their relevance to the selection of a tractor to match an implement and their efficient operation, in terms of performance, are illustrated.

Chapter 8 (combined with Chapter 7) contains a series of general problems.

Keywords
agricultural tractors, functional performance, implement performance, traction, agricultural engineering education, tractor operation

For further information, or to receive a copy of the CDROM, please contact the Secretariat. You may order online through the IAgrE website.
www.iagre.org

***There will be a nominal charge of £5 for postage, packing and CDROM duplication**

ROAD SAFETY

New code bids to improve safety of timber lorries

Moves to improve the safety and standards of timber lorries took an important step forward today with the launch of a new Code of Practice for the Road Haulage of Round Timber throughout Great Britain. The Code is the third edition since the first was published in 1996, and incorporates the latest findings from research into load and road safety by the Transport Research Laboratory. It also encapsulates material from the Department of Transport's *Safety of Loads on Vehicles* report.

Welcoming the launch of the new Code, Scottish Forestry Minister Allan Wilson said, "Although sea and rail transport can provide important opportunities to reduce the impact of timber transport on fragile rural roads, the fact remains that road haulage will always be the single most important mode of timber transport. Some 90 per cent of all timber arrives at processing plants by lorry. This equates to some 320,000 lorry loads a year in Britain.

"Transport accounts for a substantial part of the industry's costs, and has a major influence on the sector's competitiveness, so developing a safe and efficient timber transport system is crucial to the industry's success. "This easily read, well illustrated new Code of Practice is an important step forward in this process, and I commend it to all concerned, from the forest owner to the fleet manager and the driver behind the wheel."

The Code includes advice on a wide range of topics, including vehicle specifications, consideration for communities, loading and unloading lorries, overloading, load security, roadside working, vehicle recovery and ways to prevent loads spilling or overturning, as well as topics such as road design and maintenance. It includes sections on continuous improvement in the industry, research and development, training and sources of further information.

Roundwood Haulage Working Party chairman Richard Scott said, "This version of the Code of Practice is a significantly expanded version in comparison to previous editions. This is in recognition of the challenges and issues that the forestry, timber and haulage industries currently face. By adopting the industry's best practice and guidance contained in the Code, many of these challenges and issues can be overcome. This will greatly enhance the role of road haulage as a strength in the British timber supply chain."

The Code was drawn up by the Roundwood Haulage Working Party and supported by the Timber Transport Forum.

MORE INFORMATION

The Code is available on the Timber Transport Forum website: www.forestryscotland.com/timber_transport

R&D on conjunctive use of surface and groundwater

A joint ICID-EurAgEng global investigation

Water resource management should preserve or enhance the environment's buffering capacity to withstand unexpected stress or negative long-term trends. As the environment's carrying capacity is put under increasing pressure due to the growing need of the population and improper use of its resources environmental vulnerability increases too. Giving proper regard to this unsustainable trend, the Second World Water Forum acknowledged the pivotal role that the conjunctive use plays in the process of sustainable development.

The term 'conjunctive use' embraces the planning and management of both surface and subsurface water resources, and of land. It takes account of social, economic and environmental factors and includes the ecosystems through which surface and groundwater flow. Moreover, it recognises the importance of water quality issues.

Effective conjunctive use of surface and subsurface water resources depends on cooperation at all levels, from individual to governmental and non-governmental, national and international organisations sharing a common political, scientific and ethical commitment to the need for water security and for optimising water resources planning and management. To this end, research must be directed towards gaining a better understanding of the hydrodynamic and hydrochemical processes involved and enhancing water productivity. This process requires a large variety of tools ranging from field techniques to advanced technology for water control and regulation. All these tools have to be considered under a broad and integrated approach for addressing the use, planning, conservation and protection of both surface and subsurface water resources, that takes proper account of the environmental impacts and socio-economic effects of development.

In 1999, during the 17th Congress on Irrigation and Drainage held in Granada, the International Commission for Irrigation and Drainage (ICID) and the European Society of Agricultural Engineers (EurAgEng) committed themselves to working together in an endeavour to select priority issues that tackle the root causes of the major problems encountered in this field of knowledge. The mission was to enhance the standards of research at worldwide level and to examine the main aspects and problems concerned with the planning, design, construction and management of conjunctive use of surface and subsurface water resources, along with its environmental impacts and constraints to sustainable development. The importance and role of research thrust, technology transfer, institutional strengthening, effective partnerships between governments and stakeholders, and sound financial frameworks have been also investigated. Finally, the challenges and benchmarks for future actions that the scientific community and planners have to face and deal with have been also analysed.

Daniele De Wrachien
President of EurAgEng
Chairman Field of Interest on Soil and Water

Costantino A. Fasso
Honorary Vice President of ICID
Chairman Permanent Committee for Technical Activities (PCTA)
Past Vice President of the International Association of Hydraulic Research (IAHR)

MORE INFORMATION

The main findings and results of this cooperation have been recently published by the Authors in the ICID Journal: Irrigation and Drainage (vol 51.1, 2002, pp 1-15) are available online in Wiley Interscience. Web: www.interscience.wiley.com

Professor John Moverley
Principal of Myerscough College in Lancashire

'PRINCIPAL RAMBLINGS'

I first became a College Principal in 1988 and when I look back, much has changed. My life here at Myerscough is now very much that of a Chief Executive running a business with a £16 million turnover and employing some 700 people. Whilst education and training remain our core activity, commercial activity and other income now represents some 40% of the total. In my first college, agricultural and horticultural engineering was just that; now here at Myerscough, we have diversified and built upon that base. Apart from tractors and horticultural machinery, we have racing and rally cars competing at national level and are engaged in innovative near market research in our new Incubator Building. Yes, times have changed but the core reason why I am in this game remain the same; that is giving every individual, regardless of age, ability or background, the opportunity to learn and attain to their potential. When battling with funding agencies, planners or whoever, it is easy to become distracted from that core value. Indeed, sometimes I feel learning is more about telling people what we do in terms of form and paper filling, than actually doing it. However, it is the true purpose of a college such as mine.

One of the great joys of being a teacher is to see the difference that can take place as a result of education. At a recent College Presentation Day, we celebrated the success of one of our Higher Education students. He had studied an engineering related route with us having joined us some years ago at 16. He had not enjoyed school but revelled in learning through the work-based route, learning on the job. He then progressed to full-time further education and then to higher studies. He now has found good employment. Yes, education and training can change people's lives. Ann Frank in her diary said *''How wonderful it is that nobody need wait a single moment before starting to improve the world'.* I like to think that at Myerscough we really do make a difference facing challenges and grasping opportunities. It sounds like management speak but it is a truly held belief. We could all do to celebrate success rather more than we do, rather than moan about what we can do nothing.

I feel privileged to have my opportunity to make a difference, however small. It is also a great honour to be a Fellow of the Institution of Agricultural Engineers, an association of like-minded people who also seek to make a difference and uphold their profession. It saddens me that more young people do not come forward for courses in agricultural engineering and mechanisation. It is no longer glamorous. In modern parlance, we need to make it more trendy. We need to increase its attraction to young people. We all know there is an employment demand. At a recent Careers event, I witnessed a young lady positively choosing to study a mechanisation course despite the initial protests of her parents who wanted her to do what they saw as a more suitable course. The parents saw no future in such a career but, after much discussion, a patient lecturer eventually put them right.

Well I must finish these ramblings and return to preparing for the next inspection! I wish all members of the Institution well and every success. Remember all things are possible. As Doug Larson is credited of saying,'***Some of the greatest feats were accomplished by people not smart enough to know they were impossible'.*** It has been nice rambling to you.

Following this first response to his initiative, the President invites and encourages other contributions from members who are committed to, and derive job satisfaction from, their careers within the land-based industries.

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Duchy College
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Camborne
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TR14 0AB

Harper Adams University College
Newport
Shropshire
TF10 8NB

Myerscough College
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Bridgend
CF35 5LG

Reaseheath College
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Cheshire
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Scottish Agricultural College
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Writtle Agricultural College
Chelmsford
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Bimonthly LATE SUMMER 2003

MEMBERSHIP MATTERS

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

STUDENTS AND NEW PROFESSIONALS: OUR MOST IMPORTANT MEMBERS!

Part of the President's strategy has been to increase student membership. The support of the Douglas Bomford Trust and major sector manufacturers for subsidising IAgrE membership for students and newly qualified technicians respectively has ensured that IAgrE has a large and thriving younger body of members numbering over 300. These members are the future lifeblood of the Institution and it is vital that IAgrE examines its strategy and provision for this important group.

A small group, chaired by Peter Redman, representing students, lecturers and recent graduates, including members of the Executive, met recently to do just that. The group addressed the needs of young people across the sector and their likely career progression through to service, design, research or management. Whilst there will be variation in the form and level of activity, it was agreed that *information* and *support* are the common ground required for all career paths. These are the key conclusions.

1. Supporting training and education

- Students need access to good information, and the IAgrE website could increasingly be used as a portal to on-line information services from companies, academic institutions and journals.
- Revision of the IAgrE Data Sheets was suggested for posting on the web, with an invitation to go to members for a volunteer to re-write these.
- The IAgrE technical presentations from both the Branch and Special Interest Group networks should be better utilised by colleges/students.
- Work experience/placements and project subjects could be provided through links with members.
- Mentoring should be established early, during the student period, giving closer tie-in with IAgrE.
- Establish a database of members available to mentor/give career advice in declared area of expertise.
- Establish the availability of members to 'guest lecture' as part of a course.
- IAgrE Awards should be set up at all relevant colleges, increasing profile, possibly through branches.
- Encourage more student involvement on branch committees.
- Branches should make closer links with local colleges, possibly through college governors.
- Branch programmes should include specific event targeted at students.
- National annual event should be targeted at young engineers.

2. Supporting Career Development

- Commission articles for Landwards by young engineers 'A day in the life of' covering range of areas, to allow insight in to what work is really like.
- Provide an opportunity to talk to potential employers through branch contacts.
- Post job opportunities and profile potential employers on website.
- Offer networking through the members database, especially with reference to

their employer (not currently shown).
- Develop Mentoring Scheme, as established by Dan Mitchell and John Sartain (list of volunteer mentors required at Secretariat).
- Promote and explain of the upgrade and registration processes – current paperwork seen as obscure.
- Promote the Continuing Professional Development (CPD) scheme, especially the possibility of a 'licence to practise'. CPD is not currently required in the market-place, but its relevance to competency must be highlighted.
- Develop the belief that IAgrE membership is useful to career progression.
- Use an electronic newsletter/e-mail communications targeting young members.

3. Action plan
- Many of the suggestions above are already in place, but need further refinement and development. One major problem area, as ever, is lack of resources. Key points to focus on in the first instance are:
- further use of web for information, databases, jobs and networking
- increased communication between colleges and branches
- support and commitment of established members to link with younger members
- further development of mentoring scheme
- promotion of upgrading, registration and CPD.
- provision of an electronic newsletter for young members.

Comments and volunteers very welcome!

LETTER TO THE PRESIDENT

3 April 2003

Dear Sir,

I was both honoured and gratified to receive your letter of congratulation on my attaining 50 years of IAgrE membership. No thought had occurred to me that the eagle eyes of Dr Dan Mitchell and the Secretariat staff were upon this grass-root member!

As I reach the landmark of 50 years membership of IAgrE, it has been suggested that I offer a few words about myself. This I do with some hesitation as I am not known for any literary talents and modesty is not an attribute of mine!

Historically, my forbears were working the land for generations in Suffolk, the earliest recorded being Adam (no, not that one!), who paid tithe in 1327. On leaving school I decided to follow the same path and I served as a farm pupil for 3 years – I wonder if anyone does that nowadays. This was followed by a very happy time at the Royal Agricultural College where I was Captain of Rugby and graduated in 1952.

At this point, it became clear that some form of specialisation was required in order to progress in agriculture, so I joined a farming and contracting concern in which mechanisation played a large part; at the same time, I was accepted by the Institution as an Associate. Life was not all work, however, and I was still playing rugby for Northampton where I remain a member to this day.

My next move was to agricultural merchanting in Lincolnshire where I was involved in the use of aircraft for crop spraying and fertiliser application. This work was state-of-the-art technology at the time but was fraught with hazard for the pilots. By this time I was serving on the committee of the East Midlands Branch of IAgrE and performed this pleasurable duty for a number of years.

In due course marriage and a growing family caused me to re-think my career (was that what they now call a mid-life crisis?) and I moved over to food processing and distribution, firstly with frozen foods and latterly with this country's largest meat processors and retailers.

I am not retired but my interests are very much of a rural nature. In an effort to keep the mind active, I have been studying part-time at Leicester University and also been elected Fellow of the Royal Geographical Society (FRGS); my next possible move is to attempt a Masters in rural history at Reading. Some years ago I was installed as a Knight Templar – the organisation, of the same name, is involved in charitable activities of an ecclesiastical nature worldwide, but particularly in the Middle East. As a United Nations non-governmental organisation (NGO), we are working in Iraq at this moment.

During this past half-century, I have witnessed many changes in agriculture and agricultural engineering which for the most part have been progressive and visionary. Sadly, the past decade has not been such a rewarding one for the industry but I am happy to say that IAgrE has moved consistently with the times and even kept ahead of the game despite heavy pressures.

May I say that membership has been a pleasure from which I have benefited considerably; the Institution has grown from the small organisation which I joined, to a highly professional cutting-edge one, now covering several disciplines. Long may this continue.

To conclude, may I add best wishes to our President, Officers, Staff and all Members for a happy and prosperous future.

Yours sincerely

Tony Orbell
EngTech MIAgrE

Tony Orbell received his 50 year certificate on 24 March 2003.

MEMBERSHIP CHANGES

IAgrE

Admissions

Fellow
C Biddle (Wiltshire)

Member
M J Sidlow (Wiltshire)

Associate
B E A Knight (Cambridge)
C T Lukehurst (Kent)
P Whalley (Warwickshire)

Transfers

Hon Fellow
S W R Cox (Hertfordshire)

Fellow
P J Kettlewell (Bedford)
J R Pedley (Worcestershire)
K H Shelbourne (Suffolk)
W Waddilove (West Midlands)
M A Zoebisch (Thailand)

Member
O Ayeni (Nigeria)

Engineering Council

Registrations

EngTech
G Hayden (Oxfordshire)

WESTERN BRANCH ACTIVITIES FOR 2002 – 2003

Peter Struck of the *Environment Agency in Somerset*, along with operational colleagues, showed Branch members the workings of the water management on the Somerset Moors and Levels on 12th February.

At Atheney, near the old brushwood foundation bunding at East Lyng, the diesel engines had just finished a session of pumping out of the rhymes and into the Tone and thence waterways leading to the Severn at Burnham-on-Sea via the River Parrett. Described in detail were the intricacies of storing floodwater on meadows and via over-spilling the dykes to flood ponds. Included in this in some cases is transferring water by linking pipes under rivers from pond meadow to pond meadow.

The party were introduced to some problems with management, such as decisions of when to pump and when to store, and when to replace diesel engines with electric units; and also the political problem faced when trying to manage badgers and water voles on dykes which in places form the only dry ground in the area. There are occasions in the year when water volumes reach a point where pumping is pointless as the waterways into which the water is pumped overflow and complete the loop.

When conditions of this excess water over norm occurs, as in 2002, and over pump capacity is reached, extra, large pump capacity is employed. Some pump capacity, such as at Gold Corner pumping from the South Drain into the River Brue, was installed at the Second World War – with the water facility used for wartime industry. The single cylinder engines coming to the end of their economic life are being replaced by electric motors. So it was that safety implications meant that that part of the visit was curtailed, as there were pumps in bits.

By contrast on 26th February, the Branch visited *TH White Cranes Division* and saw the practical side of an earlier, well delivered and received technical paper given by Nick Handy.

During Nick's study time at Lackham he worked at the Cranes Division and on leaving college gained employment leading to stress analysis and bespoking 'Palfinger' cranes, hook lifts, *etc.* to lorries and hauliers/carriers various. His studies and work now involve him in standards setting. Branch members were able to see the 'niceties' of fitting in the assembly area, but prior to this, were given an in depth account of the vagaries and complexities of satisfying customer desires and staying in business with competitive marketing conditions.

Continuing the manufacturing theme Eddie Phillips gave a splendid talk on 12th March on the integration of electronics and hydraulics to modern vehicle manufacture and use. As a specialist with *Sauer-Danfoss*, Eddie treated us to computer simulation, and had various pieces of hardware supporting his presentation.

On 9th April, a group set off to Bridgend to see the modern *Ford engine plant*. The complexities of assembly were revealed as were the fine engineering and power: weight considerations that lead to the zetec and other ranges and the ultra-light-weight V-8 block which our slightly built guide, Tom Philips, had no problem in raising, without mirrors, above his head. Always entertaining, Tom showed the various technical aspects from air tolerance measuring to engine blower / electric units.

All in all, a varied and interesting programme but in agricultural engineering there is a lighter side – or – was it bitter? Both really; as we were taken on a tour of *Shire dray horse stables* before following the process of brewing quality beers at *Wadworth* in Devizes.

A special feature of the visit was a hands-on display of barrel making by one of only five beer barrel makers still operating in UK. A splendid raconteur, our Master cooper gave good account of apprenticeships and the vagaries of the folk law and activities of Guilds…whilst keeping the right side of his hand tools. A really full night, that required a sample duly taken in full (several times), followed by retreating to a local 'tied' hotel for a splendid meal.

Richard Heath

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WR11 5SW

John Deere Ltd
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Nottinghamshire
NG13 9HT

FEC Services
NAC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2LS

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

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

David Ritchie (Implements) Ltd
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Suttieside
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DD8 3EE

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Summerwood Lane
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Ormskirk
Lancashire
L39 8RH

White Horse Contractors Ltd
Lodge Hill
Abingdon
Oxfordshire
OX14 2JD

LETTER TO THE EDITOR

Dear Sir

I have just read the article on SETNET in *Landwards* **58**(3), written by the SETNET Chairman, Ron Oxburgh. He mentions that SETNET, through regional SETPOINTS, has taken over responsibility for the established Neighbourhood Engineers programme. IAgrE members may be interested in a comment from a previous Neighbourhood Engineer on how this has worked out.

I work with a school in South Shropshire, an area in which the Neighbourhood Engineers scheme seemed to work particularly well. This was because we had an energetic local organiser, a retired electrical engineer, who despite being over eighty spent a great deal of time and energy extracting funding from learned bodies and training organisations, and making sure that it all went straight to the schools to fund student projects. As a result, all the schools had one or more engineers working with them, and their Engineering Clubs were successful in National competitions such as 'Greenpower' racing.

When the SETPOINT organisation was announced, backed by substantial DTI funding, and a change of our titles to 'Science and Engineering Ambassador' (SEA), we thought that this must be a good thing, with the prospect of more back-up and more money for student projects. Alas, not so. All the new money, and all the old money previously available to us, has gone into funding a professional bureaucracy which, in my view, achieves nothing at all. We now have more rules and regulations, but no money. Two of our number have resigned in disgust, and the death of another leaves three schools without an engineer.

SETNET promise in their literature to make an engineer available to every school. They have done nothing to fill our three vacancies.

I'm sure that there must be other Institution members working as SEAs who have a view on this situation. If enough of us make our views heard, we might manage to disband this unnecessary QUANGO and put the money to better use.

Yours faithfully

J C Jeffery
MA CEng FIMechE FIAgrE

THE SCANTLEBURY TROPHY – 2003

Herts & Essex Branch, Young Engineers Evening

Writtle College was once again, the venue for the annual Herts & Essex Branch Young Engineers Evening, presenting the Scantlebury Trophy to the best Agricultural Engineering Final Year student project, from Writtle College.

Although the course in question is coming to the close of its penultimate year, the judges were again treated to a good number and variety of final year projects. This year's projects varied widely, in many different aspects, from geographical location (Europe to Africa), to technology (Autonomous vehicles to Savonius rotor).

Projects were voted upon, with respect to six aspects, technical thought, relation to industry, breadth and depth of subject, and presentation, both verbal and visual. The final contenders from the 12 individuals, for the 2003 Scantlebury Award, pushed forward three candidates, and three very different subjects. Richard Carter presented his project on material handling by fan, of an abrasive airflow, Matthew Pratt introducing his investigation into malfunction of conventional baler twine feed system due to vibration and Nkosinathi Manana, relating his work on evaluation of the modelling of catchment soil erosion.

After much discussion, the Scantlebury Award was presented to **Richard Carter**, with Highly Commended honours awarded to Matthew Pratt and Nkosinathi Manana. The judges' decision was based on Richard's attempt to follow a complete development process, especially of a relatively complex concern, in detail, from root cause analysis, through scale modelling, to identifying a final design resolution. Despite not being able to test the final design, this key factor gave him the slight edge over his peers.

The thanks of the Herts & Essex committee are conveyed to the individuals presenting their projects, and also to the judges for their participation and assistance.

Congratulations to Richard Carter, Matthew Pratt and Nkosinathi Manana.

Jim Holmes

LONG SERVICE CERTIFICATES

Name	*Grade*	*Date of anniversary*
50 years		
Ronald Bridger **Jessop**	IEng FIAgrE	6 Aug 2003
35 years		
Graham Joseph **Boult**	MIAgrE	1 Jul 2003
Paul Adrian **Crisford**	IEng MIAgrE	24 Jul 2003
Eric Charles Fife **Lacey**	EngTech MIAgrE	25 Jul 2003
Patrick Martin **Forrest**	MIAgrE	25 Jul 2003
Simon John **Holder**	IEng MIAgrE	25 Jul 2003
Roger Gale Beddard **Jackson**	IEng MIAgrE	25 Jul 2003
Bryan William **Maw**	IEng MIAgrE	25 Jul 2003
David Thomas **Wilkinson**	IEng MIAgrE	25 Jul 2003
James Robert **Poolman**	EngTech MIAgrE	19 Sep 2003
25 years		
Robert John **Phillimore**	EngTech MIAgrE	3 Jul 2003
Michael Dawes **Lea**	AIAgrE	25 Jul 2003
Gordon Clare **Day**	EngTech MIAgrE	11 Aug 2003
John Lawrence **Defty**	AMIAgrE	11 Aug 2003

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INSTITUTION of AGRICULTURAL ENGINEERS, WEST END ROAD, SILSOE, BEDFORD, MK45 4DU, UNITED KINGDOM. Tel: 01525 861096 Fax: 01525 861660

COMPUTER CONTROLLED CALF REARING

Frank Seipelt, Arno Bunger, Reinhard Heeren, Dieter Kähler and Martin Lüllmann

BIO NOTE

Frank Seipelt, Arno Bunger, Reinhard Heeren, Dieter Kähler and Martin Lüllmann are at URBAN Feeding Technology, Urban GmbH, Auf der Striepe 9, 27798 Wusting, Germany. Tel: +49 4484/9380. E-mail: fseipelt@urbanonline.de

The feeders are supported in the UK by Volac Ltd, Orwell, Royston, Herts. Tel: 01223 208021

Summary

The main objective of using computer controlled calf feeders is to save on labour and to avoid digestive problems by giving calves an homogenous drink several times a day. However, there are still major problems connected with this technique, namely:

- hygiene;
- health control; and
- accuracy of milk allocation.

A newly developed calf feeder is now able to improve hygiene by automatically rinsing with detergents, including all parts which are in contact with milk. Feeders can also be equipped with a flexible teat which can be disinfected after each visit of calves. To control the individual milk consumption of calves, a float in the mixing bowl measures the amount of prepared and consumed milk. The float is a transsonar distance sensor which is also able to monitor the drinking speed of each calf. All data is sampled and gives detailed feedback about the state of health of the calves.

Introduction

For more than 20 years, dairy farmers in Europe have made use of various types of automatic calf feeders. This began with simple *ad lib* feeders for acidified whole milk feeders which then became more sophisticated enabling them to mix milk, from the milk replacer, with hot water and supply it to calves on request. For this purpose each calf gets a collar around its neck, equipped with an identification transponder. When a calf appears in a feeding station, the transponder signal is transmitted through an antenna and is identified at the control unit. This way it is possible to divide up the daily milk amount into several portions. This feeding process meets the natural behaviour of rearing calves. Computer controlled calf feeders can be set up directly in the barn next to the calf pens where cold water and an electrical supply are required. The feeder mixes milk from the milk replacer and heated water and supplies it to the calves on request. It is also

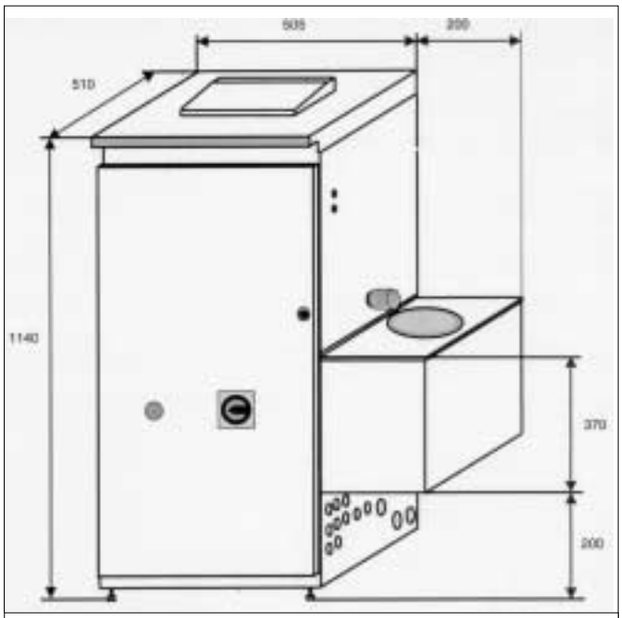

Fig. 1 Dimensions, shown in mm, of the U40 computer controlled calf feeder

possible to feed whole milk using additional equipment.

Technical structure

The calf feeder has an stainless steel cabinet and consists of four basic components:

- feeding computer
- powder hopper and dosing system
- water/milk heater
- mixing bowl

The dimensions of the feeder are shown in Fig 1.

Feeding computer

All calves are registered in the feeding program by putting in date of birth, sex and animal number. Calves can be divided up into different groups which could be fed with various mix ratios. The feeding computer samples animal data, such as time of stay in the feeding station while drinking, number of station visits per day and average drinking speed, and deviations in these data limits can be defined to cause an alarm message when exceeded. Calves are fed in accordance with a feeding curve, to allocate milk to the calves depending on the age of each animal. The feeding computer is positioned on the top of the calf feeder to simplify data input and animal control.

Powder hopper and dosing system

The powder hopper is a tissue-bag which can hold 35 kg of milk replacer. The milk replacer is dosed by a dosing spiral into the mixing bowl. The dosing weight depends on the turning time of the spiral so the spiral has to be calibrated to know how much powder is dosed in a specific time. The motor of the spiral is connected to a moving element which shakes the whole powder bag carefully to empty the hopper continuously without any blockages occurring. Figure 2 gives a view into the feeder housing.

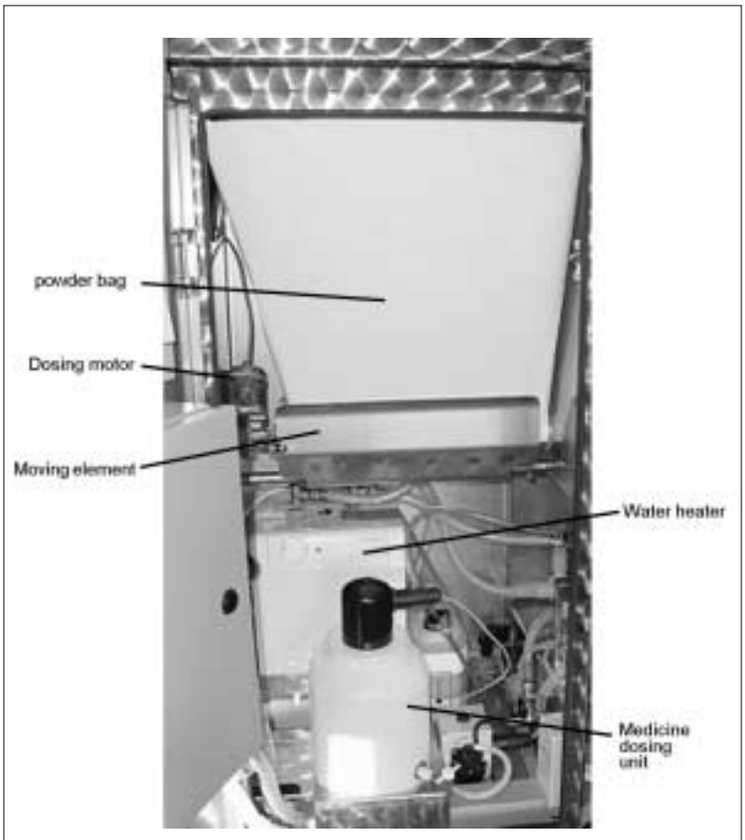

Fig. 2 Calf feeder equipped with powder hopper, water heater and medicine dosing unit

Heater

The standard feeder is equipped with a 5 litre heater (Fig. 2). When the water inlet valve of the feeder is opened, water comes in with 1 - 4 bar pressure and is then heated up to the adjusted mixing temperature. If calves are fed also with whole milk a 10 litre heater is installed containing an 8 m spiral tube for heating up whole milk by guiding it through hot water. The heater is via a pump connected to the warm water bath surrounding the mixing bowl to keep the mixed milk warm.

Mixing bowl

The mixing bowl has a volume of 1.1 litre. The lower part of the bowl is sitting in a warm water bath to keep milk warm while circulating through the suction hoses. Figure 3 shows the structure of the mixing bowl.

The float in the mixing bowl generates information about the filling level. During the calibration of the feeder the water inlet valve opens for 10 seconds. The volume of the additional water is then measured by the float. The float is a transsonar distance sensor which is sliding on a pole. Inside the pole, a continuous sound wave is generated on a steel wire which is reflected by a magnet inside the float. The reflection time is then measured and transformed into filling level information to an accuracy of 10 ml. The amount of water added in 10 seconds depends on the water pressure of the water supply.

In many dairy barns, calf feeders are connected to the same water supply as the dispensers for the cattle, so the water pressure varies, in which case the calibration mode can be changed from time restriction to continuous measurement of incoming water. As a result of this, milk preparation takes a little longer but the milk composition is more accurate.

Another benefit of the distance sensor is that the drinking speed of each calf can be recorded. The feeding computer samples the data and shows the average of the last seven days and the average of the previous day. The difference between these two values is calculated and, if an adjustable limit is exceeded, the calf identity is entered on an alarm list which requests the farmer to examine the calf's health.

If the application of medicines is then requested, the feeder can be equipped with a medicine dosing unit. In the medicine dosing unit for liquid medicines (Fig. 2) powders or drops are dissolved

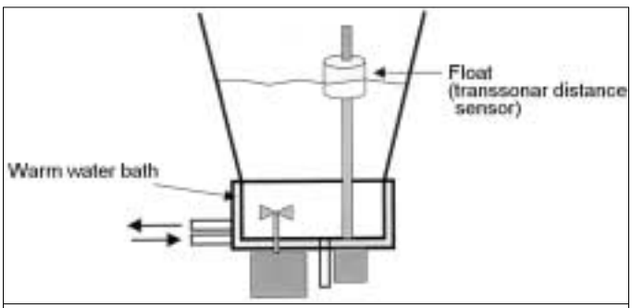

Fig. 3 Mixing bowl with distance sensor

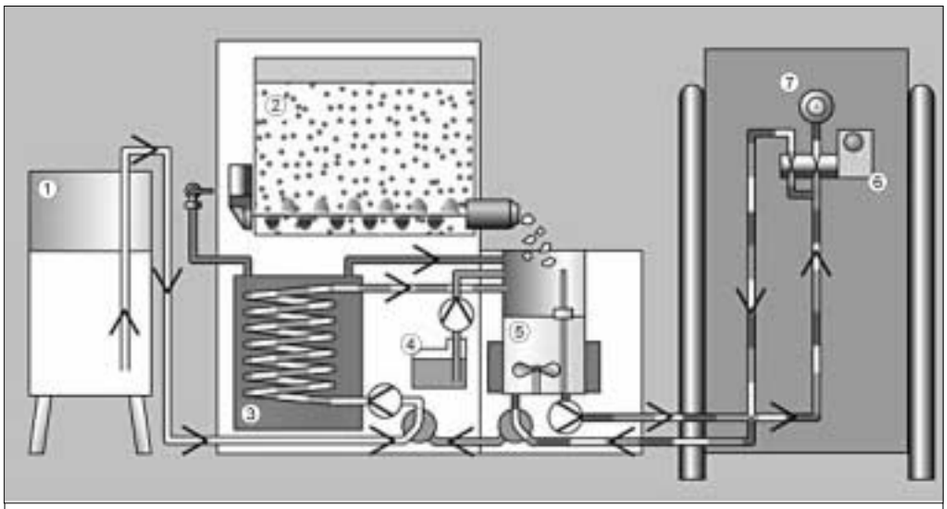

Fig. 4 Schematic plan of milk, water and detergent circulation: (1) whole milk container; (2) powder hopper; (3) heater with whole milk heating; (4) detergent; (5) mixing bowl; (6) milk valve;

in water and regularly agitated at intervals of 30 seconds. After one or more calves are selected for treatment in the feeding program, dosing period and dosage per day are adjusted. When a selected calf appears in the feeding station, the feeder prepares milk which the calf starts drinking. The calf then gets shots of medicine directly into the hose going up to the teat. Therefore, the calf gets milk, medicine, milk, medicine and so on, with dosing of the medicine restricted to the first 200 ml . When the float senses a milk consumption of 200 ml, medicine dosing is stopped immediately. This successfully combats the problem of sick and weak calves leaving the station before drinking their complete portion of dosed milk or leaving contaminated milk in the hoses. In addition to this, the direct injection of liquid medicines into the suction hoses avoids contaminating the prepared milk in the mixing bowl.

Automatic rinsing

The cleaning of the feeder starts automatically up to three times a day. If only milk replacer is used, then one cleaning per day is sufficient. Figure 4 shows how the suction hoses are installed in a circle so that they can be cleaned right up to the teat automatically.

The feeder starts the rinsing program while pumping out the rest of the milk from the mixing bowl. The remaining milk in the mixing bowl and suction hoses is then flushed out with clear water. After that, all parts, which come into contact with milk, are rinsed with detergents several times. Finally, hoses and mixing bowl are cleaned with clear water, to flush out the detergent.

Although the automatic cleaning causes a high level of hygiene, vets have criticised in the past that there is a risk, for calves, of catching diseases and germs from other calves by using the same teat. To solve this problem, a mechanism was developed which allows a regular disinfection of the teat. During the automatic rinsing program, the teat is dipped into a disinfection bath. That way, the teat is included in the circulation of water and detergents to clean the inner side of the teat. In the disinfection bath, nozzles are installed which spray detergents on the teat to disinfect the outside of it. Afterwards, the teat is cleaned with clear water to flush out detergents and to avoid any bad taste for the calves. How the teat is tipped over into the disinfection bath is shown in Fig. 5.

Another benefit of the tip over mechanism is that calves like to suck at the teat even if they have got already their entire portion. This behaviour avoids reciprocal sucking but it causes a quicker attrition of the teat and sucking calves block the feeding station for others. It is up to the farmer whether he activates the tip-over-function in the program or not.

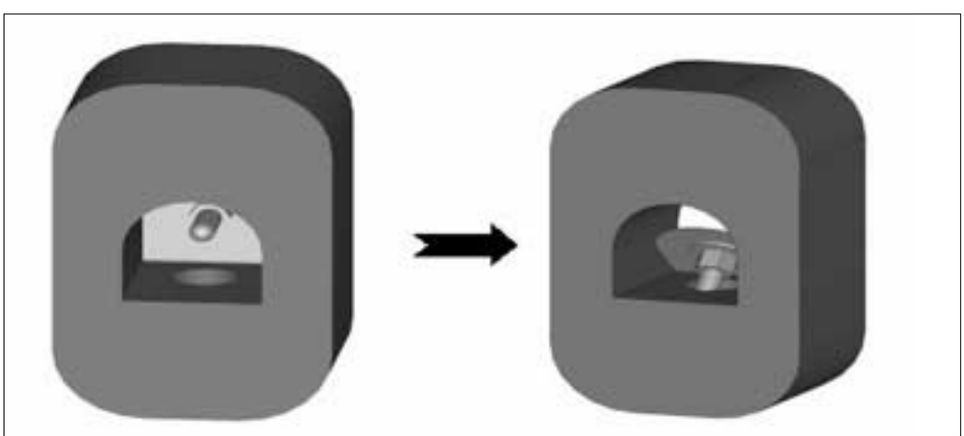

Fig. 5 Disinfection of the teat

Conclusion

The aim of development and improvement of computer controlled calf feeders is to make calf rearing for dairy easier and to meet the requirements of healthy calves. A calf feeder, in good working order, reduces the daily work of a farmer in his calf unit to simple management tasks, such as checking the animal data in the computer and controlling the state of health of the calves.

The farmer is released from manual work such as mixing milk and carrying buckets, enabling him to concentrate on managing his dairy herd. The feeder cleans itself and offers a high level of hygiene which makes it possible to keep calves in groups without problems. It is a 24 hour working system and calves can get milk several times a day. Further developments will combine the milk feeder with computer controlled concentrate feeders and supervised water dispensers so that calves can be weaned individually. The ultimate objective is to find the best way to prepare each calf to become a high yielding cow.

APPOINTMENTS

New appointments at John Deere

John Deere Limited has announced the appointment of David Hart as commercial & consumer equipment (C&CE) division sales manager,responsible for managing the company's sales and marketing operations for golf & turf, commercial and homeowner products and dealerships in the UK and Ireland.

David takes over from Pieter Nel, who has returned to his homeland after 18 months in the UK to become marketing manager of John Deere's agricultural and C&CE divisions in South Africa.

David Hart's position as product manager for harvesting equipment in the agricultural division of John Deere Limited has been taken over by Jonathan Henry, previously the company's agricultural management solutions (AMS) product manager.


David Hart

After graduating from Lincolnshire College of Agriculture & Horticulture, David Hart began his career with a John Deere dealership. He joined John Deere Limited in 1990, becoming an area service manager and subsequently area manager product support (AMPS) in south-east England, a territory manager in south-west England and then harvesting equipment product manager.


Jonathan Henry

David was brought up in Norfolk, where his father Ernie Hart was a well known and respected figure in the amenity and grounds-care industry for many years. A keen golfer, David took part in the inaugural John Deere Team Championship golf tournament finals at The Belfry last year.

Jonathan Henry joined John Deere Limited as a management trainee in 1993, following an HND in mechanisation, planning and business management at the Scottish Agricultural College, Auchencruive, and a spell in the service department of an agricultural dealership. He also worked as an AMPS in south-west England and a territory manager in the north of England and borders of Scotland. Jonathan Henry will be responsible for combine harvesters while also continuing his role as agricultural management solutions (AMS) product manager. Jonathan is a member of the IAgrE.

RESEARCH REPORT

Major developments in forest research

Climate and environmental change are highlighted in the latest Annual Report of Forest Research.

The 2002 report cites a number of projects that were progressed or completed during the year to provide important new information on forestry practice. Much of this work is included in an authoritative and comprehensive Bulletin entitled Climate Change: Impacts on UK Forests, which collates evidence and conclusions on likely future climatic conditions and their effects on forest ecosystems.

Britain's climate has been warming at 0.1 to 0.2 degrees Celsius per decade, and with this warming the prospect of wetter winters, more-severe gales and more-frequent droughts and floods becomes likely. The report discusses the current and future responses of the forestry industry.

It also highlights the establishment during the year of Forest Research's new Social Research Unit to increase understanding of the social aspects of sustainable forest management. The unit is working on social aspects of forestry such as health, values, participation, recreation and governance, and has published *Trees are Company*, an account of the proceedings of a major conference at Cardiff University that looked at social science research into woodlands and the natural environment. The unit also set up three projects in Forestry Commission Districts to trial a decision framework for forest planning, and the results of this work are already proving useful to the Commission when consulting on grant applications.

In-depth articles in the report look at Forest Research's achievements on topics in which there has been significant recent progress, including protecting trees from deer, ecological site classification, the silviculture of upland native woodlands, the impacts of nitrogen pollution in British forests, and stump treatment against the tree decay fungus, *Fomes*.

The Agency also met its financial and other key performance targets in 2002/03.

MORE INFORMATION

The Forest Research Annual Report can be read on the Forestry Commission website at www.forestry.gov.uk/research Paper copies, priced £18.50, are available from outlets of TSO (The Stationery Office) at TSO, P O Box 29, Norwich NR3 1GN. Tel: 0870 600 5522 or Parliamentary Hotline Lo-Call: 0845 702 3474. Fax: 08700 600 5533. E-mail: book.orders@tso.co.uk

COMPUTER LEGISLATION

New guidance on using computers and preventing RSI

New guidance to help reduce musculoskeletal disorders (MSD), such as backaches or repetitive strain injury (RSI) at work, has been published by the Health and Safety Executive (HSE), coinciding with International RSI Awareness day.

Around 1.1 million people in Great Britain suffered from MSDs caused or made worse by work, in 2001/02. Advice on using laptops and working with a computer mouse is available in *The law on VDUs: an easy guide*, and *Work with Display Screen Equipment*, while *Aching arms (or RSI) in small businesses* offers advice on RSI in other work activities.

Health and Safety Commissioner, Owen Tudor, launching the three HSE guidance booklets at a conference organised by the RSI Association in Nottingham, said: 'The time for excuses is over. By following the guidance, preventative action in most workplaces can be taken quite easily and need not be costly. Indeed it is likely to be far more expensive for employers and their insurers to ignore RSI, which may lead not only to compensation claims, but also to costs arising from sickness absences and reduced productivity.

"Excessive work pressures, such as high job demands, time pressures and a lack of control, can often act alongside physical risk factors like force, posture and repetition, and can influence both the onset and duration of RSI. Only an integrated management approach which addresses both the organisational and the physical aspects of a worker's job and work environment is likely to be successful in preventing RSI.

"It is particularly important to identify signs of RSI early, to treat the individual and remedy the causes, including stress and other psychosocial factors in the workplace, before the condition moves into its chronic phase".

An estimated 12.3 million working days were lost due to work-related MSDs and on average each sufferer took 19.4 days off in 2001/02. These figures include upper limb disorders from which approximately 400,000 people suffered, resulting in a loss of around four million working days in the same period.

The law on VDUs: an easy guide which is aimed at small businesses, contains illustrated, practical advice on avoiding risk from using ordinary office computers, while *Work with display screen equipment* discusses the same issues in full technical and legal detail and is aimed at large firms and health and safety professionals. Both guides take account of recent minor changes to the law that came into effect last September, as a result of the Health and Safety (Miscellaneous Amendments) Regulations 2002.

Aching arms (or RSI) in small businesses is a new free leaflet aimed at reducing RSI due to work activities other than those caused by using display screen equipment. It offers advice for identifying risk factors such as using force, repetitive movements, or poor posture, and gives practical ideas and tips for preventing RSI.

MORE INFORMATION

Leaflets are available from HSE Books, PO Box 1999, Sudbury, Suffolk, C010 2WA. Tel: 01787 881165. Fax: 01787 313995. Priced publications are also available from good booksellers.

Work with display screen equipment L26, ISBN 0-7176-2582-6, price £8.95; The law on VDUs: an easy guide HSG90, ISBN 0-7176-2602-4, price £8.50; VDU workstation checklist (which is included in both the above publications), ISBN 0-7162-2617-2, price £5.00 for a pack of 5; and Aching arms (or RSI) in small businesses available in priced packs of 15 or as individual copies, free.

ELECTION

Keith Christian is elected AEA President

Keith Christian, Managing Director of Claymore Grass Machinery, has been elected President of the AEA after having served as Chairman of the Outdoor Power Equipment Council of the AEA for the last two years.

Keith is 47 years old and has been with the Claymore company since its start up in 1985, being appointed Managing Director in 1993. Prior to helping to establish Claymore, he had started in the gardening machinery industry with H Burlinghams Garden Machinery near Tewkesbury selling to golf clubs and councils and he then moved to Spear and Jackson to sell the Stiga line to garden machinery dealers.

Claymore Grass Machinery is located at Bidford-on-Avon, being a division of Reekie Engineering Ltd (based in Arbroath, Scotland) and is a sister company to Allett Mowers. It offers a wide range of products from compact tractors through to lawnmowers

In taking on this role Keith has declared that his aim is to encourage new blood into the industry, recalling the opportunity and training he was given in his early days with Burlinghams.

Keith is married with three children and is known for his love of rugby, being Chairman of the Bredon Rugby Club and captaining their second XV.

CVT is standard on high spec MF 7400 Dyna-VT tractors

All six models in Massey Ferguson's completely new MF 7400 Dyna-VT Series Tractors feature constantly variable transmissions (CVT), electronic engine management and a host of high tech features that provide the ultimate performance and operator comfort.

This eagerly anticipated range of CVT tractors is completely new and is an addition to Massey Ferguson's comprehensive range of equipment. With engine powers from 90 kW to 139 kW, the high specification range combines proven AGCO CVT technology with renowned, straightforward MF control.

'Dual stage' cab supension

All tractors feature:

- proven CVT technology with straightforward, intuitive controls and choice of operating modes
- powerful new electronically controlled engines with excellent constant power, torque-back up and 7.5 kW 'power boost'
- new cab, with unique suspension as standard, offers class leading comfort, control and noise levels down to 71 dB(A) – the quietest in its class
- MF QuadLink front axle suspension is standard
- closed-centre, load-sensing hydraulics
- automatic headland and field management control
- Fieldstar ready

Proven CVT transmission increases output and control

AGCO's CVT transmission design has proved its reliability and performance in literally thousands of tractors at work today. CVT seamless shifting, without any steps or fixed ratios, supplies numerous performance and economy benefits with its ability to always use the optimum combination of forward and engine speed.

As well as maximising quality of the work and output by selecting precisely the right speed for the job, the CVT transmission also optimises efficiency by providing the correct combination of power and torque at the lowest engine rev/min. This reduces fuel consumption and engine noise.

On the MF 7400 Dyna-VT Series, proven CVT technology is combined with Massey Ferguson's renowned straightforward, intuitive controls. Operators used to the left hand Dynashift Power Control lever will be completely at home with the CVT: the further the lever is pushed forwards or back the faster it goes. It really is that simple. There is also a right-hand armrest-mounted CVT lever that works in the same way, while a foot pedal offers numerous performance enhancing operating modes.

Two working ranges provide speeds from 0-28 km/h and 0 up to 50 km/h (where legislation permits). Forward and reverse speeds can be pre-set in each range. The system automatically maintains the desired speed and stores the information even when the engine is shut off.

A 'Supervisor' dial sets the engine speed and CVT for optimum output to match every working condition. If engine speed falls when Supervisor is set to one end of the scale, marked with a PTO logo, it adjusts the CVT to maintain engine speed by quickly slowing the tractor. At the opposite end (marked with a trailer) the system allows the engine speed to fall before reducing the forward speed, making the best use of the engine's superb torque and constant power characteristics. The dial can be set to anywhere in between for draught work and other tasks.

Two forward speeds can be memorised in each range at the touch of a button, allowing operators to quickly flick between speeds when, for example, turning on headlands. Two rotary knobs on the console adjust the speed memories.

Hand levers or pedal set the working modes

There is also a choice of hand lever or pedal operating modes. In lever mode, operation is as described above; while in pedal mode, the system automatically controls the engine and transmission to offer three automatic operating modes:

- Power
- Eco
- Forager (PTO)

Power mode is ideal for

heavy work such as towing a loaded trailer. The transmission control allows engine speed to rise to rated speed and keeps it there. The system ensures the engine maintains maximum output by changing the transmission speed in response to varying engine load.

ECO sets the tractor for maximum economy. Ideal for light work, such as towing an empty trailer on the road, the system allows the transmission to increase speeds at low engine speed - saving fuel and reducing noise.

Forager (PTO) mode maintains the set engine speed for optimum PTO performance. Engine speed remains constant, regardless of forward speed. This allows operators to vary forward speed with the foot pedal to ensure perfect work quality, without effecting engine speed and the power to the implement.

Electronic control for optimum engine performance

Latest, powerful Perkins and Sisu electronically controlled engines give the MF 7400 Dyna-VT Series excellent constant power and torque back-up, producing high torque at low engine speeds. All the engines also supply a true 7.5 kW of power boost at ground speeds more than 15 km/h.

As well having the power and torque to pull though the toughest conditions, the electronically controlled engines are also very fuel-efficient. Rated at 2,200 rev/min, the engines produce maximum power at 2,000 rev/min, so as engine speed falls the power output increases to match the demand. Maximum torque is generated at 1,400 rev/min and there are huge reserves with extra torque back-up from rated speed down to 1000 rev/min.

Electronic control is not only responsible for these superb characteristics, it also improves accuracy and performance. As well as an electronic throttle for precise control, Engine Speed Control adjusts pre-set speeds and memorises two rev/min settings that are activated and adjusted by two buttons mounted conveniently on the side console. This is useful, for example, when ploughing, hit button A to reduce speed for turning and then back to B for full operating speed.

All engines comply with the latest Tier II emissions regulations.

Ultimate comfort and control

Massey Ferguson's unique 'Dual Stage' cab suspension is standard on the new cab across the MF 7400 Series. Even before its launch, this advanced system received awards from both the French SIMA and Spanish FIMA shows.

Similar to units used on trucks and buses, the pneumatic suspension uses two large bellows with dampers at the back of the cab. These provide +/- 50 mm of vertical travel, isolating operators from shocks. A switch selects two suspension settings – one for fieldwork and the other for transport. The control then automatically adjusts the cushioning to suit the work.

Noise levels in the new cab are down to 71 dB(A), one of the best in its class. A Super Deluxe pneumatic suspended swivelling seat and standard climate control further enhance operator comfort. Ergonomically designed internal cab layout sees all the controls now clustered together by function. And standard, automatic climate control for the air-conditioning constantly maintains the cab temperature.

An attractive new automotive-style analogue/digital dashboard displays all operating functions of the tractor and CVT. Other useful changes include extra headroom, a 1.5 litre capacity coolbox and numerous cubbyholes and storage boxes.

Externally, the new rounded roof incorporates four front and two rear elliptical shaped with the option of Xenon front and rear worklights. The 270 litre (up to the MF7480) and 380 litre (on the MF7485/7490/7495) capacity fuel tank are easily filled with the cap located by the nearside steps. Telescopic wing mirrors come with electric angle adjust and demisting as standard.

QuadLink front axle suspension for further comfort

Ride comfort and traction is further enhanced by the standard QuadLink front axle suspension. This well proven system provides a big improvement in operator comfort, productivity and safety as well as improving traction by up to 20%.

The simple compact, four-link system uses a single hydraulic ram, accumulators and electronic control to maintain a constant suspension height regardless of load, axle oscillation or turning angle. It is also possible to deactivate the system at the touch of a button.

Powerful and precise hydraulics

A 110 litre/min, closed-centre, load-sensing (CCLS) hydraulic system is standard on all MF 7400 Dyna-VT Series tractors. Providing lift capacities of up to 9255 kg, the efficient CCLS pump supplies pressure and flow only on demand, helping to improve overall tractor performance and reduce losses.

Massey Ferguson's renowned Electronic Linkage Control (ELC), with its class-leading accuracy and straightforward operation, provides precise draft, position and intermix functions. Further sophistication includes rate of drop, 'quick soil engagement' and Active Transport Control suspension for mounted implements.

New 'decompression couplers' on the electro-hydraulic or mechanical external spool valves allow easy coupling under pressure. The valves are also angled outwards to improve access and ease connection. There is no chance of dirt from external oil contaminating the CVT transmission circuit because the units are completely separate.

Automatic headland and field management control

Automatic electronic control of various routine functions on headland turns further increases productivity. PTO operation is linked to the ELC switch, automatically engaging and disengaging drive. Four-wheel drive and differential locks also engage and disengage automatically. Hydralock controls the front and rear differentials simultaneously to provide true four-wheel drive – not three!

Further, useful, hydraulic functions to boost performance and ease operation are available on tractors fitted with the option of Datatronic II. Spool Valve Management System (SMS), Trailed Implement Control (TIC) and Dual Control offer unrivalled automatic operation of the hydraulic functions on front and rear mounted combinations and semi-mounted implements.

TIC allows the use of automatic slip control with trailed implements, transferring weight from the implement to the depth wheel in response to tractor wheels slippage.

Dual Control ensures perfectly timed and sequenced soil engagement of front mounted and semi mounted implements.

PTO power for every application

MF 7400 Dyna-VT Series tractors come with a choice of either 540 rev/min and 1,000 rev/min or 540/750/1,000 rev/min PTO drive, making it possible to select the precise

speed for maximum output and optimum efficiency. All the controls are clustered together in a convenient position on the new side console in the cab. There is also an external on/off switch mounted on the rear fender.

Fieldstar ready

All the MF 7400 come ready wired for Fieldstar – AGCO's industry-leading precision farming system. As well as offering further automation and field performance, Fieldstar helps maximise profits by providing automatic record keeping and the control of variable rate application equipment.

Product range

AGCO Corporation, headquartered in Duluth, Georgia, is a global manufacturer of agricultural equipment and related replacement parts, with distribution to 140 countries and net sales of $2.9 billion. AGCO offers a full product line including tractors, combines, hay tools, sprayers, forage, tillage equipment and implements through more than 8,450 independent dealers and distributors around the world. AGCO products are distributed under the brand names AGCO Tractors, Ag-Chem, Challenger, Farmhand, FENDT, Fieldstar, GLEANER, Glencoe, Hesston, LOR*AL, Massey Ferguson, New Idea, SOILTEQ, Spra-Coupe, Sunflower, Tye, White Planters and Willmar.

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RECYCLING

Applications pile up for compost accreditation

Eight composting companies, representing around one third of the UK's total manufacturing capacity for higher value applications, are now seeking accreditation under the Composting Association's national standard.

The companies, which together process more than a quarter of a million tonnes of compost a year, aim to follow in the footsteps of Wolverhampton based Jack Moody Ltd which earlier this month became the first company to be certified by the association. Accreditation allows companies to demonstrate, through use of the Composting Association's Standards for Composts logo, that their compost has been produced according to a rigorous approved procedure and is of consistently high quality.

The Waste and Resources Action Programme (WRAP) is a 'not for profit' company limited by guarantee, which is supported by the Department for the Environment, Fisheries and Rural Affairs (DEFRA), the Department of Trade and Industry (DTI) and the devolved administrations of Scotland, Wales and Northern Ireland. It has been established to promote sustainable waste management and to create stable and efficient markets for recycled materials and products. WRAP has laid down targets across eight programmes, comprising five material streams:

- paper
- glass
- plastics
- wood
- aggregates

and three generic areas:

- procurement
- financial mechanisms
- standards and specifications.

The Standards and Specifications Programme identified the development of robust national standards for the UK composting industry as a priority.

Since January 2002, WRAP has been helping the Composting Association to strengthen and promote its Certification Scheme, and is delighted by the surge in interest in the standard.

Anne Riding, special projects manager at WRAP, said: "An important part of ensuring that the market for composted products flourishes is the development and promotion of industry standards which WRAP is facilitating. To see so many firms applying for the association's accreditation is extremely promising and should spur other companies into action."

The Composting Association launched its voluntary standards for the composting industry in May 2000. Details of the standards can be found at www.compost.org.uk.

The Composting Association's Certification Scheme, which is key to the operation of the standards, comprises of three phases:

- application
- initial intensively monitored qualification
- maintenance monitoring.

WRAP, which is supporting the scheme through its Compost Standards programme, has seconded two full-time members of staff to work alongside organisations looking to become accredited. Another key aspect of the programme's activities is the development of a British Standards Institution (BSI) publicly available specification for composted materials that builds on the existing industry standard.

Among the eight companies applying for accreditation, a process that can take up to 12 months, is the Waste Recycling Group whose processing capacity of 118,000 tonnes a year across six sites makes it the largest of the present crop of applicants. Others include Eco Composting, TEG Environmental, Cleanaway and Premier Waste Management. "I am delighted that the industry is moving to adopt the association's standard," said Jane Gilbert, chief executive of the Composting Association. "While most already have rigorous quality control procedures in place, accreditation will enable them to use the logo to demonstrate a consistent quality product.

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DATA CAPTURE

Omnistar-HP accuracy

Positioning Resources Ltd is pleased to announce the introduction of the Omnistar -HP (high performance) system to their extensive range of data capture products.

Omnistar-HP uses dual frequency global positioning system (GPS) technology combined with Fugro's set of reference stations, to produce a robust and reliable decimetre level GPS solution, without the need for base station set-up. With these satellite derived differential corrections, field users can now locate themselves to the decimetre level in real-time.

Pocket GIS has been enhanced to work with the Omnistar-HP system providing the capability to capture filed data to decimetre level. Combined with an integral OSTN02 datum shift, UK users have never before had such an accurate link from GPS to the real world mapping in their hand. PocketGIS is a fully customisable GIS field data capture product which enables users to build forms specific to their needs for the collection of feature and attribute data. The recent release of version 1.7. has ensure that PocketGIS stays at the forefront on this technology.

The new Omnistar-HP system; high performance data capture in the field

Now in its twentieth year, data capture specialists, Positioning Resources Ltd, successfully provides positioning and mapping solutions to both public and private sector organisations for various applications. PocketGIS software was one of the first of its kind to run on handheld PC's when introduced back in 1997. For more information on Omnistar HP, PocketGIS software and other products available, visit www.posres.co.uk

CONTACT

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TIMBER PROCESSING

Wood-Mizer responds to small and industrial timber processing

A virtual, small timber processing operation set the theme of Wood-Mizer◊s outdoor exhibit at Ligna.

A second stand, indoors, featured more industrial timber processing. The mills and equipment operating outdoors represent a semi-industrial timber set-up which could saw up to 25 m^3 per working day or 6000 m^3 a year.

New sawmill range at Ligna will feature this enhanced version of Wood-Mizer◊s small LT15 with the addition of standard powerfeed up and down and optional manual hydraulic log loading.

The arrangement links an LT70 electric remote band sawmill with an incline conveyor to take boards from the sawmill and then to a cross-transfer conveyor which brings the boards or cants to an edger and/or MultiHead. The edger or multi-rip, edges boards or rips them into small elements, while cants pass through the MultiHead to resaw them into battens or boards. The set-up aims to get the most production on the main break down saw this way. An edger/multi-rip is demonstrated in line, while the MultiHead is shown set up for conversion of pallet blocks into pallet boards.

Additionally, a new sawmill range unveiled at Ligna features an enhanced version of the widely used LT15 cutting head which permits addition of standard power feed up and down. Standard manual beds have also been augmented by the optional addition of manual hydraulic log loading and clamping, making this an attractive mill package at an affordable price.

At the other extreme, on the indoor stand, Wood-Mizer◊s new LT300 represents the Company◊s most productive mill ever. Using Thin-kerf narrow band technology, it is part of a system designed to cut labour while increasing yields and profits. It too is linked to a MultiHead and also a new five spindle moulder √ reflecting Wood-Mizer◊s 'From forest to final form' slogan.

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HARVESTING

Weedfree harvest

An effective trial using MyPex groundcover is transforming fruit production and harvesting under 'Spanish Tunnels' at Wood Farm near Norwich.

Eight years ago production on the farm focussed on blackcurrants. Each year a considerable amount of effort was spent pulverising and spraying between the rows of fruit to deal with a major weed problem. However, this battle is a thing of the past following the decision to introduce strawberry production.

Weedfree harvest; MyPex ground cover transforms fruit production at Wood Farm near Norwich; owner Joan Dickie (above) inspects the harvest (Photo: Growing Technologies)

Joan Dickie of Wood Farm explains: "We decided to diversify into strawberries, setting aside an initial half hectare for the construction of a series of seven open sided one hundred metre long tunnels. Five rows of metal structures were erected to elevate the plants to shoulder height to ease harvesting. On the ground under the structures we laid MyPex to suppress weed growth.

"The groundcover has performed excellently. We said goodbye to the willow bay, dock and nettles and hand-weeded occasionally around the edges of the MyPex. It not only suppressed the weeds but reduced the drift of seeds. It was very foot friendly, allowing run off rain to soak into the ground, yet avoiding puddling and the harvesting trolleys moved smoothly over the surface. We recently laid some MyPex out on open ground to stand next year's plants out on it. We're now considering whether to increase production to one hectare."

The MyPex was supplied from the Boston depot of wholesale distributor Avoncrop. It is marketed by Sue Spencer at Growing Technologies who said: "MyPex is the original polypropylene groundcover which leads the field in terms of quality and performance. Its specially woven construction combines outstanding weed suppression with excellent water permeability."

MORE INFORMATION

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MOWERS

New centre pivot mower

John Deere's new centre pivot mower conditioner was seen working in public for the first time at Grassland UK. The 730 and 735 models have been produced in limited numbers for 2003, and will be fully available for the 2004 season.

The 730 and 735 mower conditioners feature six and seven disc cutterbars with cutting widths of 3 m and 3.5 m and pto power requirements of 67 and 75 kW respectively. Windrow widths are easily adjustable from 0.9 m to 2 m on the 730 model, and from 1 m to 2.4 m on the 735.

Centre pivot design allows the operator to work to either side of the tractor. Together with the standard swivel hitch, this increases manoeuvrability, particularly at headlands, and saves time by allowing the operator to work straight across the field from one side to the other. Options include a windrow grouper to produce double windrows up to 3 m wide for pickup by high capacity foragers such as John Deere's new 7000 Series.

John Deere's new 730 centre pivot mower in the field

Both the 730 and 735 feature a fully enclosed modular cutterbar. This is made of cast iron for extra strength and high cut quality, with a low profile that operates close to the ground, down to only 20 mm, and at a flatter angle for improved cutting performance and forage quality. This design also reduces wear and limits stone damage, and the mower's retractable knives are easily reversed or replaced.

John Deere's proven impeller conditioning system is easily adjusted to suit different field conditions, employing free swinging V-shaped steel tines for a more positive pickup and faster operating speeds. A simple crank on the conditioning hood changes the distance between the hood and the impeller from 10 mm to 120 mm and rotor speed can also be changed to match the crop.

A completely new advanced suspension design incorporates two long adjustable springs to ensure constant ground pressure and enable the mower to return to the working position quickly after striking an obstacle. The machine also features large, wide 13/75-16 tyres to reduce soil damage and compaction. Transport widths are 2.98 m on the 730 and 3.45 m on the 735.

MORE INFORMATION

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RASE MACHINERY AWARD WINNERS 2003

The two Gold Medal awards are presented on the inside back cover of Landwards and the Silver Medal awards are presented below. It is also worthy of mention that two of the awards endorse the innovative funding support provided by the Douglas Bomford Trust. The Trust Silver Jubilee Innovation Award was presented to ATL in 1997 for their prototype in-stall identification system, the company now receiving a Gold Medal for a machine which is fully proven and of outstanding innovation and importance to the industry. As a result of a research project funded by the Douglas Bomford Trust at Silsoe Research Institute, the vision guided hoe was commercially exploited by Garford Ltd and the company has now received the Silver Medal and Grower Award.

Silver Medal and Grower Award

Robocrop vision guidance hoe

The Robocrop essentially 'sees' the crop in the row and accordingly adjusts the position of the implement, usually a hoe, to give precision operation at speeds that could not be approached by the best human operator. The majority of machines seen by the Awards judges were hoeing cereal or vegetable crops but the system was also being used for precision spraying and fertiliser placement. Forward speeds of up to 12 km/h were seen, with daily coverage more than 32 hectares. Crops included cereals, rape, peas, beans, leeks, sugar beet, sunflowers, onions, carrots, parsnips and parsley and the precision claimed by the users was down to 12 mm on either side of the crop. Some of these crops present a minute target for the vision system in the early stages of growth and successful modifications have been made by Garford Farm Machinery, as new problems have arisen.

Most of the users interviewed were very large-scale growers and their use of the hoe covered several thousand hectares of crops. The main purpose of using the Robocrop was to reduce dependence on chemicals for cost, environmental and organic farming reasons. The economics of the vision guidance hoe were very clear.

Royal Agricultural Society of England silver medal winner: Garford inter-row cultivator for cereals utilising the Robocrop vision guidance system

Where it was compared with traditional tractor hoeing, the time required was halved and driver fatigue was much reduced. Where it reduced chemical use it was said, in one case, to have paid for itself in one year. In some cases, the alternative was hand pulling of weeds, and labour for this work was not available.

The Robocrop views images of the crop ahead of the tractor and translates this into very precise positioning of the hoes by means of a hydraulic sideshift. It is colour-intelligent, finding the higher concentrations of green and minimising the effects of shadows or very strong sunlight. The machine copes perfectly with curved headlands, and compensates for windy conditions when the roots of the crop may not be directly under the foliage. Drivers find using it a low-stress operation, and this, combined with the high forward speeds and 6 or 9 metre width of the implement, produces high daily and seasonal outputs. Support from the manufacturer, and especially the instruction given to operators, was rated as outstanding by all users.

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Silver Medal

CATROS stubble disc cultivator

The CATROS stubble disc cultivator consists of two rows of discs followed by the well tried Amazone wedge ring roller. The implement is fully mounted, and the 6 m working width is hydraulically folded from the tractor seat to a transport width of less than 3 m. There are a total of 48 discs of 460 mm diameter in a staggered arrangement which provides intensive mixing of straw and trash. The spaced consolidation by the wedge ring roller provides ideal conditions for the germination of volunteer grain and weed seeds and a high degree of 'weatherproofing' in a difficult season. Forward speeds of up to 15 km/h are recommended and tractor size required is around 120 kW.

Users interviewed had bought the implement mainly for reasons of economy of effort put into cultivation. They were covering more than 40 hectares a day, using tractors of around 110 kW. Mixing of crop residues was excellent, and drilling with the cultivator drill was possible after one, or at most two, passes. Construction of the implement was good, with no replacement parts needed on those seen. The most-used had exceeded 1600 hectares of work.

The CATROS, on the farms visited, was a less expensive and very effective alternative to some of the large combination tillage implements. Users accepted that there would be some conditions where the CATROS would not be suitable, and heavier equipment would have to be used. It is worth noting that on all the farms visited the cultivator-drill needed a higher power tractor than the CATROS of the same width.

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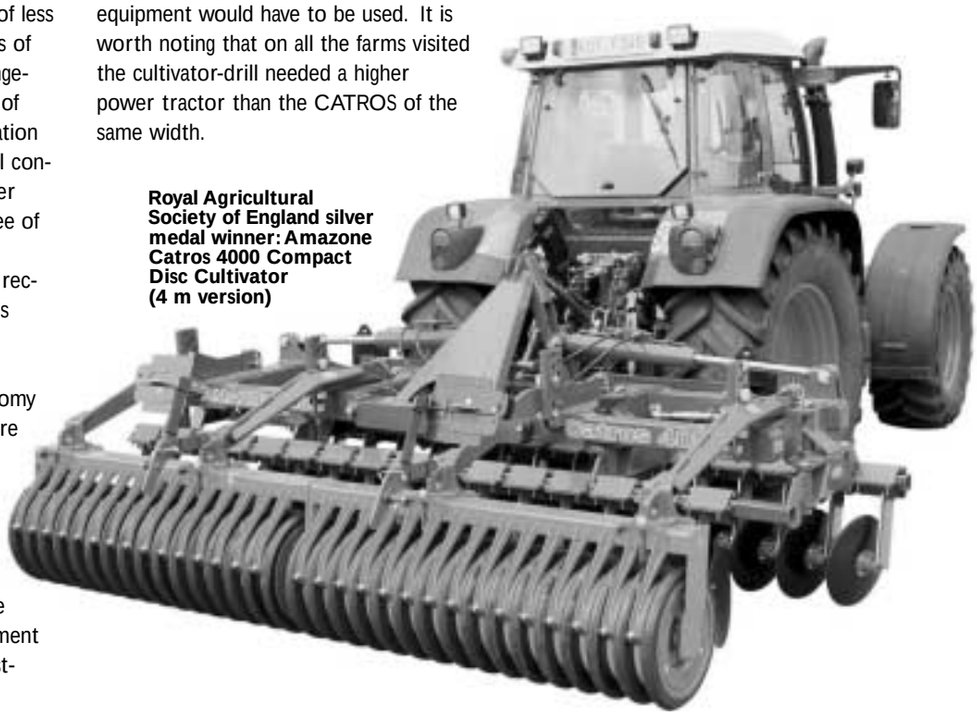

Royal Agricultural Society of England silver medal winner: Amazone Catros 4000 Compact Disc Cultivator (4 m version)

Silver Medal

John Deere 9780CTS combine harvester

The John Deere 9780CTS combine harvester uses an eccentric twin rotor tine separator system which threshes and separates the crop in a unique 'pull and release' of the material passing through. It offers high output with very low threshing losses, minimal grain damage, good straw quality, medium power requirement, the ability to work effectively early and late in the day and to work in moist conditions and where there is 'green' in the straw. Servicing is easy, with no daily grease nipples and with the tine separator module quick to remove. The combine harvester is only 3.3 m wide for road movement. Straw chopping and chaff spreading is of an exceptionally high standard.

The new 9780 CTS combine harvester, one of ten all-new John Deere models, is designed to handle conditions that can paralyse a conventional rotary machine

Users were generally harvesting 600 to 800 hectares a season with the CTS, at about 35 tonnes an hour output in wheat. The machine performed well in a variety of crops and under a variety of conditions. The main reasons given for buying the CTS were the need to replace two existing combines, the need to extend the working day and the need for a machine that was narrow enough for easy road movement, especially on the west side of the country. One user made the point that the CTS was the width of a 5-walker machine but offered at least 50% greater output. Users thought that the resale value of the CTS could only be helped by its compact dimensions. All users praised the ergonomics of the controls and the support from John Deere Ltd was, in all cases, outstanding.

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Silver Medal

Kverneland model LO on-land/in-furrow plough

The LO is a fully mounted reversible plough with a parallel linkage system which, prior to turning, moves the plough into a balanced position to allow a smooth and low stress turnover of the 7-furrow configuration. For on-land ploughing the offset can be up to 1.42 m, and conversion from on-land to in-furrow mode is by simple hydraulic control. The lift requirement, because of the design used, is well within the range of any tractor likely to be used with the plough. The Vari-Width hydraulic furrow width adjustment facility is standard and gives infinite adjustment between 300 and 500 mm. Auto-reset or shear bolt protection against hitting obstructions is provided.

Silver medal winner: Kverneland Model LO-85/300 7 furrow reversible plough for 'on-land' or 'in-furrow' operation

The judges met users ploughing up to 1200 hectares in a season with the 7-furrow LO plough. The features most praised were Vari-Width and the on-land/in-furrow option. The two together were said by one user to be 'worth their weight in gold'. The skimmers were said to be easy to set and use. Road movement, an important aspect with most users, was very satisfactory. Daily output was 20 - 30 hectares depending on field size, soil and depth of work. The plough bodies used were popular, especially the 'No 8'. With the 'No 9' digger body one user was ploughing at 30 to 35 cm deep for root crops. All users commented on the simplicity and elegance of the design and the extra output provide by the special features of this plough. Service from Kverneland dealers was outstanding.

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Silver Medal

Agritrac rubber track systems

Agritracs are a rubber track conversion that replaces the drive wheels of conventional rigid tractors, all four wheels of articulated tractors, or the drive wheels of combine harvesters. They use proven 'Goodyear' rubber belts, are within 3 m vehicle width and can be used on roads at up to 32 km/h. Agritracs can be quickly fitted or removed and therefore offer versatility of use within and between seasons. A pair of tracks runs on a total of 16 rubber tyred idlers, providing total area support of more than 1.2 m^2 each side and a ground pressure of less than 35 kPa from a 10 tonne tractor. The tracks pivot and therefore remain 'flat' on the ground under all traction conditions to give uniform ground pressure across the contact area. There are 32 teeth on the drive wheel which engage 12 notches of the belt at any one time. The drive is therefore extremely positive and has been proved up to 35 kW. Extensive warranties are given on the Goodyear belts and the drive gear, and John Deere maintain the tractor warranty when Agritrac is fitted. Fitting the tracks effectively gears the tractor down by 10 - 12%, and the front wheels normally have to be changed to provide the right drive ratios.

The advantages of the tracks are low slip, low ground pressure, reduced sinkage and soil damage, reduced fuel consumption and improved ride in the field. The initial cost is much less than that of a dedicated track machine, and the Agritracs can be retained and fitted to the next tractor when machines are sold on. Users found slippage under heavy traction very much reduced (15 - 20% down to 2 - 3% quoted), daily work output improved, and noticeably very little sinkage on cultivated land as, for example, when drilling. Drivers said they had the advantages of tracks while retaining the convenience of conventional tractor steering. The tracks also functioned very successfully on the combine harvester, giving reduced marking of the land and an improved start for minimal tillage.

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Silver medal winner: John Deere 8520 model illustrating the use of the Agritrac rubber track system

Silver Medal

Power Arm 52 and 59 Hy-Reach hedge and verge mowers

Silver medal winner: McConnel Power Arm 52 Hy-Reach mower

The Power Arm 52 and 59 Hy-Reach mowers are designed to meet the needs of contractors and municipal authorities. They are either front or rear three-point linkage mounted on tractors of 50 kW or over. Both the reach and dipper arms are tapered for additional strength and use the McConnel parallel arm geometry for easy control in the horizontal plane as well as good over-fence clearance. For transport the arms and flailhead are slewed to a position within the width of the tractor. There are a total of five flailhead options for the two models, with the new lightweight 'Tuffcut' head available on the PA59. The 50 kW hydraulics may be semi or totally independent. The outstanding Easy Drive System (EDS), which gives automatic head control at high forward speeds and attracted an earlier silver medal award, is available as an option on the PA52. The standard control is cable operated, with electric switchbox, mono lever and digital armrest controls as options.

Users subjecting the machines to very heavy usage reported up to 20% increase in work output compared with other models, very accurate cutting, easy to drive which made for longer revenue earning hours, superb performance from the McConnel flails, and excellent support from dealers and the manufacturer. The machine stands up to the heaviest contractor use without problems and was rated as 'outstanding' by all those interviewed. The only regret registered was that they had not accepted some of the advanced options offered by McConnel - but would do so in future.

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Silver Medal

Tinemaster

Royal Agricultural Society of England silver medal winner: Quivogne Tinemaster shown with rear mounted press

The Tinemaster is a substantial tillage combination of two rows of discs with intermediate winged tines. It is offered in widths between 3.2 m and 6 m and folds hydraulically to within 3 m for road movement. Gas suspension with totally safe and positive locking, in the transport position, give safe and stable movement. Tine depth adjustment is manual. The discs are closely spaced and this combined with the even lift from the winged tines gives a remarkably level finish for drilling.

Most users had bought the Tinemaster to speed up and reduce the cost of cultivations for combinable crops. Most aimed to drill after one pass with the Tinemaster and the daily coverage with the 6 m model was from 20 to as much as 40 hectares with tractors of 225 - 300 kW. Users stated that the design of the machine was excellent, commenting particularly on the level and weather resistant tilth produced and the ease of folding, locking and transport. Disc replacement was at around 1600 hectares at the front, with up to 3200 hectares at the rear, obviously with variation according to soil conditions. Sets of points maintained with hard-facing, did up to 240 hectares. Maintenance costs were thought to be modest and after the several thousand hectares of use, represented by those interviewed, there was clear evidence that the machine is very robust and reliable. Technical support from Quivogne was immediate, as was support from the dealers and the manufacturer.

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GOLD Medal

Royal Agricultural Society of England gold medal winner: John Deere's GreenStar AutoTrac assisted steering system for tracked tractors, in action; image also includes a close-up of the Autotrac unit

GreenStar guidance systems

The John Deere Parallel Tracking and Autotrac are based on a differential global positioning system (DGPS), with the additional refinement of StarFire correction, to give automatic steering accuracy of better than 100 mm. A standard global positioning system (GPS) receives a signal from three different satellites and in conventional form achieves an accuracy of around 3 m horizontally and 5 m in the vertical direction. With the addition of a reference station (in this case sited in Cornwall and John Deere owned and operated) this accuracy is raised to less than 1 m horizontally and is known as DGPS. The John Deere receiver takes in a further signal from one of two levels of the StarFire correction signal (again a John Deere facility) to bring the accuracy to better than 100 mm. This is available on the 'T' rubber track tractors to give assisted or fully automatic steering.

Parallel track gives an audible signal guide for manual steering. Autotrac provides total hands-off automatic steering in the field. This is almost universally used in straight-line mode in this country, although there is a contour-following facility available. The system includes 'return to marker', for example, returning to a point to resume spraying, 'row finder' to get to the next tramline and a facility for resuming at the correct point the next day.

The advantages of the guidance system are increased efficiency in the field through accurate matching of bouts, less stressful and therefore potentially longer working days and precise steering where there are no tramlines or where visibility is poor.

Users, without exception, said that the cost of the system would be quickly recovered through accurate bout matching and elimination of overlap in the field. They found the equipment easy to operate, precision of steering was better than manual work by a skilled operator and support from John Deere was superb. The potential for night-time and poor visibility work was recognised by all users.

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GOLD Medal

Electronic animal identification - parlour, install and sort-gate

The centre of Agricultural Technology Limited's (ATL) parlour in-stall identification technology is their 'high power' install antenna. This can be added to virtually any parlour without structural alteration and does not need any special equipment to install or test. Parlours with wide passages pose no problem as they might for portal-type antennas. The cows do not need to be 'streamed' in through a long entry race to prevent them backing off after they have been identified. The wide range of tuning tolerance means that, once the antennas are installed, re-tuning is virtually unnecessary. The in-stall antenna does not rely on a correct sequence of cows entering the parlour and is remarkably insensitive to animal behaviour. A full range of movement of the cow's head, from normal standing to eating from a manger, is accommodated by the large size of the antenna.

The other elements of the system are the TIRIS ear tag, a disc of 18 mm diameter costing about £3 and the powerful TIRIS S2000 reader. The system is designed for linkage to in-parlour feeding, milk recording, sorting or segregation gates and out of parlour forage or concentrate feeding as required. The advantages of the ATL equipment reported by the users were:

totally reliable cow identification;
shorter milking times;
consistently accurate feeding;
elimination of paper instructions for relief milkers;
reduced milker stress without the need to leave the pit to direct cows for veterinary attention;
use of warning flags against particular cows which could be set up 'at leisure' on the computer in the farm office;
production-based out-of-parlour feeding.

Use of this equipment had revolutionised herd management in several cases, reducing labour costs and raising the profitability of the enterprise. There were further advantages for the safety of operators working alone with large herds. All the equipment was robust and clearly built to last, and had not been affected by pressure and steam cleaning. Judges reported one herdsman looking after 300 cows with only occasional help, with the automatic sorting of cattle for artificial insemination (AI) or other reasons being of prime importance. One owner said: "It allows 200 plus cows to be managed as individuals". Support from ATL was said to be immediate and technically excellent by all users.

CONTACT

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FEG
Forestry Engineering Group

SYMPOSIUM

Newton Rigg College, Cumbria
Tuesday 2nd September 2003
(9.30am - 4.00pm)

As usual real experts in their fields have been persuaded to speak once again, so, the Symposium presents a great opportunity to catch up with the cutting edge of development in the industry. Those attending the Symposium will be able to generate CPD points.

The morning session, which is entitled **Selling by Weight – Is Someone Losing Out?** will be chaired by John Kissock of James Jones and Sons.

THE FOLLOWING SUBJECTS WILL BE COVERED

- Measurement of Timber, Conversion Factors & Method of Payment
- Swedish Sawmill Experience, Scanners and Appliances and Payment of Timber in the UK.
- Views from a Timber Merchant on Log Measurement and Payment Methods.

LUNCH

The afternoon Session which is entitled **Road and Transportation Developments** will be chaired by David Sulman of UKFPA.

THE FOLLOWING SUBJECTS WILL BE COVERED

- Bill Barker of Dumfries and Galloway Council will speak on Vehicle Developments, Strategic Routes and other Public Road Issues.
- Jo Mundy of Building Research Establishment will speak on Life Cycle Analysis as it applies to forestry and timber production.
- Ron Munro of Highland Council will talk on Timber Transport in Sutherland and Road Construction over Peat.
- David Killer of Forestry Civil Engineering will speak on Topical Issues regarding Forest Roads and Vehicles.

If time allows the Sessions will finish with an opportunity for the attendees to ask questions of the speakers.

INSTITUTION OF AGRICULTURAL ENGINEERS

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