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LANDWARDS

Early Spring 2003

FOOTPATHS

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Agrobots

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LANDWARDS

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

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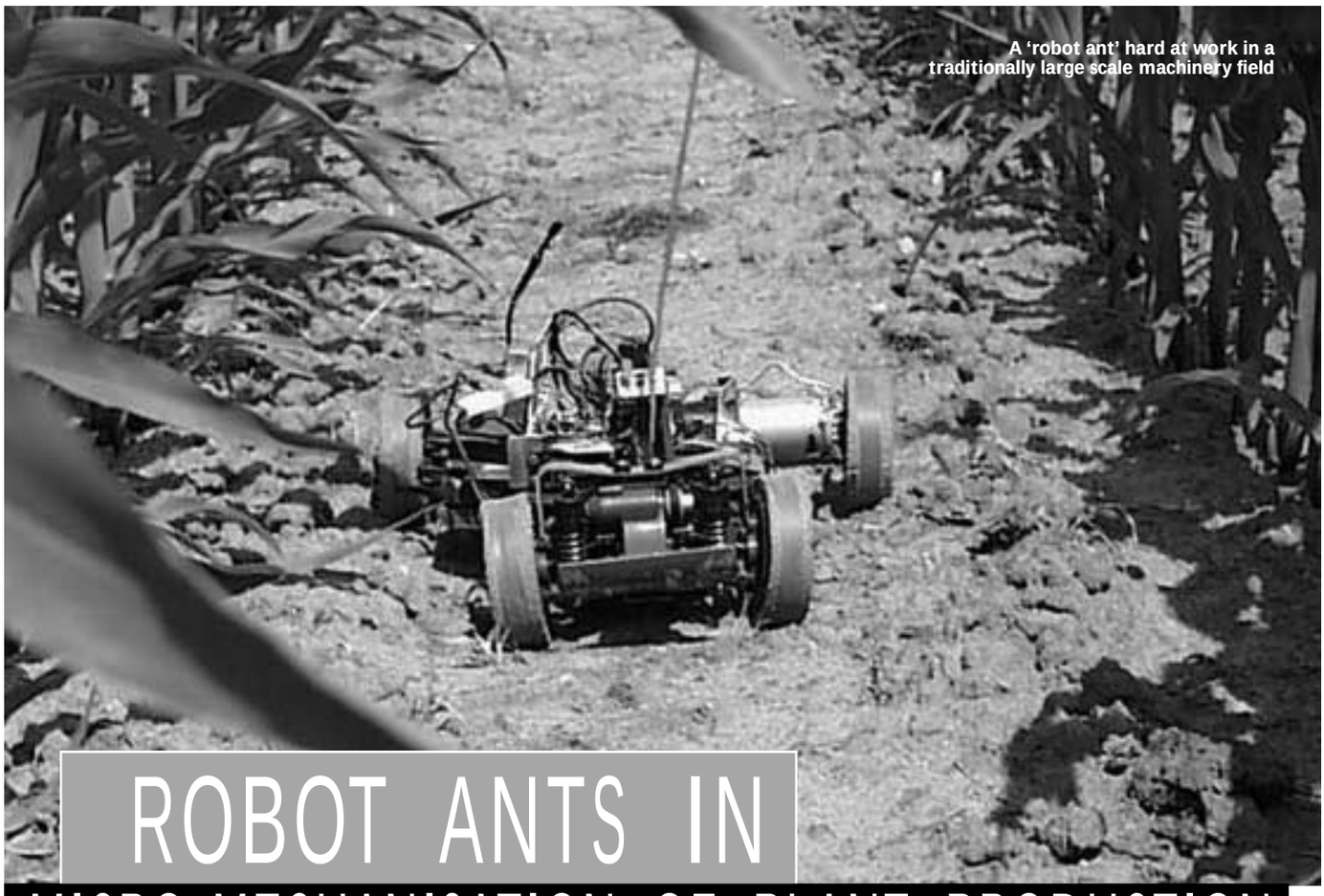

A 'robot ant' hard at work in a traditionally large scale machinery field

ROBOT ANTS IN MICRO-MECHANISATION OF PLANT PRODUCTION

Louis Claessens, Pieter Huizinga, Michel Huls, Antoine Miltenburg, John Thelen and Bram Vanthoor

Summary

To optimise plant growth, in sustainable agriculture, it is desirable to work at a plant specific level. At present, this requires a labour intensive approach and labour has become increasingly expensive. Ants provided the inspiration for our solution to this problem: the use of small autonomous platforms for the mechanisation of plant production. The minimal requirements for such a platform are the ability to scout and act intelligently, be small yet robust, reliable and inexpensive; information management is an extremely important feature as well. The time frame for the development of the 'robot ant' is 20 years. The 'Agrobot', an experimental mobile platform, is the first step in this project. Test results of the 'Agrobot' have highlighted some important practical challenges.

The main requirements for a well functioning mobile platform are: small in size, light and robust. A positioning system is not necessary in some applications. The 'Agrobot' may lead to higher farmer revenues and contribute to a more sustainable agriculture in the future.

BIO NOTE

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Professor Ettore Gasparetto (Milan University and EurAgEng Council Member representing the Italian Society) who presented the UNACOMA Vision Event Award at AgEng2002 to some of the participants from (2nd left to right) Antoine Miltenburg, John Thelen, Bram Vanthoor, Michel Huls and Pieter Huizinga.

Introduction

What can agricultural engineering do for society and what will agricultural engineering look like in the future? These two questions formed the basis of a vision contest announced by EurAgEng. We took on this challenge and found that there should be an alternative to tillage with large and expensive machines. To realise this alternative, we looked at nature for inspiration. Ants live in very well organised colonies, sharing tasks by a highly developed communication system that can be considered as a decentralised intelligence. Bioinformatics can be used to simulate this organic information system.

Hand weeding as an example of labour intensive, plant specific tillage (Photo: Soil Technology Group, Wageningen University, The Netherlands)

State of the art

The current methodologies are designed for large-scale agriculture. The working widths of agricultural machines are increasing, as are field dimensions. The vision for the future is that as many hectares as possible will be farmed per member of a farm workforce. However, labour is getting more expensive, especially in Western Europe, and one person has to crop a very large area to realise equivalent savings through utilising large agricultural equipment. The prices of agricultural products are already low and therefore it is not easy to develop any alternative method with even lower costs than at present. In ecological farming, labour demand is even more intensive and no chemical sprays or chemical fertilisers are permitted. Non-chemical machine widths are extremely limited to ensure accurate operation and to reduce machine mass so that neither the crop nor the soil is damaged.

We remain convinced that increasing field dimensions is not the right way to improve European agriculture. Similar to Blackmore and Griepentrog (2002), we think that, in the future, small autonomous vehicles will be needed to work on a plant specific scale. This will enable us to close the nutrient cycle and to work on biodiversity within the framework of sustainable farming. Nowadays, working on biodiversity is contradictory to working at large-scale. In large-scale systems, it is not possible to work on a plant specific level without increasing labour and associated costs.

Problem

For both the problem of labour scarcity and the challenge of a sustainable agriculture, the interest for us as a research group lies in the ability to work at a plant specific level. The problem is that, currently, no equipment exists to tend crops at a plant specific level on a larger scale, without increasing labour and associated labour costs.

Objectives

The objective is to develop an autonomous platform that is able to work at a plant specific level. The mobile platform should have the following attributes.

- **Scout: gathering information about the crop, weeds, diseases, climate and soil**
  The mobile platform has to make a detailed 'map' or a plant profile of the field with the circumstances of each plant on it. To make this map, it has to be equipped with intelligent sensors for: plant recognition; moisture; level of nutrients; sunlight; soil conditions; presence of diseases; and so forth.
- **Intelligent action: optimising the crop conditions in the field by means of specific actuators**
  By plant profile reference, the mobile platform has to assess and eliminate any lack of nutrients, water, soil structure and weeds of different species.
- **Reliable and low risk: no danger to humans, animals and crop**
  No risk of personal or livestock injury or of crop damageis allowed; it has to be absolutely reliable in the field and operation should be equipped with manual override.
- **Small and robust**
  The platform must be lightweight, very small and extremely dextrous; it has to be able to move through the crop and be resistant to variation in weather conditions.
- **Standardised communication with base station and other platforms**
  The mobile platforms have to be able to communicate with each other so they can work alone or in a group; thus generating capacity by working in groups, instead of increasing the output working singly.
- **Data processing: decision support based on the systems knowledge**
  The collected data and the position information of the mobile platform will be inputs to a Decision Support System (DSS) which can then navigate the platform.
- **Inexpensive: suitable for mass production**
  The costs of the mobile platform have to remain in proportion to size and also be affordable in relation to the number of mobile platforms which are required for general cropping. The choice of navigation system and sensors are a crucial factor of this costing process. These costs must also balance with the labour saving which they can make for the end user *i.e.* the farmer.
- **Ready for work in 20 years from now**

Experimental crop scout, 'Agrobot'

The mobile platform is not based on existing frames/machines but is a new concept, so no limitations of crop systems and current techniques are included.

Method – 'trends in agriculture'

Blackmore and Griepentrog (2002) state that machines, in the future, will be more plant specific rather than working large scale. Precision Farming (PF) is the system approach to managing crops and land selectively. There are three types of variability when adopting PF technology:

- spatial variability
- temporal variability
- predictive variability.

PF technology gives managers a better understanding of field parameters at the sub field level while managing many hectares. The first step in the PF process is to collect data and to create a yield map with this data. Most traditional systems over apply inputs such as seeds, sprays and fertilisers to reduce risks of crop failure. With a good PF system, these inputs are managed more precisely. In future more specific sensors, for example to recognise crops and lacks of nutrients, will have to be developed. It is, therefore, important that what is being measured is well defined. For example, there are many things that can be measured with electronic transducers, so irrelevant inputs need to be separated from essential measurements. Here is, and possibly always will be, a task for the farmer - to process incoming data.

To make a very small and light platform, it is also important that higher density energy sources become available. In addition to this, more concentrated sprays and fertilisers are required to reduce the volumes which currently would have to be transported.

At least there are also some new techniques which would work along with PF to help improve it such as genetic modification, improved versions of global positioning systems (GPS) and geographical information systems (GIS). Due to these systems being in place, it is possible to shift the attention of the manager from farm level to field level and, in future, possibly even to sub-field level. Plant specific management will present many opportunities for the future.

Goense from IMAG BV and Müller from Wageningen University (2002) state the following points about an Autonomic Platform (AP). By developing an AP, people are starting with a common tractor or machine, instead of starting from the unknown. There are three levels of intelligence which have to be developed:

- individual intelligence for navigation, steering, etc.
- interaction with other AP's, for example to get the same row distances
- intelligence for the platform to organise itself, the AP's single goal.

Method – 'trends in technology'

In 1965, Gordon E. Moore stated that the numbers of transistors per integrated circuit would grow exponentially. This came to be known as Moore's Law and stands for doubling processing power every eighteen months. This enables us to store and process information much better and faster. As a result of this, both personal and industrial computers have become much smaller. Today, a palm-top computer has the same processing speed and memory (200 MHz, 64 MB) as a lap-top (notebook) 5 years ago and a personal computer (PC) 10 years ago.

In communication technology another trend can be seen. The first Dutch mobile telephone in 1939 had to be mounted in a car. In 1982, a mobile telephone was the size of a shoebox and at present it is only now as big as a pack of cards.

Building an experimental crop scout

The first step in building the crop scout, called the Agrobot, was finding which requirements should be met. The key note of this project was to keep it simple, since little money was available and it was only a prototype.

The mobile platform or 'crop scout' has to be steered with camera vision. This is important because the crop scout has to drive under plant leaves, an area inaccessible to an operator. The crop scout has to drive slowly, about 0.5 m/s, otherwise it will be impossible to steer it using camera vision. The last requirement is that the crop scout should be small. The maximum size of the crop scout is 0.30 m x 0.15 m x 0.10 m. It is clear that there is no requirement in terms of measurement instruments. This will be done in a later stage of the project. With these requirements finalised, we set about finding the right parts so that the experimentation with the crop scout could begin.

The Agrobot crop scout was based on an existing radio controlled car. The original velocity of the car was thirty times bigger than the desired speed. In order to reduce the speed, a planetary gear was implemented on the motor. The advantage of the planetary gear is that the decrease in speed causes an increase in torque with a reduction in speed ratio of 1:30. Increasing the torque is favourable because the mobile platform has to be able to move on the uneven surface of the field. The new transmission unit was too long to put on the existing chassis so the Agrobot had to be enlarged. Adding the new transmission unit was combined with the strengthening of the frame of the mobile platform. A steel profile cross was made and mounted under the original chassis. However, the body of the platform then touched the ground and was not able to move. A simple solution had to be found; this involved placing foam on the original wheels, whereafter the camera and transmission unit could then be mounted onto the platform.

The Agrobot has to be able to be steered by remote control, which means that the power resources have to be stored on the Agrobot. The Agrobot has three different power resources:

- a 12 volt battery for the camera and video transmission unit
- a 7.2 volt battery for the moving and steering the mobile platform
- a 9 volt battery for the remote control of the mobile platform

At this stage the Agrobot is able to move beneath a canopy using remotely controlled steering. The camera view is shown on a normal television.

The next development stage is to steer the mobile platform using a computer. If it is possible to steer the Agrobot by computer then it will be easy to use the full capacity of the computer in conjunction with the mobile platform. The possibilities then become endless but the main aim of the computer is to enable it to control the steering of the mobile platform. This can be done using software packages. The easiest way is to program a specific path that the mobile platform has to follow. This particular system is not desirable because if the Agrobot deviated from its programmed path just once, then the software would be unable to steer the platform efficiently, as its actions would no longer correspond correctly to the programmed instructions. The errors made would escalate to a point where the mobile platform was not performing the tasks required of it.

The prototype of 'Agrobot'; noticeably working its way round people at the UNACOMA Vision Event which took place as part of AgEng2002 in Budapest - July 2002

The second way to steer the mobile platform is to use its environment. If the mobile platform is able to see the difference between the crop and the end of the row, it will be able to steer the platform accurately between the crops. This means that the platform has to understand what it sees. One solution for this problem is to use image processing. Image processing can only be used if the images are digitised and the computer carrying out the processing has enough capacity to process the images. The problems would be that the analogue signal of the video transmitter has to be converted to a digital signal and that the computer must be able to process the images at a rate that is higher than the rate of the incoming images.

A simple but expensive solution is to use a 'frame grabber'. If the data is transferred by the frame grabber, the image processing software can immediately begin to decide how to steer. The decision support system can be based on colour thresholds combined with the shape of the crops or by high non-visible frequencies. The threshold values of the colours are given in red, green, blue (RGB) values. To make a good decision, at least the RGB values of the surface area of the crop and the sky have to be determined. The high frequency method is based on the different moisture content of the elements in the environment. Before the method can be utilised, it is necessary to program the decision support model off-line, with only the computations being processed on-line.

After the first development stage, the mobile platform was tested. The results gave mainly steering problems and simple practical difficulties. There are a number of problems with steering the mobile platform by hand. If these problems occur when steering by hand, the likelihood is that they will probably also occur when the steering is controlled by a computer. It is important that these problems are identified and outlined here, however it is our intention to elaborate on them in a later project. The problems documented are that:

- only one fixed camera takes pictures of the environment and with a 'one eye' or 'one camera' viewpoint it is impossible to estimate distances; without seeing depth, it is impossible to steer the platform efficiently;
- there is no reference of vision; the camera only makes pictures of the environment and not, for example, the width of the mobile platform; and without seeing the size of the Agrobot in the same view as the environment, it is not possible to steer the mobile platform without causing accidents;
- the platform is able to drive out of the maximum range of the remote control unit; the remote control is not able to give a warning that radio contact will be lost; if the Agrobot is out of this range it will be difficult for the driver to get the mobile platform back into the range of control;
- the mobile platform is not robust enough with some simple elements missing which could ensure the platform moved well when in use in the field; the platform is still not powerful enough and has a lot of trouble handling rain, sunshine and sand; with simple improvements these problems could be resolved.

Results

The width of the crop scout has to be smaller than the crop row distance. The distance between the crop row and the mobile platform should be related to the quality of steering of the unit. The mobile platform must also not cause damage to the crop, so the height of the crop scout should be less than the height of the canopy of the crop.

The ground contact area of the mobile platform is small so the force exerted on the soil is high. The maximum mass of the vehicle, therefore, should be small to avoid soil compaction and to ensure that the mobile platform cannot move off course in wet conditions. The designer has to take account of the mass of the measuring instruments and ensure that this is not higher than the critical mass of the mobile platform.

High capacity in yield per hour is not a requirement because the autonomous platform will be able to work continuously, 24 hours a day, with the exception of maintenance and malfunction time; performance of the mobile platform is also not weather dependent.

To realise a commercial success within 20 years, the vehicle has to be able to work with the 'growing systems' in use today. If a growing system were to require adaptation, this would greatly influence all field operations, in so much as making it less achievable in the near future. For a four-wheeled scout (see section 'Building an experimental crop scout'), it is

not possible to move in a crop with a narrow crop row distance, for example wheat. This inability will not affect the success of the scout's introduction because the highest returns of the system are most likely to be expected in crops with a high profitability, such as potatoes or vegetables, where there is a large row distance.

The mobile platform moves autonomously and therefore it must be safe. The platform has to stop if a problem arises. In such cases it has to be able to send some form of warning to the base station so that the farmer knows that something is wrong and can solve the problem indicated. To achieve this the crop scout needs a self-diagnostic system.

Plant specific agriculture can be carried out in either of two ways. The first option is to use a data map. This is where the collected data and position, recorded by the vehicle, is sent to the base station where it will be processed to form a data map and subsequently converted to a digital information file. To determine position information of the mobile platform, an expensive Differential Global Positioning System (DGPS) is necessary. The second option is to use a sensor and an actuator, both mounted on the mobile platform, with the sensor linked in real-time to the actuator. The advantage of this approach is that no data map and, consequently, no expensive DGPS is used; instead, the platform responds immediately to detected signal impulse variation, but the response is without the benefit of the data map

Since the scout moves autonomously and the data will be processed by a computer, the cost of labour will be zero. The

EurAgEng's 'UNACOMA Vision Event'

This paper was the winner of the UNACOMA Vision event which took place as part of AgEng2002 in Budapest in July 2002. EurAgEng invited 'visionary people from the younger age group' to answer the questions of 'what can agricultural engineering do for society?' and 'what will agricultural engineering look like in the future?'; including their views on the future. Taking the form of a competition, 'young people' of aged 35 or under presented papers with their vision of the future of agriculture and technology in agriculture. Entrants were allowed to bring details of inventions and prototypes to demonstrate their vision, with the emphasis on looking forward, not looking back at work already done. The ideas had to show lateral thinking and consideration of ecological and economic factors had to be taken into account. The Vision Event was sponsored by the Italian Machinery Manufacturers' Association (UNACOMA).

COMMENDATIONS

All three submissions for the UNACOMA Vision Event were highly commended by the judges drawn from EurAgEng Council – Professor Bent Bennedsen (EurAgEng President from Denmark), Professor Ettore Gasparetto (Italy) and Professor Brian D Witney (UK) – and the oral presentations received well-deserved praise from a large audience of conference delegates. Congratulations to all the contestants for their commitment and enthusiasm as they enter their careers in biosystems engineering.

'Agricultural engineering as backbone of agriculture' which won second place with an excellent but more general paper written by **Edward Dekker, Kees van Putte, Jeroen Smit and Randy Wilbrink**, who make up another research group from Wageningen University, in The Netherlands.

This paper identified that a central farm management system would be key in providing good food tracking and tracing systems; to provide the extensive information about the production chain of all products, for food safety guarantees. Their vision also envisages new sensor techniques, smaller actuators and Artificial Intelligence systems as the key to improving the management of nutrients, chemicals and natural resources on the farm. The paper also introduces the idea of using alternative lightweight power sources to enable the deployment of robotic devices for field scouting and integrated pest management. The group draws the conclusion that the farmer will ultimately still have to make management decisions but all these will provide vastly improved aids in supporting decisions taken.

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'From tradition into a modern future' won third place with a very good paper, written by **Christoph Oberndorfer**. This paper has the vision that agricultural engineering, currently strongly oriented to mechanical engineering, will have to develop itself into a much more complex branch of 'biotechnical engineering'. In future, the major break-throughs in agricultural engineering will not result from the traditional, mechanically oriented disciplines. Instead they will come from the new, additional working areas in the fields of post-harvest technology and further processing of agricultural raw materials, agricultural energy production and biosystems technology.

Christoph Oberndorfer, Institute of Agricultural Engineering at the Georg-August-Universitat, Gottingen, Gutenbergstr. 33, 37075 Gottingen, Germany. Tel: +49 (0)551 39 55 96 E-mail: cobernd@gwdg.de

use of an ecological energy resource will also have the advantage that the energy costs will be zero. On the other hand, the investment costs will most likely be high. The farmer has to buy a completely new system that consists of expensive components which will also result in high costs. However, using a system without DGPS which is expensive, can decrease the overall investment required for the mobile platform.

The system hardware and software and, in addition, the actual mobile platform, all have to be standardised. The farmer will then be able to use a single scout where he can plug on only the actuators and sensors that he requires. These components, therefore, have to mounted onto the mobile platform in a simple way.

The software has to be able to communicate with different sensors and actuators and to store all the data in a data map. The communication can be wireless like a radio modem, Global System for Mobile Telecommunications (GSM) or Universal Mobile Telecommunication Services (UMTS). If a number of scouts are in the same field, it is favourable to create a Wireless Local Area Network (WLAN). However, non-wireless communication is possible but the mobile platform itself would be used to store the data. On a certain time-interval the mobile platform would move to a stationary point in the field where a docking station would be located. At this station, the data collected by the mobile platform would be stored.

Conclusion

To realise a commercial success, the mobile platform or 'crop scout' has several critical requirements to realise the plant specific approach. The scout must be small, light and robust. For safety reasons the scout needs a self-diagnostic system to warn the farmer if a problem exists.

Two different types of mobile platforms are possible. The mobile platform can use DGPS to make a data map of the area to be covered or, alternatively, the mobile platform can scout and act in one single pass. If the data map option is used, the data can be transferred from the scout to the base station via a wireless or non-wireless communication system. Compatibility with other mobile platforms and with the information systems at farm level, including the decision support system, requires standardisation. Standardisation is also needed to enable the use of different sensors and actuators on the same mobile platform.

The use of crop scouts would decrease labour input, improve crop quality and increase profitability, although costs will be higher with using a positioning system and wireless communication option. Using a crop scout not only increases profitability but also decreases the impact on the environment by optimising nutrient usage compared to the field specific approach which is currently in use.

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PROFESSIONAL NETWORKS

Science, Engineering and Technology gateway for women

Portia is a web-based community of and for organisations and individuals concerned with Science, Engineering and Technology (SET). The aim is to provide a comprehensive source of knowledge, experience and information relating to SET, particularly from the perspective of women.

Portia has already achieved a great deal – it has:

- developed and published a prototype website;
- created a network of Partner organisations;
- secured inputs and contributions from industry, academia and the voluntary sector;
- secured funding for a number of activities relating to website development;
- secured funding for and embarked on a major, two-year project focusing on careers in the Information Technology, Electronics and Communications (ITEC) Industries;
- created a management and operational structure for the next phase of development; and
- formalised an Intellectual Property agreement for Portiaweb.

Over the next two years Portia proposes to:

- develop a Membership Scheme;
- increase the number of participating Partners;
- manage the ITEC project to a successful launch in 2003;
- develop an editorial system for the acquisition and processing of copy material;
- develop portal features that support interaction with Partners;
- prepare applications for further R&D projects;
- support the administration of essential activities;
- further develop the website, to add more content and enhanced capabilities.

All the work to date has been made possible through the generosity of the many Sponsors and Partners, including BT plc, Business in the Community, the Department for Trade and Industry (DTI), Engineering Manufacturers' Training Association (EMTA), Imperial College, The Institute of Physics, IT Synergy, Opportunity Now, the Post Office and the Daphne Jackson Trust all of which have given support in cash or in kind.

CONTACT

For more details on becoming a Partner organisation or for individual subscriptions; donations or sponsorships; Consultancy or other services, contact Elizabeth Pollitzer, Director. Tel: 01483 689162. Fax: 0207731897. Email: or eep@doc.ic.ac.uk Web: www.portiaweb.org

INNOVATION

Scottish Minister opens UK's first Centre for Timber Engineering

The first national Centre for Timber Engineering was opened on 17th January, at Napier University in Edinburgh by Scottish Minister for Enterprise, Transport and Lifelong Learning, Iain Gray.

The Centre for Timber Engineering is the only establishment in Britain offering academic courses specifically aimed at training undergraduate engineers in the uses of wood in the design of buildings and structures. The first intake of students will be in September 2003 and students on the four-year course will graduate with a BSc in Civil and Timber Engineering.

More than 60% of houses built in Scotland are timber framed and with the output of Scottish forests set to substantially increase over the next two decades there is an opportunity to secure significant investment and jobs while building a sustainable forest industry.

To achieve this, the research and teaching in timber engineering needs to be expanded and enhanced and Napier University was chosen by the Scottish Forest Industries Cluster to establish a national centre for excellence in Timber Engineering. Working in partnership with all aspects of the timber industry the new Centre aims to enhance the level of knowledge amongst designers and professionals, which in turn will create market opportunities and result in higher demand for domestic timber products. The Centre will also help rural inclusion by supporting a vital Scottish rural industry.

Professor Ban Seng Choo, Director of the Centre, says: "I am delighted to be joining Napier at such an exciting time. The Centre will contribute significantly towards the UK's need for technology transfer, innovation and applied research to further develop the use of this sustainable construction material. The Centre will also provide degree level and professional development courses in timber engineering - using leading-edge web-based technology which is designed to meet the needs of the industry and the lifelong learning needs of those employed in the sector."

Scottish Minister for Enterprise, Transport and Lifelong Learning, Iain Gray, crossing Geoff Freedman's novel bridge design in stress laminated timber after opening the Centre for Timber Engineering at Napier University

The Centre is part of Napier's School of the Built Environment within the Faculty of Engineering and Computing. There are already some post-graduate researchers working within the Centre for Timber Engineering and industry sponsorship will be available to undergraduates. Funding for the establishment of the Centre has come partly from Scottish Enterprise and partly from industry.

Stress Laminated Timber Structures

The arch bridge on display at the opening of the UK's first Centre for Timber Engineering is a further significant step forward in timber engineering. Until now, stress lamination has been used for flat decks and mostly in the repair or replacement of existing timber decks. The arches are intended for recreational sites, which are in demand at the moment in the UK.

Basically, timbers of variable quality, are dried, drilled, cut and treated before being simply being compressed using very high tensile steel. There is no glue and little to go wrong. We are however into new territory using home grown timber and arches so until the research is complete we cannot be sure that the structures have the reserve strength they seem to display and that they will be constructable by anyone anywhere. One of the benefits of such a structural system is that the materials are easily transported so the bridges can be built anywhere even if there is no vehicle access. The slenderness of the arch deck is quite remarkable for a material regarded as only suitable for secondary structural elements. The bridge on show has a span to depth ratio of 60 to 1.

There is clearly a future for this type of bridge. It is low cost, basic technology and the ultimate sustainable structure.

The development of Stress Laminated Timber Structures is becoming the first main focus for the work of Innovative Engineering in the Countryside (InTeC) as it is a way of utilising smaller timbers to build large structures. The method developed from a repair system started in Canada in the mid 70's which became a new design method in the USA through the 80's. The idea took hold in Australia and Scandinavia during the 90's largely due to the visits from Michael Ritter who had taken the research forward some significant stages in the USA.

InTeC began three years ago as an initiative to increase the sale of timber to the lucrative and available structure markets in the UK. Timber has many advantages over its construction industry rivals - concrete and steel – with its social, environmental and sustainability tickets. However it was perceived that further value could be achieved by adding engineering which would multiply timber's advantages, so InTeC was set up to explore these possibilities.

The Chairman of InTeC, ***Geoff Freedman***, is head of Design, Bridges & Structures at the Forestry Commission and is currently registered for a PhD based on research into stress laminated timber arch construction at Napier

MORE INFORMATION

Further information from: Prof Ban Seng Choo, Director, Centre for Timber Engineering, Napier University tel: 0131 455 2450

FORESTRY

New approach to sustaining England's woodlands

At the National Forestry conference in Cirencester, Forestry Commission (FC) Chairman, Lord Clark of Windermere, announced publication of the Sustaining England's Woodlands report and the Forestry Commission's response to it. Emphasising the Government's commitment to forestry, Lord Clark said the Commission was looking for a new relationship with woodland owners and managers, and that partnership would be the key. He added that the Forestry & Timber Association would have an important part to play.

In a message to the conference Forestry Minister, Elliot Morley, strongly endorsed the Forestry Commission's response to the report. "I take particular pride in seeing the way that our Forestry Strategy is being delivered. It is important that we continue to work with existing partners and stakeholders in this, given that most of England's woodlands are privately owned.

"There is a lot about UK forestry to be proud about. We have a good story to tell on sustainable forestry, including Government actions since Rio, forest certification, and the development of implementation of industry standards including the UK Forestry Standard.

"I warmly welcome the Forestry Commission's new approach. I agree that the time is right for a new relationship with woodland owners and managers in England based on partnership and empowerment. We need to work together to help woodland owners and managers implement sustainable forest management and deliver the England Forestry Strategy.

"I strongly endorse the publication of the Forestry Commission's response to the findings of the 'Sustaining England's Woodlands' report. I also pay tribute to the hard work of the Steering Group chaired by Anthony Bosanquet, and all the others at this conference who contributed to the review."

The keys areas for action in the response are:

- improving the evidence base;
- enhancing engagement with owners and managers;
- strengthening advocacy for woodlands and sustainable forest management;
- developing new and stronger partnerships;
- increasing income from woodlands;
- using FC resources more effectively

Paul Hill-Tout, the Forestry Commission's Chief Conservator for England, said: "Over the years, the relationship between the Forestry Commission and woodland owners has become focussed on the payment and receipt of grants. Other activities have either been relatively weakly developed or are not always joined-up in a mutually supportive way. Grants are important, but grants alone will not implement the England Forestry Strategy.

"England's woodlands and woodland owners are characterised by variety. The Forestry Commission needs to deploy a similarly diverse and flexible range of support mechanisms which are able to respond to the local circumstances of individual woodland owners and connect their objectives with the wider aims of Government policy.

"Our response to the report marks a step change in our desire to connect effectively with all types of woodland owners and the wider industry in implementing the England Forestry Strategy. We have made a series of commitments. We will publish a report on progress in April 2004 and will invite the Review Steering Group to make their assessment of our progress at that time."

The principles established by this review will set the context for the subsequent review of grant schemes and the rates of grant aid for existing woodland. That work and the current review of woodland creation grants will feed into the mid-term review of the England Rural Development Programme.

EDUCATION

Innovative new course offers study at all levels

The University of Sheffield's Civil Engineering Department has developed an innovative, multi-disciplinary learning programme funded by the Engineering and Physical Sciences Research Council.

The Urban Land and Water programme will allow students to learn in a flexible way depending on the breadth of study they are seeking. It offers learners the choice of professional short courses, masters level workshops or wide range of formal qualifications, all the way up to a four year PhD. The course is designed to appeal to a wide variety of people, from those already working within the water and environmental industries to graduates seeking an industry-orientated MSc.

Dr Simon Tait, Department of Civil and Structural Engineering at the University of Sheffield and organiser of the course says, "The urban land and water programme provides students with the technical knowledge to enter into a market that is currently worth around EUR26 billon worldwide. In the UK, this knowledge is becoming increasingly important as the government pledges that at least 60% of the 4.4 million houses to be built by 2014 will use brown-field sites.

The Department is well placed to deliver this cutting edge course. We are an international centre of research expertise in urban land and water and have a variety of awards, including the Queen's Anniversary Prize, the most distinguished award that can be made to a UK higher education institution."

MORE INFORMATION

Simon Tait, Department of Civil and Structural Engineering, University of Sheffield. Tel: 0114 222 5718

SCIENCE, ENGINEERING & TECHNOLOGY

Lord Sainsbury chairs ETB forum on plugging the skills gap

The Engineering & Technology Board (ETB), a national partnership to promote science, engineering and technology, held a meeting of key business leaders and academics at its headquarters in London to hear their views on a way forward to tackle the UK's growing skills problem in science, engineering and technology (SET).

Following recent research commissioned by ETB on how to build the future stock of top quality engineers, ETB continues to gain support from business, industry, education and Government for its new plans. The meeting was chaired by the Minister for Science and Innovation, Lord Sainsbury. He said: "I am impressed by the progress ETB has made so far. The UK's future competitiveness depends on us all working together to increase the contribution that engineering makes to the economy and society. I am very pleased that ETB is now tackling the practical issues that the industry and the profession need to address."

It is generally accepted that science, engineering and technology are crucial to wealth creation, with an estimated 2 million people working in the sector. The aim of the meeting was to clarify the extent and exact nature of the skills problem facing industry, what the likely impact is on the UK economy as a whole and to consider possible solutions.

Over 30 senior figures attended the meeting: Janice Shiner, Director General Lifelong Learning, Department for Education and Science (DfES); Martin Temple, Director General, Engineering Employers' Federation (EEF); Dr. Mike Sanderson, Chief Executive Officer, Engineering Manufacturers' Training Association (EMTA); Andy Scott, Director of International Competitiveness, Confederation of British Industry (CBI); and Dr Graham Spittle, Vice President, IBM; as well as representatives from education, including Dr. Geraldine Kenny-Wallace, Director of E-Learning and Strategy, City & Guilds of London Institute.

They considered what action needed to be taken to reverse the decline in those studying and practicing science, engineering and technology, and how best to promote a better understanding of the sector among the general public.

ETB Chairman, Sir Peter Williams, commented: "I am delighted that Lord Sainsbury has been able to chair this debate on the pressing issues which ETB has been specifically set-up to tackle head-on."

ETB Chief Executive Alan Clark said: "The only way we will be able to deliver where we have all collectively failed in the past, lies in the unique characteristic which is at the heart of our strategy. We will create a powerful platform to bring the SET community together, reflecting both its diversity and its common purpose, and build the ETB into an outward looking, dynamic force for change."

The meeting forms part of ETB's on going programme of forging links and engaging all sectors of business, industry, academia and the science and engineering professions to tackle the skills challenge. The outcome of the forum will contribute to the ETB's 'Blueprint for Action'. This is its plan for uniting the diverse science, engineering and technology communities to work together to ensure a continuous supply of engineering and technology skills for the UK, and to improve the public's understanding of the sector. The detailed plan will be unveiled towards the end of this year.

SOIL TESTING GUIDE

Forestry soil guide published

Knowing the soil they are working with is fundamental to foresters' success or failure – and a new field guide just published by the Forestry Commission is designed to help them identify soils for themselves. The guide, entitled 'The Identification of Soils for Forest Management', was launched at International Forest Fest at Lockerbie, South West Scotland, by the Commission's Chairman, Lord David Clark.

It was written by Dr Fiona Kennedy, a soil scientist with the Commission's Forest Research agency, and is designed to help foresters identify soils for themselves by working through a series of decision boxes. Lord Clark recalled that, thanks to its long and complex geological history, Britain's soils are very varied, and, in the 1960s the Forestry Commission developed a classification for British forest soils that has since become standard throughout British forestry. Commission staff have identified and mapped the soils on about half of the 800,000 hectares of forests and woodlands that they manage, and the soils in an appreciable area of private forests have also been identified and mapped.

"However, there remains a significant proportion which still needs mapping," Lord Clark said. "Knowledge of the type of soil in the forest is vital for a range of management options in modern forestry, including tree species choice, drainage and cultivation planning, remedial fertiliser applications, planning harvesting operations, and predicting windthrow.

"It is also important for managing woodland for biodiversity and conversion to continuous-cover forestry, so it is important that foresters and others have the ability, easily and unambiguously, to identify the soils in a particular forest or woodland. This new Forestry Commission field guide is intended to help in that process. Its purpose is to empower and give confidence to forestry practitioners across Britain to identify soils themselves. It also hopes to demystify some of the necessary terminology used in soil classification."

MORE INFORMATION

The guide costs £17, available from Forestry Commission Publications, P.O. Box 25, Wetherby, West Yorkshire, LS23 7EW. Tel: 0870 121 4180. Fax: 0870 121 4181. E-mail: forestry@twoten.press.net

ENVIRONMENT

Pesticides: the voluntary initiative

The Environment Agency welcomes the report from the Environmental Audit Committee's inquiry into the Pesticides Voluntary Initiative (VI), a programme of measures devised to minimise the environmental impact of pesticides as an alternative to a pesticides tax.

Environment Agency Pesticides Manager, Dr Andy Croxford, says, "The Environment Agency welcomes the efforts on the part of the Crop Protection Association (CPA) and the farming unions to introduce improved pesticide practice".

The Agency agrees with the majority of conclusions and recommendations contained in the Committee's inquiry report and in its identification of the following critical issues.

Implementation

The Agency agrees with the Committee that the Initiative needs more time to deliver its promises and that the coming year is critical to its success. All producers and users of crop protection chemicals have an important role to play in its implementation and the Agency agrees that further work is needed to ensure good levels of farmer take up. A review of progress should be carried out at the end of 2003.

Reduction in pesticide use

The Agency agrees that there is a lack of clarity on whether a reduction in pesticide use is an aim of the VI and agrees with the Committee that this should be cited as an aim alongside a requirement to reduce environmental risk and impact.

Indicators and targets

In its evidence, the Agency highlighted its concern that indicators and targets are still to be finalised and will continue to assist the signatories in this area.

Fiscal instruments

The Agency agrees that further work should be undertaken on designing fiscal instruments since they could have an important part to play and could provide, through hypothecation, far more resources than are currently available within the Initiative. The Agency would welcome further research by the Treasury and Defra to prepare for the introduction of practical proposals.

Pesticides strategy

The Agency is in agreement with the Committee that a mixture of instruments – voluntary, financial and regulatory – will be needed to maximise benefits to the environment whilst minimising costs to farmers, the agrochemical industry and regulators and that reliance on a single policy is unlikely to be successful.

Dr Croxford adds, "The Environment Agency will continue to provide advice on the implementation of the Pesticides Voluntary Initiative. If it delivers the anticipated improvements in farmer practice, it should provide environmental benefits such as reduced impacts on aquatic life. The Initiative provides an important opportunity for the crop protection and agriculture industries to demonstrate that they can control and manage their environmental impact".

MORE INFORMATION

Farmers can obtain additional environmental guidance by visiting www.environment-agency.gov.uk/business and following the 'agriculture' link. Agricultural small and medium sized enterprises (SMEs) can obtain information on environmental legislation by following the 'NetRegs' link on the Agency's homepage.

The full text of the Environmental Audit Committee's report is available online at www.parliament.uk/parliamentary_committees/environmental_audit_committee.cfm Copies can also be obtained from TSO outlets and from the Parliamentary Bookshop, 12 Bridge Street, Parliament Square, London SW1A 2JX. Tel: 020 7219 3890. Please quote House of Commons No. 100.

MEMBERSHIPS

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TALKING OF WALKING

Andy Carling

BIO NOTE

Andy Carling is an international specialist on the construction, care and maintenance of footpaths, trails and tracks. 'Sustainable Trails' is his trail management consultancy. 'Fernbank', Millan's Park, Ambleside, Cumbria, LA22 9AG. Tel: +44(0) 15394 32829 E-mail: andy.carling@virgin.net Web: www.sustainabletrails.org

Introduction

Drive along any road in the developing world and you will see many people using the road on foot, often walking for quite staggering distances with huge loads of fuel, water, goods or possessions. These people far outnumber those riding, driving or travelling as passengers; people just cannot afford any alternative.

The cost of travel in so many parts of the world is far too high for far too many people. As walking is their only solution, it is clear how important trails and footpaths are for the world's poorest and marginalised communities. Rural transport planners should recognise that people in these communities may only have two options for travel - the left leg and the right leg!

The world's trails are as old and diverse as humanity itself, providing a communications network linking people and communities. They enabled mankind to better exploit his natural environment, to extend the boundaries of his territory, to overcome his adversaries, to colonise new areas, to trade and barter. As well as facilitating trade some were developed to provide routes for pilgrimage or other spiritual purposes.

Many are thousands of years old but their use has often changed over time. Early trade routes such as Cumbria's bridleways are now recreational trails. Roman roads and other historical long distance pathways have become major highways. Some have been formed naturally through regular use over centuries, others in whole or in part have been constructed and it is interesting to note how similar are the methods used throughout the world.

Erosion

These paths need protection in the face of serious challenges, such as climate change, increased populations and road improvement projects. Road projects are included here because such projects, especially when tied into improving services, often place an additional burden on trail networks. The opening of the M6 motorway in the 1960s was a contributing factor to increased wear and tear on Cumberland fell paths and the same effect has been recorded in the developing world.

Some years ago in the Lake District National Park, the

National Trust was looking for a solution to these erosion problems. As the number of walkers and climbers increased, so did the erosion. The solution needed to be natural, fitting into the surrounding area as well as durable and requiring low maintenance. Instead of looking to the latest materials and modern civil engineering techniques, the ancient methods of path construction and repair from times gone by which used natural materials found on the mountainside were adapted to suit requirements.

By using and developing these old techniques, such as stone pitching, we could manufacture a hardwearing surface that required little maintenance. The approach is labour intensive but requires low material inputs. If certain approaches have been used for very long periods of time there is usually a reason – they actually work!

Having worked for over a decade on the Cumbrian fells repairing paths using and refining these techniques and having successfully found a solution to the problem in Cumbria it seemed only logical to consider whether these skills could be transferred for use in other parts of the world

In rural areas of developing countries useable road networks are usually very limited, even more so during the rainy seasons and the main transport network between communities is mostly made up of trails and footpaths. These paths are used for carrying goods and produce to and from markets, for accessing vital amenities such as schools, hospitals and government services and as a communications network for social interaction between families and communities.

In 1996, I was invited to undertake an assignment for the charity Farm Africa in Babati, Tanzania. During initial consultations after I arrived, the villagers explained their concerns about the erosion of the trails

A stone path built in Cumbria designed to withstand regular flooding (Photo: Andy Carling)

that served their village. These trails connected isolated settlements on top of the Rift escarpment with larger villages at the escarpment base. Also situated at the base were schools and a large hospital, the only one for many miles around. The trails to the hospital were vitally important because transport by road, taking a much longer route, was too expensive for most people.

The only non-Tanzanian involved and in order to make myself available to all sections of the community, I lived outside the 'Farm Africa' compound, in the centre of the village where work was to begin. This enabled people to get to know me and communicate with me in a friendly, sociable setting in their community.

The trails were certainly very eroded and the villagers listed the effects as:

- no access to the hospital during the rains
- dangerous for elderly walkers
- difficult to move produce either to buy or sell.

This finished path at Orrest Head in Cumbria has a hardwearing surface that carries over 100,000 people per annum; it has excellent revegetation, giving a natural appearance and was built in the same style as the Inca trail, Peru (Photo: Andy Carling)

We held a series of meetings with villagers and let them plan the work schedules, when we would work and who would do the work. They decided on rotating work groups to spread the training widely throughout the community, and minimise interference on the villagers other work commitments, such as their farms. I also spoke often with the village elders and traditional leaders. Their valuable advice and comments provided a historical and cultural context to the planned work.

I walked the trails on many occasions with villagers, where on-site discussions helped us to jointly work out an action plan to restore the trails. We examined various erosion control methods, both traditional and experimental. This was vital as the villagers knew what they wanted and I was able to learn what had previously been attempted and include the villagers' own ideas for recovering the trails.

Due to the approaches we used, relying on materials to hand, such as stone, wood, sisal plants *etc*, the only inputs required were a couple of spades and crowbars. As a result, the total cost for equipment and materials for the repair was only £15!

Shortly after the work was completed, the villages took the full force of the storms provoked by El Nino. The destruction was massive, with the area virtually cut off for six months; the journey to Arusha would normally take about five hours but during this period it took 2 - 3 days. Many bridges were destroyed with all rivers deepened and widened. There were several major landslides and much other environmental damage. The footpath work was virtually unaffected by this. The villagers at the escarpment base in Bermi credit the path repair work for halting any landslides or

Village meeting in Bermi, Tanzania to discuss the trail work; many meetings, formal like this one, and informal brought the whole community into the decision making and planning of the trail work (Photo: Andy Carling)

flooding which would have destroyed their homes and fields.

The hospital path remained in use throughout this period and many more people are now using the path to get to hospital saving the much longer alternative journey that involves walking along the road. As people can't afford the cost of public transport, they are even less likely to be able to afford to hire a vehicle to convey them to hospital. Therefore, the repaired path is enabling the poorest sections of the community to gain access to hospital facilities.

This has proved to be a fascinating and rewarding project and is an excellent example of how ancient footpath construction and repair techniques, adapted and updated on the fells in Cumbria, have been successfully applied to improve conditions for the rural poor in Africa.

We need to recognise that there are serious transport/access issues beyond the roadhead and that the world's trail network is vital to the enormous numbers of people who rely on it.

Let's keep talking about walking!

For further details about the Tanzanian project discussed in this article, see ww.sustainabletrails.org/tanzania.html For further information about Bermi in Tanzania see the website written and designed by the community at www.bermivillage.org

This article is based on a presentation at 'Access All Areas', the 2002 joint IAgrE/ICE/TAA seminar on rural access and mobility in developing countries and the paths, trails and roads that make it possible.

SUSTAINABLE ENERGY

Forestry commission leads pioneering wood fuel resource study

As part of the drive to promote sustainable energy, the Forestry Commission is leading a ground-breaking project that has just been launched to estimate the size of the wood fuel resource available from British forests. Partners in the project include Forest Research, Forest Enterprise, the Forestry Contracting Association and the forest industries.

Unlike fossil fuels such as coal, oil and gas, wood from sustainably grown forests can be burnt to generate heat and/or electricity without increasing the amount of carbon dioxide in the atmosphere, which contribute to climate change; the carbon released during combustion has already been taken up during the growth of the trees, a process the next generation of trees will repeat.

The study will examine the potential wood fuel resource from Forestry Commission forests in each of the Commission's Forest Districts, and apply harvesting and environmental constraints to give an actual wood fuel availability. These constraints will then be applied to private-sector forests. The study will also assess the wood fuel resource available from short rotation coppice, primary processors of timber and arboricultural operations.

This research will differ from previous studies in that all resource results will be linked to Forest Enterprise's forest database system to allow easier data interrogation. The ability to store and present the data in geographic information system (GIS) format is expected to provide improved information flows to potential end users.

Potential users of wood fuel will be able to access a website that will provide, at a glance, the wood fuel available from forestry and woodland, primary processors and arboricultural activities in each Forest District. Further information will then be available through consultation with the Forestry Commission, which will then be able to carry out detailed analysis and forecasting via the forest database system.

MORE INFORMATION

The project partners are keen to draw from any previous or current local resource studies that might benefit this study, and anyone with relevant information is invited to contact Ben Hudson at the Forestry Contracting Association. Tel: 01467 651368. E-mail: ben@fcauk.com

Bimonthly EARLY SPRING 2003

MEMBERSHIP MATTERS

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

THE BRITISH TRACTOR INDUSTRY –

A PERSPECTIVE FOR THE FUTURE OF DESIGN AND DEVELOPMENT ENGINEERS

At its height the British tractor industry produced about 320,000 tractors per annum and exported over 70%. Tractors were always part of the automotive industry because of the use of automotive components (engines, wheels, tyres, instruments, electrical items, gears, axles and steering systems, ***etc***.) as part of their design. Not only this, but BMC and Leyland plus Ford were in trucks, cars and tractors and farm tractors sold into over 90 countries.

Supporting the industry by R&D was the Silsoe Research Institute, which had adequate funding to at least try to help the industry. Today, the tractor industry is a shadow of its former self and Silsoe has about three people working in the tractor testing field!!

Within Great Britain, however, we have probably the best trained and certainly the best educated tractor design engineers and tractor development engineers. We also have some excellent farm-implement designers and developers with a vast amount of worldwide experience. The skills and knowledge of these 'Brits' were never more required in the world of tractors, especially for food production in developing countries. In China, India, Turkey, and former Soviet Union and S. American countries, there is a significant need for tractor design and engineering skills and for agricultural implement design engineers.

Whereas in-company decision-making is largely made in USA (Deere and AGCO) and Italy (New Holland-Fiat-Same-Deutz, Landini-McCormick), it is in Germany that the Munich University tractor laboratory has assisted Deere and AGCO-Fendt with new tractor technology and its development and especially with transmission development. Some transmission development has been in the centre of automotive technology, as tractors slowly bring themselves up to truck speed, truck safety and the operational standards normally associated with trucks. In Britain, however, this kind of development has only been conducted by HST Developments Ltd, (Trantor tractors) and JCB Ltd, (Fastrac Tractors). Except for these two innovative firms, tractor development has followed the changes in the leadership of the main tractor manufacturers and placed most, if not all, of the power of decision-making in the hands of engineers in USA and Italy and to a lesser extent Germany.

One of Britain's problems is that it has the people with the brains and the experience but few opportunities to work within the tractor industry. This is partially to do with cuts in R&D budgets and partly to the Foot and Mouth outbreak in particular, but the overall trend is a continuous decline in this kind of 'engineering manufacturing'. The problem is beginning to be serious. Some of the world's most experienced tractor researchers and engineers are now working outside, or on the fringes of the tractor industry and some have left the sector altogether. We must, therefore, if we are not to waste this knowledge and experience, find the means to use it and develop it.

A good starting point on a world scale, could be: 'Where are the skills most needed?' Food production is central to the development of poorer countries. Tractors and agricultural implements are vital matters concerned with food production to the immediate future of many of the poorest of the poor countries. Currently, Trade Partners, DEFRA, DIFID, DTI, and our agricultural research organisations have ***not*** found a way of bringing together the needs (as expressed in the minds of country experts overseas and, in particular, our aid advisors and export promoters) and the British resources best capable of satisfying those needs. Nowhere is this more true than in the case of India and China. In India, the indigenous tractor manufacturers are only ***just beginning to look*** at and relate design and export marketing. For 40 years, India's domestic market has been growing at a rate which all local manufacturers have tried to keep up with. That situation changed in 2001. Now, each of the main companies has found that they are not prepared or able to enter most export markets because the engineering specification of their tractors suits Punjab and Tamil Nadu but not Europe, Africa, ASEAN, Australia and over 100 different countries. ***continued overleaf***

Whilst China is a wholly different scenario, it is a fact that our DEFRA (MAFF) has been sending missions to China for some years. These reports indicate very significant interest in tractors and agricultural engineering equipment and Britain's response to that interest has been to largely ignore the potential. In China, the UK and British support programmes do not therefore address agricultural engineering needs properly, if at all. What is needed is a market research study relating to the strategic needs of China (and India) as reflected by population growth, food production and the mechanisation requirements to feed the growth!

The presence of the vast number of primitive tractor and rural transport vehicle (RTV) factories and the Chinese government's intention to upgrade them is surely an area of interest to us in Britain! One hundred and forty five (145) RTV factories making 4-wheeled RTV's is very considerable indeed and part of their very name 'rural' tells us something (see Bernard Stokes report for Financial Times) about technical requirements and specifications! Britain has never had more than a dozen tractor factories to make its 320,000 tractors (largest volume ever) and so 145 factories represents a very considerable number indeed!

If Britain is to be a force in the industrial world in future, 'Great Britain Ltd'., should be aware that it possesses some valuable assets (of an experienced software and services kind *i.e.*, brains, training and experience) that are much needed overseas and in particular in India, China, S. America and the Eastern Bloc.

Tractor engineers and farm implement engineers need to be part of Britain's technology transfer and software services industry. This sector needs to be organised and promoted, and British firms need to be involved but segregated as to those supplying services and those providing products for sale. The immediate need is to organise our marketing effort. We have to consider how to (i) market it and (ii) organise it in a manner which is pro-active and directs itself to the market.

Closing down tractor-making at Banner Lane, Coventry (after Meltham, Bradford, Bathgate, Fleet, and Hounslow) may have been forced on the tractor industry by US and Italian owners but it is up to 'Brits' to organise the expertise and marketing so that we can minimise the loss of these closures. Only by being pro-active can Britain retain its lead in tractor design, engineering and technology!

My reason for writing this note was originally to try to obtain support from within the Automotive Industry Innovation and Growth Team, under the chairmanship of Sir Ian Gibson. He gave the 2001 Sir John Cockcroft (Hovercraft) lecture at UMIST (where the world's first transport-first tractor originated). My request to him was to create a working-group with the objective of ensuring that the tractor industry is still perceived (by DTI and Trade Partners) as relevant to and still an important part of the *British Automotive Industry*. That time appears to have passed!

The way to develop and use Britain's professional tractor and agricultural engineers in the modern world now needs to be considered. Links with the Institution of Agricultural Engineers and members of the Agricultural Engineering Association (AEA) are essential, of course, but now is the time to formulate a strategic policy related to world needs and our professional aims.

G.A.B. Edwards, HST Developments Ltd
e-mail: trantor@btinternet.com

OBITUARY

WATTIE J WEST CBE

Wattie was born in September 1912 in the tiny village of Temple Guiting, deep in the Cotswolds. The son of a quarryman who found work as a farm labourer after being wounded in the Great War, Wattie shared a frugal family upbringing. Yet with encouragement from the village school headmaster, he was sent to Cheltenham Grammar School, travelling there by horse and cart and returning only at the end of term. How this was paid for, we don't know, but he became a talented soccer player and cricketer and an excellent student, gaining a scholarship at Cambridge to read Natural Sciences and to study Agricultural Science for a postgraduate diploma. Very much the boy from the country, he met a lot of snobbery at Cambridge, but with his sporting skills he was able to establish himself and make friends. However, he had left Lena Brain behind in Temple Guiting and he cycled the 80 miles back from Cambridge to see her! Lena used to say that they had an understanding: "I waited for him". They married in 1939. For 60 years, Lena was Wattie's loyal and caring wife.

Wattie was very patriotic and immediately volunteered when war broke out in 1939 but was rejected because he was in a reserved occupation, agriculture. During the war years, he worked for the Institute of Research in Agricultural Engineering in Oxford and then for the National Institute of Agricultural Engineering (NIAE) at Askam Bryan near York. His work involved hill land reclamation to satisfy the urgent need for increased food production, and animal husbandry. He also had the opportunity to tell the Toffs to grow Turnips in their lawns! It was this land reclamation work in Montgomeryshire that led to his life long interest in bracken eradication and the mechanisation if the potato crop. In 1946, Wattie was asked to move to Scotland to Howden House outside Edinburgh 'to set up from scratch the NIAE's Scottish Station'. He was the Director there until he retired in 1977. In 1961, the Station moved to a brand new site on the Bush Estate near Edinburgh as part of the Scottish Centre of Rural Economy. He was a Fellow of the Institution of Agricultural Engineers (one of the longest serving members); he was elected as a Fellow of the Royal Society of Edinburgh in recognition of the research work done by the Station; and, in 1974, he was awarded the CBE for his services to Agriculture.

Wattie loved sport all his life. He captained his final school year football first eleven and was unbeaten: played 16, won 16, goals for 101, goals against 14! He played for Norwich City as an amateur. On moving to Scotland he took up rough shooting, curling and fly fishing.

He was a keen and successful gardener. At Howden, all the family's vegetables were grown in the big, walled kitchen garden, with raspberries and strawberries in profusion in summer. Hens and (in the early years) pigs, featured as well. Eating his own produce gave him immense pride and pleasure. When he moved (reluctantly) to Charlbury, he spent his time gardening, fly fishing, walking

and reading the newspaper, but was still involved professionally with potato research. He brought to gardening the same precision and meticulous approach to everything he did. Rows had to be accurately measured so they were parallel to the edge of the garden; spacing of all vegetables had to be measured. When expanding his activities into a neighbour's garden, he was offered a spirit level when he was putting up his bean poles!

Wattie was a lover of the countryside, his walking stick being used to point out wild flowers whose botanical names he knew, bird's nests and sloes for sloe gin. He greatly admired a 'clean' crop in a field and tidy, neatly clipped hedges. A landscape of carefully tended and productive land gave him great pleasure. Wattie was a great respecter of legitimate authority - "the powers that be". He'd never park on a yellow line or overstay his time on a parking meter. On the other hand he also was very determined and stubborn. He fought his corner with the administrators in St Andrews House in Edinburgh to run the Station his way. He said any Director should be able to get his Governing Body to agree with his recommendations. You couldn't argue with him-"that's an end of it" he would say, and it was.

He died at the age of ninety in 2002.

FARM CARTS AND A RAILWAY COACH AT THE FORTH BRIDGE

A social evening at The Forts, South Queensferry, was described by Chairman Dave Howat, as extremely interesting and the most unique event ever held by the Scottish Branch. Our hosts were Allan and May Smith. Allan, an F Eng, was awarded the CBE in 1983 and retired five years ago from his post as Managing Director of Rosyth Royal Dockyard PLC.

We were shown twenty different Scottish farm carts brightly painted in traditional colours, all immaculately restored by Allan and kept in pristine condition. In the workshop, a luxurious cart was in the process of restoration and the major part of another awaiting rebuilding. Two of the wagons were made over 70 years ago by cartwrights Robert Brechin of Linlithgow. The builder's veterinary surgeon grandson Rob Brechin joined us for the evening. We admired a magnificent two-wheeled cart designed to carry a bull. The cost of the ash wood used in the restoration amounted to £1750.

A large fountain and pools containing kof (similar to very big goldfish) provided an excellent backdrop to the carts elegantly displayed on the spacious lawn.

In pride of place was a retirement present from colleagues. This was the redundant Superintendent's railway coach resting on a section of line. Formerly a railway carriage, it was cut in half and then used in the early part of the last century to transport VIP visitors around the dockyard.

The property is called 'The Forts' because in the First World War it was a military fortification. Two 4.5 inch guns were placed here, forming part of the defences for the Forth Bridge and Rosyth Dockyard. Stops were fitted to the guns to ensure they could not accidentally fire on the bridge. In the 1939-45 war, it was the centre for barrage balloons protecting the bridge. The party went down into the deep underground gun crew quarters and ammunition store. Not ideal living conditions but preferable to the front line in France.

The evening was completed with wine and refreshments, and rounded off with beautiful piano playing by Leanne, one of Allan and May's three daughter's.

Denis Welstead

SPONSORED STUDENT MEMBERSHIP

The following **Douglas Bomford Trust** sponsored Students have been admitted as Student members, from Harper Adams University College

D J Allison
N J Andrews
A E Baylis
T N Blaken
P J Brady
A Brown
P Brown
D E Bryan
I D Brydson
R J D Carter
D R Clark
D N Coates
R P Dando
A Davies
Arwel Davies
G Davies
D T Eastham
I L Evans
C J Frost
J P Gilbert
J T Gittins
R J Hoare
T N G Hocking
C P Hulme
J R James
T King
J P J Kingston
J W Kirk
A J Lang
J F Marshall Roberts
R W Marston
G A McKnight
R J Morton
B Murphy
M Naughton
W J Olley
G O'Neill
R G Orford
R Pennock
C M J Pinard
T W Reeve
J A Schofield
I G Seaborne
T L P Seabrook
T W Shakeshaft
R J Sharpe
D E Shenton
D S Spark
J P Stonehouse
D J Throup
R D Tibbs
M J Walker
M J Whitfield
D Williams
R O Wood
W A C Wood

LONG SERVICE CERTIFICATES

Name	*Grade*	*Date of anniversary*
35 years		
Nigel **Finch**	FIAgrE	11 Jan 2003
Paul Vernon **Hartley**	IEng MIAgrE	11 Jan 2003
John Noyes **Lawton**	IEng MIAgrE	11 Jan 2003
Colin Eric **Le Patourel**	IEng MIAgrE	11 Jan 2003
Stuart Wilson **Robertson**	IEng MIAgrE	11 Jan 2003
George Brian **Sanders**	MIAgrE	11 Jan 2003
Roger Michael Alan **Stevenson**	IEng MIAgrE	11 Jan 2003
Colin Michael **Arksey**	IEng MIAgrE	11 Jan 2003
William Denys **Basford**	MIAgrE	11 Jan 2003
Paul Hamilton **Baskerville**	IEng MIAgrE	11 Jan 2003
Robert Osborne Arthur **Drew**	MIAgrE	11 Jan 2003
Patrick Anthony **Inwood**	CEng FIAgrE	11 Jan 2003
Geoffrey **Osborne**	CEng MIAgrE	11 Jan 2003
John David **Shearing**	MIAgrE	11 Jan 2003
Geoffrey Roberts **Keevil**	IEng MIAgrE	11 Jan 2003
25 years		
John Alistair **Kay**	CEng FIAgrE	12 Jan 2003
John **Roddan**	CEng FIAgrE	12 Jan 2003
Paul Vincent **Dunham**	FIAgrE	12 Jan 2003
Malcolm Gilroy **Simpson**	EngTech MIAgrE	20 Jan 2003
John Robert Alderson **Colman**	IEng MIAgrE	20 Jan 2003
Thomas Martin **Agars**	IEng MIAgrE	20 Jan 2003
Edward Arthur **Burleigh**	AIAgrE	30 Jan 2003
Roger Michael **Weyman**	CEng MIAgrE	30 Jan 2003
Vernon Charles **Nott**	MIAgrE	20 Feb 2003

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PR3 0RY

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Bridgend
CF35 5LG

Reaseheath College
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Cheshire
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KA6 5HW

Sparsholt College
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Wiltshire College - Lackham
Lacock
Chippenham
Wiltshire
SN15 2NY

Writtle Agricultural College
Chelmsford
Essex
CM1 3RR

ENGINEERING CAREERS FAIR, OPEN DAY AND INDUSTRIAL LIAISON MEETING

TUESDAY 4TH MARCH 2003

Harper Adams University College holds an annual afternoon/evening careers event, which has proved very popular with both students and employers alike. This year, we are planning to make the event a careers fair with an open day and an Industrial Liaison meeting to cover the Engineering suite of courses and in particular Off-highway Engineering.

The aim of the day is to increase interest in engineering, and send a positive message to potential students that there is a future in engineering and associated industries, at all levels. The event is directed at young people, in the 16+ age range, who have shown an interest in engineering. We will target Technical and FE Colleges that run National Diploma courses in engineering and vehicle technology, so that they can bring their students along to see what potential there is for them. We will also invite potential students that have already expressed an interest in our courses and are listed on our databases.

Alongside your company's stand, where we seek your participation in talking to potential employees and showing potential students what engineering is all about, we are planning to provide a series of workshops. These workshops will allow individuals the opportunity to see first hand engineering principles being demonstrated so that they will understand more about our courses and engineering in general and how it might fit into their future, particularly if they are contemplating Higher Education.

Proposed 20 minute workshops from 11.30 to 16.00 h

Location	Description
Off-Road Course	Operation of Off-road Vehicles
Soil Hall	Tyres vs Track traction Demo
Mechatronics	Materials Testing
Workshops	Evaluating Engine Performance
Machinery Hall	Sprayer Demonstrations
Computer Room	CAD and Modelling Demo

Proposed visitor programme for day

Time	Activity
11.00 – 11.30	Arrival. Tea, Coffee, Drinks
11.30 – 12.00	Getting the most from the day
12.00 – 12.30	Options at 16 and 18.
12.30 – 13.00	What is HE all about
	What does HE expect from you
13.30 – 14.30	Lunch
14.30 – 15.00	What are the requirements of employers?
15.00 – 15.30	Options at 16 and 18
15.30 – 16.00	Funding Higher Education
16.00 – 16.30	Question and Answer Forum – Careers, Higher Education, Employers.
17.00	CLOSE

Stands for potential employers

'Fly the flag' in the Queen Mother Hall from 13.00 to 16.00 h.

Normally we would expect over 200 students or potential employees and, with this format, we expect to attract larger numbers. With your support, we can make it an effective and memorable day for all that attend. If you are able to contribute by having a stand at the event, demonstrating some of your equipment or making a presentation on your Company's capability, please get in touch.

CONTACT

Jim Loynes, Peter Darkins or Mark Kitson on Tel 01952 820280

ENGINEERING EDEN ENTHRALS SELL-OUT AUDIENCE

Another sell-out audience filled the Albert Hall in Nottingham on 4th December to hear the key players describe the engineering behind 2002's crowd-pulling visitor attraction, the award-winning Eden Project in St Austell, Cornwall.

This year's East Midlands Professional Engineering Institutions Joint Annual Prestige Lecture was sponsored by 12 engineering institutions, the largest number ever, joined by the Campaign to Promote Engineering, and for the first time by the East Midlands Development Agency. Following the tradition established by earlier Prestige Lectures, the presentation was by three of the key leaders of the project, Jolyon Brewis, of architects Nicholas Grimshaw & Partners, Alan Jones of civil & structural engineers Anthony Hunt Associates and Alastair Guthrie of mechanical & electrical engineers Ove Arup.

All the speakers' talks illuminated the massive act of faith required by the project team seeking to make a reality of the vision of entrepreneurs Tim Smit and Jonathan Ball, which resulted in the transformation of a sterile wasteland into 'one of the Seven Wonders of Britain'. And of the huge satisfaction of seeing the visitor numbers reaching some 2 million a year, four times those in the business plan accepted by the Millennium Commission and still rising. With well over 600 local jobs created compared with the 150 forecast.

Severe financial constraints ["the client had no money to buy the site"], challenging site conditions ["the former clay pit was riddled with areas with no load bearing capability"] and ["each time we looked at the site it had changed slope as the final reserves of clay were extracted"] and sudden crises ["take £8million (some 15%) out of the project cost immediately"] were all overcome. The team can be justifiably proud that despite these challenges the project was delivered ahead of time and within the agreed £58 million construction budget.

The audience were told how design of the structure, the visitor facilities and the climate control had all had to be adapted to these challenges, and yet still environmentally friendly systems had been engineered to provide services such as water and climate control. The team said it developed into a real 'design & build' project with contractors McAlpine with commitment and teamwork the keys to success. Significant use was made during the presentations of computer generated graphics to emphasise design elements and constructional challenges. It appeared at times that the audience were in fact on a space walk or similar. IAgrE members, coming from the agricultural industry, where 'plastics' often wrankle, found the use of an inflated polymer for the roofing element with a forecasted 25 year life challenging.

The audience were left in no doubt that while the Eden Project demonstrated how plants were the basis of all human life, these plants from around the world could thrive in Cornwall only through world-class innovative engineering.

Bill Basford
East Midlands Branch Information Officer

MEMBERSHIP CHANGES

Admissions

Fellow
P Bonfield (Hertfordshire)
K I Crews (Australia)
S Ward (Ireland)

Member
M J Blake (West Sussex)
D J Booth (Dorset)

Associate Member
D McGovern (Co Fermanagh)

Associate
G P Connolly (Co Derry)
M H A Ingram (North Somerset)

Readmission

G Newsome (Kent)

Deaths

S G Hanson (Cambridgeshire)
W J West (Oxford)

Transfers

Member
G J Bowen (Berkshire)

Associate Member
E T Askew (Cumbria)
J W Fulwood (South Yorkshire)
G W J Seddon (Powys)

Engineering Council Registrations

CEng
R A Boak (Shropshire)
M Sterling (West Midlands)

EngTech
T M Farrow (Lincolnshire)
C M Johnson (Cheshire)
C P Pitelen (Norfolk)

NEWS OF MEMBERS

Peter Waggitt has recently been elected to the Board of Chartered Professionals through the AusIMM in Australia. He will be one of the two environmental specialists vetting applications for Chartered Professional status in Australia and New Zealand. Peter is still Principal Environmental Scientist in the Australian Federal Government's Environmental Department, specialising in environmental issues in relation to the uranium mining industry in the 'Top End' – the far Northern Territory. The WNC is all located within the famous World Heritage Kakadu National Park. This adds a certain 'frisson' to the task especially when all the land is also Traditional Aboriginal Land! Any members visiting the Northern Territory are invited to contact Peter anytime, as follows: +61 (08) 8920 1120 or E-mail Peter.Waggitt@ea.gov.au

Tim Stacey has left Alvis Vehicles and is now working at McCormick Tractors.

Unfortunately, **John Quinton** has been forcibly liberated from his farm in Zimbabwe by Robert Mugabe and is now back in the UK after being absent for a decade. However, he seems to have emerged unscathed and says that it has been an interesting transition from Zimbabwean farmer to machinery supervisor for Glendale Grounds Management. Glendale Grounds Management is the green side of Parkwood Holdings plc, based out of Preston, Lancashire. The grounds management covers a variety of different aspects from council/borough contracts to golf course maintenance to the training and welfare of Defence Animals at Melton Mowbray. The contracts stretch from Sunderland to Maidstone and John's role is to supervise and control the running and maintenance of all the machinery and equipment on all sites around England. John says that his experience of running his own business and dealing with unqualified operators in Zimbabwe combined with his background in agricultural engineering made this sort of position a logical choice for him in this transitional stage of his life. Hopefully, he will gain experience in the contracting business which may lead on to greater things in the future!

Marcus Oliver has left Silsoe and has started a job with CNH.

Professor **Ralph E H Sims** who is now Director of the Centre for Energy Research at Massey University, Palmerston North, New Zealand was pleased to read about the progress with biodiesel in Eire [see Landwards 57(6)]. He has just entered a VW Golf in the Energy Wise Rally (see **www.energywiserally.org.nz**) which was designed to show the fuel efficiency of new cars. There were 36 entries - and the Golf (a gimmick entry on 100% methyl rapeseed esters the team made in the lab) completed the 1500 km at 84 km/h and 4.7 l/100 km beating even two of the hybrids! They won the Environmental Award for lowest greenhouse gas emissions (of course!). VW were VERY supportive.

Biodiesel Massey team with Ralph Sims in the centre

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

Agricultural sector urged to act now to avoid being left out in the cold this winter

Action Energy is calling for the agricultural sector to act now to reduce their energy bills. Winter is the time when energy costs tend to soar, but it doesn't have to be like that this year! Simply by calling 0800 58 57 94 and requesting a free energy survey*, farmers can act now to start saving money and become more energy efficient. Action Energy is a government-backed initiative that provides free, practical and impartial help and advice on implementing energy efficiency measures, so there's no excuse for not taking action.

Every year £12 billion-worth of energy is wasted in the UK. Some of this money, which equates to 30% of the UK's energy consumption, could be saved if organisations focussed on their own energy use. Action Energy has already helped thousands of organisations reduce their energy bills by up to 20%, using a wide range of energy efficiency techniques, many of which involve little or no cost. Action Energy services available for the agricultural buildings sector include information, advice and publications.

Most of the energy used in the agriculture sector is in greenhouses and pig/poultry production. Large amounts of heating, lighting and ventilation are used, costing money and contributing to global warming. Although energy may not represent a high proportion of company turnover, a 20% saving in energy costs can represent a 5% increase in sales.

Act Now with Action Energy's no cost and low cost top tips for winter energy efficiency:

- Reduce air leakage in greenhouses.
- Ensure boilers and heaters are correctly maintained.
- Ensure temperature controls are effective and set correctly.
- Dirty glass reduces the free natural light and heat from the sun.
- Use fans to evenly distribute air around the greenhouse, reducing temperature gradients.
- Ensure lighting equipment is cleaned regularly to maximise lighting efficiency.
- Replace tungsten lamps with energy efficient lighting.
- If climate control systems are in use, ensure they are regularly maintained and used effectively.
- Ensure minimum ventilation rates are used during the winter period.
- Dirty fans can reduce ventilation efficiency by 60%.
- If large amounts of hot water are required, heat over night to take advantage of cheap, night-rate electricity.
- Ensure insulation levels meet the required minimum.
- Use thermal screens to maximise energy use in the greenhouse.
- Call Action Energy on 0800 58 57 94 for a starter pack* or to arrange an energy survey* or visit the website at www.actionenergy.org.uk

Action Energy was introduced by the Carbon Trust to help businesses and the public sector cut energy costs through the provision of free, impartial advice and assistance. Action Energy is ready and waiting for UK organisations to call for professional advice on 0800 58 57 94. The benefits to UK organisations of adopting energy efficient measures are threefold:

- every £ you save goes straight to the bottom line
- saving money makes you more competitive
- energy efficiency is good for business and is good for the environment

Action Energy's services include a free helpline providing expert, impartial advice, online information at www.actionenergy.org.uk and publications on energy saving measures across a wide spectrum of industries. Action Energy also provides free onsite energy surveys* to identify opportunities for energy savings, interest-free Energy Loans of between £5,000 and £50,000 for small and medium-sized companies in England and Wales, which builds on the success of similar schemes operating in Scotland and Northern Ireland. The Carbon Trust also administers the Enhanced Capital Allowance Scheme, a tax relief that permits businesses to deduct 100% of their capital expenditure on designated energy-saving plant and machinery against their taxable profits.

Industry Specific Services Available

Advisory groups have been set-up within the Horticulture, Pigs and Poultry sub-sectors.

** Subject to availability*

DESIGNS FOR PIGS: FEET AND FOOD

Jamie Robertson

Introduction

Our farrowing systems produce foot and leg lesions in more than 90% of piglets (Leonard *et al.*, 1996). More than 30% of sows are culled for foot and leg problems (Taylor, 1995). Current research by the University of Aberdeen on UK pig farms is finding that poor flooring, old and new, is a significant factor in health and productivity losses on some farms.

Feed is definitely the most important variable cost in pig production, but food wastage ranges between 3% and more than 10%.

The industry scrapes along on low margins, but does not apply current design knowledge to save substantial costs. This article will mention some of the costs of poor livestock pen facilities, highlight known positive design factors, and suggest further contributions from the design engineer.

The discussion uses pigs as the example species, but the concepts are equally applicable to cattle.

Floors - design criteria

There is clear guidance in both design and philosophy on the construction and maintenance of livestock flooring. For example, BS5502: Part 42 (Code of practice for design and construction of pig buildings) states that 'all buildings should be designed, constructed and maintained so as to avoid discomfort, distress and injury to the pigs'. The evidence from scientific studies and practical experience is that that we fall well short of these criteria. BS5502 should be a baseline for the whole industry.

Design/manufacturing problems

It is highly probable that the agricultural industry does not recognise the severity of the livestock environment. The European guideline (CEN TC 229) for precast slatted floors requires that the concrete mixture used for slats must meet the requirements of exposure class XA 3, for 'Highly aggressive chemical environments'. The chemical combination of faeces and urine (Table 1), feedstuffs (organic acids, fatty acids and enzymes) and cleaning chemicals (high/low pH, corrosive sodium or ammonium salts) can cause rapid deterioration in poorly specified flooring.

The physical requirements of flooring are similarly demanding. There is a need for durability, comfort, and hygiene. The design brief for a farrowing house floor would attempt to meet the following diverse criteria:

- support for 250 kg sow; contact area with floor 10 - 20% of total body surface
- foot support with a load area of less than 80 cm2
- floor resistance to give adequate traction during getting up/lying down
- sufficient void for passage of high dry matter faeces
- thermal comfort to 20°C
- rapid surface cleaning down to microbiological level

and for the piglet:

- thermal comfort to 30°C
- low abrasive capacity yet with adequate grip
- slot width not more than 10 mm; 15 mm after 15 days of age.

The design conflicts are obvious. In practice, foot and leg lesions are very variable but significant, thermal comfort is compromised and hygiene can suffer. However, studies of mechanical damage and also behaviour in pigs can give guidance. Younger pigs preferred plastic coated metal to metal 'Tri-bar' flooring (Christian & Rhodes, 1990) and whilst various surface coatings have been tested, other experiments indicate that good quality concrete is well accepted, durable, and low cost (Phillips *et al.*, 1996). Concrete must be left to cure completely as green concrete can cause significant lesions on knees and teats.

Straw versus slats

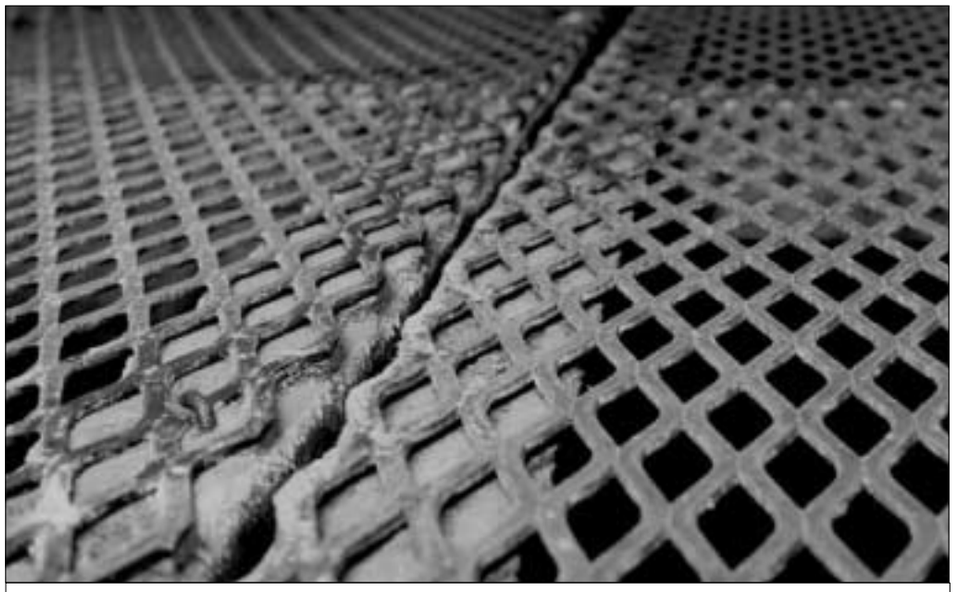
It is unfortunate that much of the debate concerning flooring for pigs has focussed on the relative merits of slats versus straw.

The scientific literature in

this area is convincing in one area; poor design. Installation and/or maintenance of the floor type, for slats or straw, are more important than the type of system.

The suggestion that fully slatted systems are intrinsically more hygienic than straw based flooring is not supported by the literature, whilst the relative merits of straw, in terms of thermal and physical comfort can, on occasion, be offset by poor drainage or high dust and mycotoxin concentrations. Good design and implementation are essential for all types of flooring.

There are adequate recommendations for the geometry and tolerances of slats in BS5502: Part 51, including the dimensions of void areas suitable for different ages of pigs. Experience to date is that manufacturing is improving primarily due to casting techniques but there is still significant sub-standard material produced. What is needed is a desire to improve the situation, to apply current knowledge.



Quality of floor design and installation can be poor (Photo: Jamie Robertson)

BIO NOTE

This paper was presented at the IAgrE Annual Conference entitled 'Faster by Design' and held at Harper Adams University College on 15 May 2002. Jamie Robertson, MIAgrE is the Livestock Projects Manager at the University of Aberdeen, with more than 20 years experience working with livestock systems and environment. Mr Robertson has worked on livestock development and training programmes in countries such as Switzerland, Nepal, Greece and Poland. He has also worked for the Commission of Agricultural Engineering (CIGR) for 10 years and the Scottish Agricultural College (SAC) Aberdeen on research relating to animal housing and production impact associated with the designed environment.

Table 1 Chemical composition of liquid manure from fattening pigs (Hoeksma, 1988)

Chemical component	*Composition, g/l*
Nitrogen (N-Kj)	4.3 – 11.5
Ammonium (NH_4-N)	1.3 – 5.5
Phosphate (P_2O_5)	3.6 – 6.6
K_2O	2.0 – 6.1
CaO	2.4 – 4.4
MgO	0.6 – 2.0
Cl^-	0.6 – 3.3
SO_4^+	1.0 – 2.0
Acetic acid	3.2 – 11.0
Proprionic acid	0.7 – 3.0
pH	7.3 – 8.6
Dry matter, % m/m	4.0 - 11.0

Floors and environment

Flooring design has a direct influence on concentrations of ammonia. Pigs are adverse to ammonia, and the gas has a positive correlation with the severity of chronic respiratory disease. Airborne concentrations of ammonia are increased when the exposed area of excreta is high. Thus drainage is important and also the area of void in slatted floors. There is clear evidence that part slatted floors, correctly installed, contribute to low ammonia emissions (Aarnink, 1997). The introduction of spacers between slats and the pen wall can reduce the build up of faeces in a pen, and significantly reduce airborne ammonia. Attention to flooring detail should be a major aspect of the current deliberations on Integrated Pollution Prevention and Control (IPPC) regulations.

Floors and behaviour

Non-slip flooring is a design requirement to provide not only safety but to promote confidence in animals' behaviour. In theory non-slip flooring is also a legal requirement for workplace safety, where the agricultural industry has a poor record.

The impact of flooring on the airborne environment relates back to the animal not only through health and mechanical damage but also behaviour. Poor air quality will reduce comfort and increase irritable behaviours and can be a factor in the stimulation of vices such as tail and flank biting.

The barren environment of some pen designs appears to impact on the resting behaviour of pigs. Modern fully slatted pens with plastic flooring provide an environment with very little stimulus for the pigs, and animals are easily startled. The noise output created by pigs on plastic floors can be considerable, adding to the environmental stressors.

Floors – UK inventory

Few floors will remain unchanged over time. Between 60 and 70% of pig accommodation is more than 10 years old (Baldwin, 1996), yet De Belie (1997) has demonstrated that concrete floors can show deterioration in front of wet feeders after as little as nine months use. It is therefore to be expected that floors in UK pig farms need substantial upgrading. Nonstad (1997) examined existing flooring in diary herds and provides conclusions that are probably equally relevant to the pig industry.

- There is an obvious relationship between concrete quality and durability.

Straw gives good design comfort but produces dust and mycotoxins (Photo: Jamie Robertson)

- Floor slats produced in the last 10 years are of lower average quality than older slats.
- The average damage score of slats is too high at 2.6 (1 = very serious, 5 = little damage).
- A great number of slats are damaged to a degree that represents a security risk to the stock.
- Floor slats are found that are satisfactory, even when old.
- Cracks were found across the length of almost all floor slats - probably caused by dynamic loads and damage during transport - with cracks speeding up the rate of deterioration.

The second point, above, underlines the need for more stringent application of guidance and the general picture is one that suggests greater care and attention is needed at all stages of design, manufacturing and use.

Feeder design

The link between feeders and floors starts as soon as feed is added to a system. Feed spillage contributes significantly to concrete decomposition, whilst wet feeds can increase floor contamination and thereby influence the slippery nature of the floor.

The non-slip nature of flooring can have a significant influence on feet problems and in the current research on pig health carried out by the University of Aberdeen slippery flooring is seen to contribute to significant reproductive losses in dry sows. The design features to reduce losses include head or shoulder partitions on feeders, which reduce both food wastage and aggression.

The value of head and shoulder partitions on feeders has been adequately described in the past. Baxter (1989) carried out a series of experiments aimed at designing pig feeders by observation of pig dimensions and behaviour. The work showed reduction in aggression using head, and head and shoulder barriers of 60% and almost 100% respectively. The head barrier reduced food wastage to 1% of intake, compared with typical losses from conventional ad-lib feeders of more than 5%.

Today, the design, construction and use of feeders follow a familiar pattern. A number of features associated with the feeder that evolved from Baxter's work were copied, such as the basic design of the head and shoulder barriers. In time even some of this detail has disappeared, leaving the industry with a legacy of low-capital but high variable cost feeders literally throwing money, as feed, down the drain. A number of new designs have reached the marketplace that have tackled food wastage and cleanliness but there is still a job to be done to convince the production sector to invest in well designed feeders.

Design support for the livestock industry

Design standards could address maintenance as a priority, on the basis that most flooring will not be replaced immediately. The industry and animal welfare, would benefit greatly from impartial studies and information on how to re-screed floors. Guidance on how to determine physical characteristics that impact on health and productivity (*i.e.* a roughness score) would assist decision making.

Current knowledge could be applied during the commissioning process of buildings. The process of obtaining building warrant focuses quite correctly on structural competence, and as a result building failures are few. Or are they? The literature provides evidence of substantial damage to pigs from inadequate

Airborne concentration of ammonia is increased when the exposed area of excreta is high so the area of void in slatted floors is important but is a compromise with feet support area (Photo: Jamie Robertson)

flooring, yet the assessment of new buildings ignores that part of the structure, the floor, that is in contact with the stock for 100% of time.

Feeders present the designer with a marketing challenge first and foremost. Many farm products are sold on performance data; why not the designer feeder?

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SAFETY TECHNIQUES

Avoiding accidents with top-handled chainsaws

Determining safe working methods that minimise the risk of injury when using top-handled chainsaws up trees is the aim of a new research report published recently by the Health and Safety Executive (HSE).

Adrian Hodkinson, HSE Inspector, said: "Too often arborists working from a rope and harness take the short cut of using these saws one-handed instead of finding a secure work position which allows them to hold both handles on the machine. One-handed use leaves the operator at greater risk of injury as they have less control over the saw. In two recent accidents, operators narrowly escaped being killed when their top-handled chainsaws kicked-back into their necks. In both incidences the saw was being used one-handed."

To date HSE's policy has been to contribute to the safe design of top-handled chainsaws through the ISO/CEN standard 11681-2:1998; to restrict their use to competent, trained operators and to confine them to off-ground work in trees. This new report builds on the work of the Forestry & Arboriculture Safety & Training Council (FASTCo) which has been active in promoting specific training in the correct use of this type of chainsaw and has produced operational guidance in the form of FASTCo Safety Guide 308.

The report demonstrates techniques which allow the operator to hold the saw with both hands in a variety of trees and work situations. Detailed photographs and diagrams are included to illustrate these practices.

The report concludes that the answer to the safe use of top-handled chainsaws in all circumstances is to ensure that comprehensive and up-to date training is provided to operatives by qualified and experienced instructors. In this study the competencies the trainers need to assimilate and pass on to their trainees are amply demonstrated.

MORE INFORMATION

Copies of Safe working methods with top-handled chainsaws (CRR 402/2001), ISBN 0-7176-2249-5, price £15, are available from HSE Books, PO Box 1999, Sudbury, Suffolk, C010 2WA. Tel: 01787 881165. Fax: 01787 313995.

Book Reviews

How to see the wood for the trees

The Law of Trees, Forests and Hedgerows
Author: Charles Mynors
Publisher: Sweet & Maxwells
020 7393 7620

The disparate body of law governing the important and often emotive subject of trees and hedges is brought together for the first time in nearly 100 years in a new book from Sweet & Maxwell. ***The Law of Trees, Forests and Hedgerows*** is the only in-depth, specialist text encompassing all aspects of the complexities of tree law, including that relating to the scourge of residential neighbourhoods, the prolifically growing Leylandii.

The recent case of Mr and Mrs Girling, who were imprisoned for cutting down a 25ft high hedge between their house and their neighbours' land, is just one of many examples of the legal controversy trees and hedges can cause.

Trees are unique in law. They take years to create, but only a few minutes to destroy. They are part of the land on which they were planted, but often encroach onto adjoining land where they can cause considerable damage. On the other hand, many people are keen to protect them. Consequently they have become subject to a unique legal framework, which is now an uncoordinated mixture of private and public law; common law and statute.

The original concern over who owned the rights to exploit trees as an economic resource has gradually shifted over the centuries to issues related to unsafe trees and those on boundaries and overhanging highways. Additionally, there are increasing ecological and environmental concerns; and new laws protect important trees and hedgerows, as well as those that provide a habitat for wildlife.

However, it is not just individual trees which can become the subject of litigation. The law relating to commercial forestry is also covered in the new publication.

Charles Mynors, the author, says: "Cases involving trees and hedges have increased in recent years, and can be hugely emotive for those involved. And Parliament has frequently intervened, with badly drafted legislation aimed at giving them some protection. Unfortunately, until now there has been a complete absence of publications to guide people through the maze which this area of the law has become."

The book is relevant to everybody whose work brings them into contact with trees and hedges, including:

- lawyers
- local authorities
- landowners
- surveyors and architects
- planners
- highway engineers
- arboricultural consultants, landscape architects and foresters

Sir Ghillean Prance, former Director of Kew Gardens, writes in the foreword: "This is not just a history of cases, but a book that is full of good practical advice. Read it, and you might avoid a lot of unnecessary litigation."

Key cases dealt with in the publication include:

- ***Hurst v Hampshire CC***, which finally settled the long-running debate of who owns trees growing on a highway.
- ***Delaware Mansions v Westminster CC***, which concerned a street tree whose roots were alleged to be harming the foundations of a nearby mansion block.

The author, Charles Mynors, FRTPI, MRICS, IHBC, Barrister, was in local government for nine years and is now a practitioner at the Bar, specialising in planning and environmental law. He has written other very successful books, including ***Listed Buildings, Conservation Areas and Monuments (3rd*** edition) (Sweet & Maxwell), as well as numerous articles in professional journals. He is a regular lecturer at professional conferences; and is Chancellor of the Diocese of Worcester.

Agricultural Vehicles on the Road

Mike Braithwaite has updated this important practical guide for those people dealing with the complexities of agricultural vehicle use on the public highway.

As is an attempt to provide an understanding of the law as it applies to the use of such vehicles when taken on to the highway, it certainly succeeds. But as Mike says in the Introduction, it should be remembered that reference must always be made to the relevant Acts and Regulations dealing with this subject as only they have the force of law and it is only the Courts who can authoritatively interpret the law.

Nonetheless, this is a useful and informative document and includes a comprehensive list of sections including:

- Carriage of Dangerous Substances
- Driver Training Regulations
- Safety of Children
- Lifting Operations and Lifting Equipment Regulations
- High Speed Agricultural Motor Vehicles

Of necessity, legislation in this area is dynamic and is affected by Act of Parliament amendments or High Court decisions. As this book is now published in a loose-leaf ring bound format, Mike is providing an updating service.

Priced at only £15 including p&p and the updating service, this publication is good value and a "must" for all those involved with the movement of agricultural vehicles and equipment on the Queen's highway.

For further details, contact Mike direct:
e-mail: **mike@t-lawman.demon.co.uk**
tel: **01430 431480**

CRW

Meat Processing: Improving Quality

Edited by Joseph Kerry, John Kerry and David Ledward.
Woodhead Publishing Ltd, Cambridge
Price: £135/US$210/ 210
ISBN 1 85573 583 0

This is a new book reviewing the latest research on what defines and determines meat quality and how it can be measured and then maintained or improved during processing. This book focuses on beef, lamb and pork although many

chapters will be applicable to poultry. A similar book covering poultry is, I understand, in preparation.

Engineers are increasingly becoming involved in meat production and with it ways to improve quality. Not only do the designs of handling, transporting and processing equipment need constant improvement but also techniques such as real time feedback, modelling and decontamination will be applied to consistently improve the product quality.

"Part III New techniques for improving quality" is where I suspect most engineers will start, choosing the chapters that match their interests be it modelling of beef cattle production, automated meat processing or new techniques for analysing meat. Each chapter is written by an expert in that specific field and conveniently there is a section at the end of each chapter on "Future Trends" to indicate where future work is leading or is needed. For those in need of more detailed information "References" are always included and there is often a "Further Reading" section.

"Part II Measuring Quality" is obviously of great importance to describe what can be measured at the moment. Although many of these techniques are used in research few are used in abattoirs, and certainly rarely are they used for on-line monitoring. Swatland in his chapter explains what could be used and why it isn't. Quality is generally considered throughout this book as "potential eating quality" but there is a chapter in this section on microbiological hazards, which includes a mention of BSE.

"Part I Analysing meat quality" predominantly covers meat science with chapters on the factors affecting the quality of raw meat, the nutritional aspects, fat content, ***etc***. The chapters in Parts II and III discuss how to measure quality attributes whereas Part I very much covers which attributes could need measuring and why.

Finally Chapter 2 "Defining meat quality" is worth skimming as it discusses the quality attributes used by the different bodies along the meat chain. I have had several multi-disciplinary discussions on "quality" and found that it is surprisingly hard to define but this chapter will certainly help in future.

For any engineer involved in some aspect of red meat production and needing to consider how to measure and improve quality this book will either provide the answer, or point you in the direction, even if, like me, you start at the back and work towards the front! It is certainly a useful book as shown by the number of times it was borrowed by colleagues while being reviewed.

DBT

TRANSPORT EFFICIENCY

Efforts to ease timber transport win Minister's praise

Scotland's forestry and timber transport industries were congratulated by Forestry Minister Allan Wilson for their efforts to find solutions to timber transport issues. Speaking to a conference of the Timber Transport Forum in Dunblane, Mr Wilson said, "We all want to help maximise forestry's contribution to rural development by ensuring efficient transport of timber from forest to mill and at the same time to minimise the impact of haulage on rural communities. "I am very grateful to those people and organisations that are willing to become so involved in helping the whole industry. "Among the efforts to provide solutions to timber transport issues in many parts of Scotland are:

- the use of sea and rail transport where possible as alternatives to road transport;
- the use of forestry and estate roads where possible as alternatives to fragile public roads in rural areas;
- working with local authorities to identify public roads that need to be used for timber transport, and when, so that road maintenance and upgrading programmes can be budgeted and scheduled accordingly;
- the formation of timber transport groups in several parts of Scotland to bring together the forest industries, hauliers, local authorities, the Forestry Commission and Scottish Executive to seek local solutions transport issues; and
- the appointment of a Finnish timber haulage expert, Tore Hognas, as the Forum's project officer to advise it and take its work forward on a day-to-day basis.

"The many timber transport groups across Scotland are working well," Mr Wilson added. "They are producing innovative solutions to transport problems and they are learning from one another's experiences. I understand that the Welsh have set up their own Timber Transport Group, modelled on Scottish experience.

"I know that the contacts your industry has across Europe and beyond are also helping to add to our understanding of the issues and possible solutions. The appointment of a Finnish timber transport expert as your first project officer demonstrates your willingness to listen and learn."

He recalled that the Executive had doubled the resources available to freight facilities grants over the three years from 2001 to 2004 to £36 million.

It had also awarded Scottish councils £70 million during the period to 2004 to tackle the backlog of repairs to local roads and bridges, "and an extra £20 million in grant was awarded in the 2001–2002 financial year to further speed up maintenance activity on local roads".

As new forests established since the 1960s mature and are harvested, Scotland's timber output is going to gradually increase to double its current level of about 5 million tonnes over the next 20 years. In some parts of Scotland this will require improvements, and alternatives, to roads, bridges and other transport infrastructure.

COMMUNICATIONS

France Telecom launch a new mobile broadband satellite transmission service

France Telecom have introduced a mobile broadband satellite transmission service: the Regional BGAN. Regional BGAN is an ideal solution for international organisations and professionals in construction, mining, the oil and gas industries, transport, agriculture, tourism, national government organisations (NGOs), finance and the media, needing to connect to their corporate networks quickly and reliably. At the same time, the service offers developing countries a cost-effective entry into the Internet age.

Regional-BGAN is the latest innovation in data services from Inmarsat, the world's leading global mobile satellite communications provider. It marks a very important stage in the evolution of its data services portfolio, as the service enables the user to access Internet or a corporate Intranet and to transmit huge volumes of data more than twice as fast as current terrestrial GPRS mobile services, at 144 kbit/s under a shared channel.

Regional-BGAN meets a strong market demand, since at present almost 20% of France Telecom revenues in mobile satellite services is for data transmission uses.

In today's fast-paced business environment, permanent access to information in remote places where no internet service provider (ISP) data network is available is often critical for organising work and for decision-making, and this applies to many different sectors. Regional-BGAN is a reliable, cost-effective and high-speed data solution addressing the need for freedom and flexibility of itinerant workers: it allows them to receive or send business information even in the most remote locations not covered by traditional land or mobile networks. Regional-BGAN is available across the Middle East, North Africa, Western and Eastern Europe, large parts of the Commonwealth of Independent States (CIS) and the Indian sub-continent, which represent a total of 99 countries.

The fastest and most reliable packet mode data solution on the market

The service is operated via a lightweight (less than 1.5 kg – 24 x 30 x 4.3 cm) portable terminal, which acts as a satellite ISP modem and delivers high-speed ISP connectivity across a 144 kbit/s shared channel. It ensures:

- always-on communication – access to information just as if the user was sitting in his office, with the terminal having a 1 hour charge in connection mode and 36 hours in sleep mode;
- ease of use – the modem is simple to operate and has a rapid Plug and Play capacity with PCs (Bluetooth, USB or Ethernet interface connectivity) compatible with Windows 98SE/ 2000/ NT4.0/ XP and Mac OS X;
- reliability – consistent high-quality access to IP-based networks including the Internet and critical corporate data networks; and
- affordability – users are charged only for the amount of data sent and received and not for the time connected.

A wide range of services

In February 2002, thanks to its strong position on the land market and its presence in all existing Inmarsat land market segments (government, NGO, media, oil & gas, construction and mining), France Telecom was selected by Inmarsat as the pilot operator to test and promote Regional-BGAN. During this pilot step, France Telecom has developed a large range of services, specifically adapted for IP and data traffic. All these services are hosted on a France Telecom dedicated service platform:

- internet & web access
- e-mail and multimedia messaging
- file transfer
- access to corporate a local area network (LAN) and Intranet
- traffic control and monitoring tools to define authorised transmissions and optimise costs
- creation of a virtual private network (VPN) solution with full access to the headquarters corporate network (dedicated and secure links)
- regional-BGAN is a particularly economic solution: the price of a communication will be approximately 15 dollars per Mbyte and the dedicated terminal is sold at less than 2000 dollars.

France Telecom Mobile Satellite Communications

France Telecom Mobile Satellite Communications is a France Telecom subsidiary marketing mobile satellite services (Inmarsat, Thuraya, Iridium). France Telecom Mobile Satellite Communications has a highly active distribution network abroad (100 distributors), and holds three subsidiaries (GloCall in the Netherlands, France Telecom Mobile Satellite Communications Gmbh in Germany and TDCom in France). The business clientele has a strong proportion of customers in the maritime, media and NGO, security, construction, oil & gas and transportation sectors. In 2001, France Telecom Mobile Satellite Communications Inmarsat activities accounted for sales of 111 million euros (an increase of 13% over 2000), handling 46 million minutes of communications.

France Telecom Mobile Satellite Communications is the third largest Inmarsat operator in the world with a market share of more than 20%.

Inmarsat

Inmarsat is the leading global satellite mobile communications network for professionals, who need to be able to communicate from anywhere in the world, and particularly from areas where there is no fixed or mobile telecommunications infrastructure.

Implemented in 1982, the Inmarsat satellite mobile communications system currently encompasses 84 member countries. The Inmarsat network is accessible on land, sea, or in the air, thanks to four geo-stationary satellites (plus five backup satellites) situated 36,000 km above the equator, each covering a section of the globe: East Atlantic Ocean, Indian Ocean, Pacific Ocean, and West Atlantic Ocean. The number of satellite mobile service customers is approximately 270,000 worldwide.

MORE INFORMATION

For more information, visit the websites www.francetelecom-mobilesat.com and www.inmarsat.com

FOOD PROCESSING

Strawberry fields forever

A Ross on Wye farming partnership has been awarded a government grant to expand its soft fruit business with cutting edge technology, making it one of only four of its kind in the UK.

E C Drummond & Son of Homme Farm, Hom Green, has received funding of over £60,000 from DEFRA's Processing and Marketing Grant to help develop 'Hartleton Fruit', a partnership initiative to grow, pack and sell strawberries and raspberries to supermarkets and other retailers.

The DEFRA grant has helped fund a cooling and automatic weighing and packing facility for soft fruit. Previously the business employed a third party to pack the fruit, adding to the cost and creating a delay in packing which led to a reduction in quality. The new system means fruit is cooled within half an hour of picking and packed on the same day, improving its shelf life by around two days.

Eric Drummond of E C Drummond said: "We are delighted with the help from DEFRA which has enabled us to put an exciting partnership project into practice. The improved accuracy and efficiency of the new facility means that we are expecting to increase our turnover by 100% in the next year and hoping to become the leading soft fruit growing group in Herefordshire within three years. We are committed to building a concern that is creating jobs and delivering a high quality product direct to retailers."

Steve Bellingham, DEFRA Project Officer, said: "This project is an excellent example of the way the Processing and Marketing Grant benefits producers by adding value to their produce in a demanding market place, but also brings advantages to the local community and the wider rural economy. We wish them every success."

MORE INFORMATION

For further information on the Processing and Marketing Grant, or any of the schemes under the England Rural Development Programme, contact your local Defra Rural Development Service office or visit the website at www.defra.gov.u/erdp/erdphome.htm

EQUAL OPPORTUNITIES

Do left-handers have a choice?

The International Left-handers Club launched their survey on Left-handers Day, 13 August 2002, to find out more about the advantages and disadvantages left-handers face in various jobs and other groups and whether being left-handed influences the career choices people make.

The Club received just over 1,500 completed surveys in the first two months and have now completed the initial analysis of the results so far.

- 91% of those who completed the survey were left-handed and 60% were female.
- 16% thought that left-handers have advantages in their area of work, but 31% thought they had disadvantages.
- 34% thought there were more than the average 1 in 10 left-handers in their work group, while 39% thought there were less.
- Closer analysis shows that there ***does*** seem to be a link between jobs where people think there are advantages and the numbers of left-handers in those jobs. That is, left-handers ***do*** seem to choose jobs where they have advantages (or less disadvantages!) and to ***avoid*** jobs where they have major disadvantages. These included people in media and art.
- The exception was quite a large group that saw definite disadvantages but had to put up with them to pursue their chosen vocation. These included people in education and healthcare work and also housewives.
- A worrying result from a large number of students was that 45% thought they were at a definite disadvantage and 50% thought there were less left-handed students than average. Are students giving up their studies because they are disadvantaged by equipment and writing difficulties?

The Club also received a lot of information from people about ***why*** they see advantages and disadvantages. You can see a more detailed analysis of the survey at www.left-handersday.com/survey_results.html

The results so far are very interesting and the Club would like more people to complete the survey as well as encourage any work to follow up on the main findings so far. These would be ideal projects for government departments, universities, organisations or individuals. You can enter the survey form at www.left-handersday.com/new_survey.html

The work on the survey so far has been sponsored by www.anythingleft-handed.co.uk who have a great new range of products to help left-handers, which also make ideal gifts. They will continue to sponsor the next stage of the survey up to the final results being published on Left-handers Day 13 August 2003.

CONTACT

Left-handers Club Press Office, Sterling House, Avenue Road, Belmont, Surrey, SM2 6JD United Kingdom. Tel: +44 (0) 20 8722 4878. Fax: +44 (0) 20 8715 1220. E-mail: lauren@left-handersday.org

ENVIRONMENT PROTECTION

New rubber membranes to secure landfill sites

An EU Directive is forcing waste disposal sites, such as refuse tips and landfills, to upgrade their anti-leaching precautions. This is especially the case in Sweden. Here, in its home market, Trelleborg is able to provide these sites with an environmentally friendly, rubber membrane which can be seam welded, to meet the stringent new requirements.

An EU Directive that is now in force, strengthened the environmental requirements for refuse disposal sites. Sweden's refuse tips have for many years been among the worst in the EU, largely due to the extensive areas of uninhabited land in the country. Most of the other countries in the EU are more densely populated which has forced them to deal with their refuse in a more environmentally friendly manner. Many Swedish refuse tips do not meet the new requirements and will have to close or be modernised. It is estimated that some 300 municipal refuse tips and 400 industrial landfill sites will have to be upgraded or closed during the next eight years.

The problem with these refuse tips is that they continue to present an environmental threat even if when are no longer in use. The leaching action of rainwater releases environmentally hazardous substances into the natural environment. It is imperative that this process be halted by covering over the disused refuse tips. In addition, ponds will need to be built, in which the leachate, that continues to seep out, can be collected and treated. This also applies to the refuse tips that will remain in use.

Seam welding of the 90 m x 5 m panels with an automatic seam-welding device producing channel welds

Since it is difficult to fully treat the water, the normal practice is to use the treated leachate to water 'energy' forests, where the plants can absorb the remaining harmful substances. When the energy forest is subsequently incinerated, the environmentally hazardous substances can be isolated and rendered harmless.

Trelleborg's Rubber Membranes', Elastoseal EPDM Geomembrane, product is one of the best solutions on the market both for covering refuse tips and for building leachate ponds in municipal refuse tips and industrial landfills. Previously, landfills were usually covered using plastic membranes but these lack many of the material properties that Elastoseal EPDM possesses, such as its elasticity, ease of installation in cold weather and durability. It is also puncture-resistant and can withstand exposure to most chemicals.

Previously, one of the problems with using rubber membranes was joining the sheets together. Trelleborg has solved this problem by developing a unique seam-welding technique - the 'Thermobond TPE seam-welding system'. This technique could previously only be used with thermoplastic geomembranes. Since the material in question is rubber-based, installation can be carried out in temperatures down to minus 15°C which further broadens the geographic market for the product.
In order to be able to quality assure the installation and bonding of the sheets - which typically measure 1,000 m2 or more - it is important to be able to test the tightness of the seams at the work site. The seams are made in the form of two parallel welds with an air channel between them, which enables the joins to be tested using compressed air. A fall in the pressure indicates the presence of a leak.

Elastoseal EPDM Geomembrane is an excellent environmental choice, both during use and afterwards. The sheeting does not contain any environmentally hazardous substances and no leaching or emission of chemicals occurs throughout its lifetime. At the end of its useful life, the sheeting can be recycled, landfilled or incinerated for energy recovery. "Given that there are so many refuse tips that need to be covered or provided with leachate ponds, we see this as an entirely new market that is opening up right in our own backyard," says Bo Peterson, marketing manager at Trelleborg Rubber Membranes, with considerable satisfaction. "We have carried out a major marketing program during testing, with focusing on the new Directive, and have already begun to see results."

[Courtesy: Minett Media]

SEED POTATO CUTTER

E W Downs cutting it for McCains

For many years McCain Foods (GB) Ltd has been cutting seed potatoes, using traditional North American equipment, to supply to their contract growers. Following trials of a 4-lane Downs rotary knife seed cutter in early 2001, McCain potato supply manager, Richard Mussett became convinced that this system offered significant advantages in terms of cutting accuracy over the American machine.

Following detailed discussions, between McCain and Downs, a totally new, purpose built machine was specified to meet McCain's requirements.

E W Downs' brief was to design and build an integrated system on one chassis for ease of mobility, with a reception hopper to accept stored crop tipped from boxes and a cleaner for removal of loose soil. An inspection table is incorporated for manual removal of any rejects and a pair of parallel roller spray tables for chemical application. Finally the crop is transferred to a pair of presentation tables for singulation and orientation, ready for the cutting process on dual 4-lane cutters.

An order was placed in October 2001, and the new machine was designed, built, tested and delivered in only 10 weeks, arriving just before Christmas 2001.

The new system greatly reduces previous problems experienced in the presentation of the tubers to the blade and produces a more uniform cut seed piece that helps enormously at planting, potentially increasing the yield of the 'grown on' crops at harvest.

The 4-lane Downs' rotary knife seed cutter

Richard Mussett is very pleased with the new system and comments: "The new Downs' machine has brought speed, accuracy and reliability to our seed cutting operation, which means we are obtaining significant benefits from our investment in this 'cutting edge' technology."

CONTACT

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ORGANIC

Rachel's puttin' on The Ritz!

Following half a century of organic farming in Wales and 20 years as an organic dairy, Rachel's Organic is this year celebrating major expansion and development marked by exciting new partnerships and an extended product range. As part of this, the brand has attracted new high profile stockists, drawn to Rachel's quality and panache.

Design and lifestyle retailer IKEA has teamed up with Wales' 'Rachel's Organic' to feature the stylish award-winning organic yogurts in their in-store restaurants across the UK. This development has been closely followed by Eurostar, who have come on board in providing their customers with the first class quality and taste of Rachel's Organic wholemilk fruit yogurts. Rachel's Organic has also produced a new sized pot to fit the airline style trolleys on Eurostar which will also prove useful in future targeting of the airline market.

One of the most famous hotels in the world, The Ritz, in London has just recently come on board to feature Rachel's fat free and whole milk fruit yogurts in their restaurant whilst whole milk fruit yogurts are also currently available in selected Costa Coffee houses.

"IKEA, Eurostar, The Ritz and Costa Coffee are ideal partners for Rachel's Organic," said Rachel Rowlands. "IKEA's customers for example appreciate style and understand quality but at the same time are concerned about the environment. Eurostar and The Ritz, in choosing 'Rachel's Organic' products for their first class and five star customers, are effectively flagging up Rachel's as being the best yogurt on the market".

There are also new additions to the award winning range of branded organic dairy products, yogurts, cream and crème fraîche produced by Rachel's Organic. The company has added stylishly packaged butter and popular new yogurt flavours - rhubarb, lemon, honey, vanilla and maple to its continuously developing product list,. This year also saw the introduction of the first national branded organic milk.

Rachel's Organic, Britain's first organic dairy, has pioneered the UK organic market, both in quality product and innovative modern packaging. Their tireless pursuit of great tasting products made with pure ingredients, hand in hand with eye-catching packaging, has contributed to their continued growth as a leading brand.

Rachel's Organic Dairy is to receive an Agri-food Processing Grant of £500k for fruit refrigeration plant

CONTACT

Rachel's Organic Dairy, Glan-yr-Afon, Aberystwyth, SY23 3JQ. Website: www.rachelsorganic.co.uk

BALERS

Case IH RBX variable chamber range

The RBX baler range marks Case IH's entry into the variable chamber round baler market, with two impressive models designed to provide the customer with the very best in round baling technology.

True multi-crop, high capacity machines, the RBX models are aimed at those wanting to produce the best round bales in all straw, hay and grass silage conditions. Both the 1.2 - 1.5 m bale diameter RBX452 and the 1.2 - 1.8 m bale diameter RBX462 feature a host of innovations to ensure ease of use, reliability and, most importantly, superb bale shape.

"Our customers have always expected and received products that reflect the way they work. We talked to them extensively during the development of this baler to establish their exact requirements," said Joe Griffiths, Case IH Baler product manager.

A 2.0 m or extra-wide 2.3 m pick-up takes care of the widest windrows, allowing high capacity combines such as the CT Series to be followed with ease. With large guide wheels and steel mounted spring tines, the RBX pick-up has first class terrain following to make sure the entire crop is collected and soil compaction is minimised. Two centring augers deliver a smooth flow of material to the bale chamber for the important bale core formation and consistent bale production.

The RBX's high performance pick-ups are complemented by a choice of packer/feeder, rotor/feeder or rotor/cutter to give the machine an enormous appetite and huge productivity. The rotor/cutter comprises fifteen hydraulically engaged knives that are individually mounted to protect them from damage. These knives improve bale density by pre-cutting the incoming crop before the bale is made. As a result bales are more easily pulled apart for feeding or bedding. The Crop Cutter rotor can be manually reversed in the unlikely event of a blockage or may be fitted with the optional hydraulic system that can be reversed from the convenience of the tractor seat.

Inside the bale chamber, five rollers and six belts, developed without joins for a long working life, complete the bale formation. The belts have a unique deep 'chevron' surface pattern to ensure a positive grip on the bale and keep it rotating even in the worst conditions. The lower roller and front rollers are also power driven and the combination of rollers and belts enables the RBX range to achieve high bale density and high work rates. Well formed round bales not only look good but also have practical benefits such as being easy to stack and handle. Bales with firm edges and flat profiles suffer less from weather damage, while tight 'over-the-edge' wrapping creates the very best in silage production.

The RBX range is equally at home with net or twine without the need to modify the baler when changing between them. The wrapping applicator is wider than the bale chamber providing a wide net capability, allowing the net to extend further down the side of the bale. The wrapping applicator presses against the bale surface, which always achieves a positive take up of the net. The result is tightly wrapped bales whether the crop is wet, wilted or dry. By protecting the corners of the bale, wind damage is reduced and rain run off is improved which is vital for bales that are stored outside.

A performance monitor takes care of the whole operation, allowing the driver to perform, adjust and monitor all major functions from the tractor cab. The touch pad control system provides all the essential information and allows the operator to obtain the optimum bale shape regardless of the windrow condition. Once the desired bale size is reached the bale is automatically wrapped, ejected and then pushed clear by the bale ramp, resulting in a soft landing to prevent damage.

In keeping with the Case IH 'farming systems' philosophy, the new RBX baler range is built to maximise productivity and minimise downtime with a durable and reliable construction. Large one-piece side panels are supported on gas struts to give easy access to all drivelines and the automatic oil system, while the large maintenance free sealed bearings offer years of trouble free baling.

RBX452 variable chamber baler

Category	Model RBX452	Model RBX462
Pick-up	2.0 m	2.3 m
Electric wrap twine only	Standard	N/A
Performance monitor - net & twine	Optional	Standard
Packer/feeder	Standard	N/A
Rotor/feeder	N/A	N/A
Rotor/cutter	N/A	Optional

Compact commands in military ranks

A New Holland TC40D compact tractor has joined the machinery ranks at the Ministry of Defence's Melton Mowbray based Defence Animal Centre (DAC), enlisted to carry out a range of ground care tasks.

Through a £25 million Private Finance Initiative (PFI) project for the MoD, the 100 hectare base for training military dogs and horses and has rebuilt most of its facilities. It now has an indoor and an outdoor ménage, a lunge ring, a dressage ring and a canter track. All have artificial fibre sand surfaces that have to be levelled, at least twice a day, by the tractor to maintain a sound riding surface for the 300 or more horses that are in training at the centre at any one time. All have tight corners which the TC40D tractor handles really well, according to Kim Swanick, one of four field hands. "Levelling is a breeze with the 'SuperSteer' axle – it really is super," he says.

"It can cope with a 1.5 t roller or a field topper just as easily. We're all amazed at how versatile the tractor is. We have power and manoeuvrability and it's so easy to use," he adds. Kim explains that the previous tractor was too small for fieldwork and, despite its small size, was difficult to use in the rings and ménages.

The TC40D's cabless layout means that visibility is excellent – vital for safety in high-traffic areas. It's also a quiet operator, according to Kim. "We don't need to wear ear defenders in the ménages which again means that we are more aware of what is going on around us; great from a safety point of view."

With valuable stock, including horses from the King's Troop Royal Horse Artillery, the Household Cavalry, and the Life Guards and 100 staff on site, safety is paramount as is reliability. Horses and soldiers have to train on even ground. The TC40D was chosen for the job by Preston based Glendale Managed Services, the company which was awarded the contract to run the centre last year and was supplied by specialist ground care dealership Richard Campey, of Macclesfield.

"It's the second New Holland compact tractor we've bought," explains Glendale's Angus Lindsey, adding that he was very impressed with the first – a TC27D used for grave digging work in Bradford.

The New Holland machines are very quiet which is essential when working with animals or for work such as grave digging, according to Angus.

"The DAC also needed something which was both powerful and manoeuvrable to use in its ménages and we thought that the TC40D was the best and most versatile compact on the market."

Glendale removed an old tractor which was falling apart and had to be dragged from its shed and jump started every time it was used and replaced it with the TC40D. "The new tractor has really taken the staff at the centre by surprise, they're really impressed by what it can do," says Angus. "As time goes on, I think the staff will find more and more applications for the machine."

He adds that the security of having Richard Campey's back-up service is another plus point for both Glendale and the DAC. "Campey is absolutely brilliant, the staff are extremely hardworking. The dealership does the New Holland brand a lot of credit."

New Holland TC40D compact tractor levelling while handling tight turns

"The New Holland machines are very quiet which is essential when working with animals or for work such as grave digging"

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