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LANDWARDS

Autumn 2005

- Macadamia Nuts
- Lavender Oil

Timber Engineering

IAgrE JOURNAL Volume 60 No.5 www.iagre.org

GROWTH REGULATOR

Tipoff puts Christmas tree growers ahead

HA Trim Trading Ltd of Reading has developed Tipoff, a new hormone growth regulator designed to help Christmas tree growers maximise the potential of their crop by achieving up to 80% premium grade trees at harvest. Tipoff is the only approved product containing NAA for use as a growth regulator for Christmas trees in the UK and Ireland.

Christmas tree leader lengths are critical to the overall look of a tree. When a conifer is approximately one metre tall, the leader, or central stem, grows too quickly and changes the shape of the tree. Typically, it would grow 50-60 cm per year but Tipoff reduces the growth to 35-40 cm, helping to maintain the traditional conical shape of the tree.

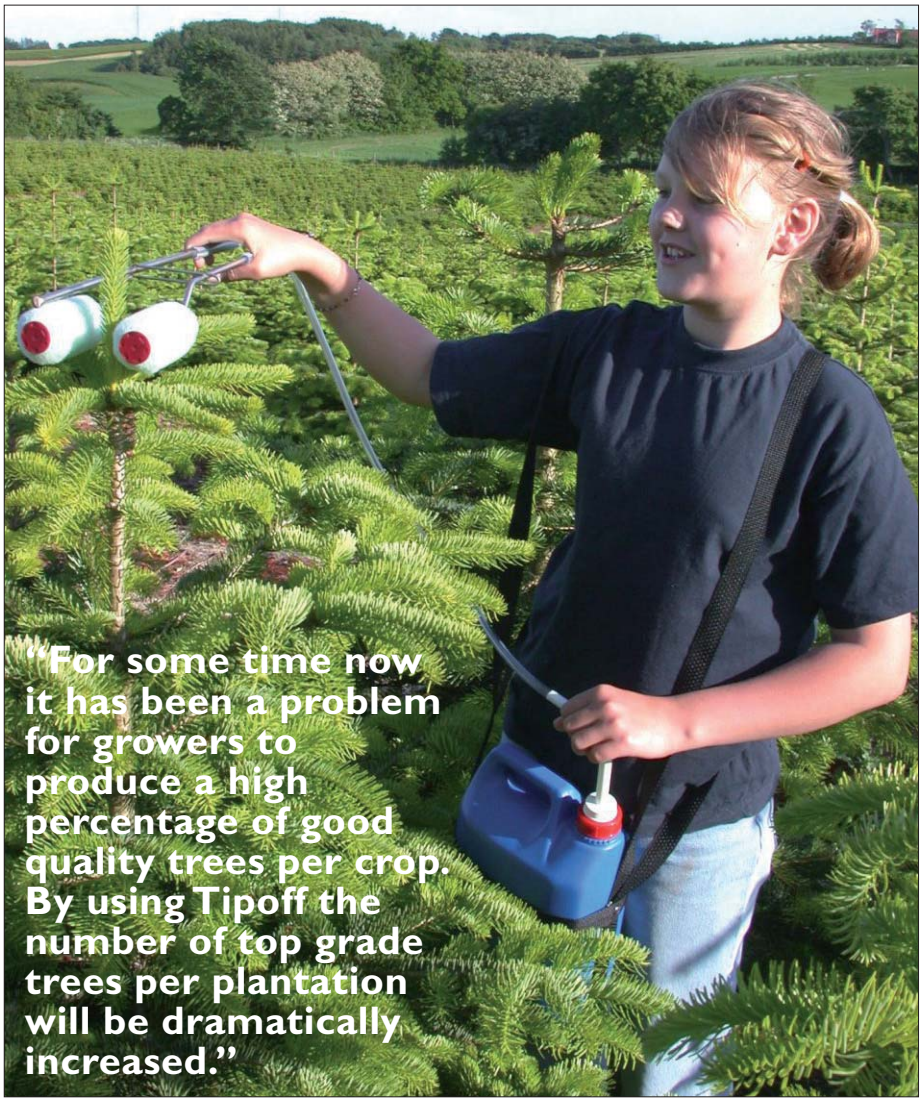
Tipoff was developed by H. A. Trim Trading Ltd's director Gareth Toogood who has over 30 years experience in the Agro-chemical industry from manufacturing through formulating to marketing, sales and distribution. It contains NAA, a synthetic plant hormone similar to the auxin, indole acetic acid (IAA), that occurs naturally in plants. NAA was originally created and used in the late 1940s to ripen apples and, after extensive trials on Christmas trees, it has been proved to be particularly effective on Nordman Fir, Noble Fir and Fraser Fir.

Conifers produce natural auxin, mainly in the buds but, depending where else in the tree it is being produced, will determine its overall shape and the creation of new root tips. During the growing period in June and July, very high levels of auxin are present in the growing shoot; Tipoff controls the concentration of IAA that, in turn, stimulates the production of ethylene to speed up the aging process of the new shoot. By applying Tipoff at a specific time in the growing cycle the shoot stops developing earlier than normal.

Hans Alexandersen, a director of H.A. Trim Trading Ltd, said: "For some time now it has been a problem for growers to produce a high percentage of good quality trees per crop. By using Tipoff the number of top grade trees per plantation will be dramatically increased."

Tipoff is available in one litre containers and is applied using the Easy Roller system, designed to regulate dosage and maximise coverage, greatly increasing application efficiency.

The Easy Roller system consists of two sponge rollers mounted on metal, spring-loaded handles. The Tipoff is pumped from a small five litre container on to the two roller sponges at regular intervals that are then rolled up the leader to the tip ensuring no mist and no waste of Tipoff. With the Easy Roller, one litre of Tipoff will treat 10,000 Nordman Fir, 5,000 Noble Fir, or 5,000 Fraser Fir. It is possible to treat 1,000 to 1,500 trees per hour at a cost of 2p per tree inclusive of the Tipoff and cost of labour. Over the lifetime of the tree the total cost of between 6p - 8p raises the Christmas tree from a standard to a premium quality increasing the return by at least £5.



MORE INFORMATION

H.A. Trim Trading Ltd, 23 Chiltern Walk, Pangbourne, Berkshire, RG8 7LE. Tel/Fax: +44 (0)1189 845018 Mobile: +44 (0)7768 511214 E-mail: trading@hatrim.co.uk Website: www.hatrim.com

(Left) A new hormone growth regulator, 'Tipoff', is designed to help Christmas tree growers maximise the potential of their crop

Volume 60 No 5, **2005**

LANDWARDS

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

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

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

Origination: David King

Printing: Barr Printers Ltd

Publisher
Landwards is published bimonthly by:
IAgrE,
West End Road, Silsoe,
Bedford, MK45 4DU
Tel: +44 (0)1525 861096
Fax: +44(0)1525 861660
E-mail: secretary@iagre.org
Website: http://www.iagre.org

President
Peter L Redman
BSc(Hons) CEnv FIAgrE

Chief Executive & Secretary
Christopher R Whetnall
CEnv IEng FIAgrE MemASAE

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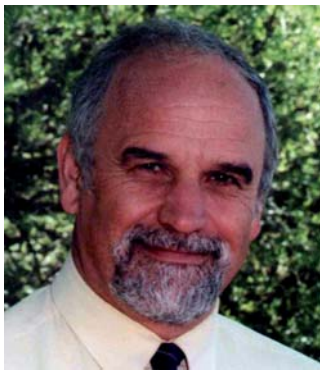
Front cover: *Harvesting lavender (Photo: Nick Cobb, Norfolk Lavender Ltd)*

ISSN 1363-8300

SUSTAINABLE TIMBER ENGINEERING STRUCTURES

Geoff Freedman and Abdy Kermani

Forestry engineering for recreation; walkway constructed for children's play area, Grizdale



BIO NOTE

Geoff Freedman BSc CEng CEnv FICE FIAgrE is a Past President of the IAgrE and Head of Design, Forestry Civil Engineering, Forestry Enterprise, Peebles. E-mail: geoff.freedman@forestry.gsi.gov.uk Abdy Kermani BSc MSc PhD CEng MIStructE FIWSc is Reader and R&D Consultant in Timber Engineering, School of the Built Environment, Napier University, 10 Colinton Road, Edinburgh, EH10 5DT. E-mail: a.kermani@napier.ac.uk

Abstract

Over recent years Forestry Civil Engineering has been concentrating design efforts on timber structures in line with the Forestry Commission's (FC) commitment to sustainability. Coincident with that, the FC is using its land to encourage the general public to improve their health by taking activity in the countryside in line with government policy. To accelerate research into timber structures the first author enrolled for PhD studies at Napier University, with the second author as supervisor, to develop stress laminated timber arch bridges.

Over the last three years of research, many advances have been made in stress lamination generally which will benefit mountain bike and play structures as well as bridges. This paper details some of the important practical issues concerning the design and construction of these structures. It discusses the advantages of timber structures especially for countryside elements and highlights the correct use of preservative treatments. Since volunteer labour is often used in building timber facilities for recreation, guidance is given on legal requirements, liabilities, safety and points out where unskilled labour can be used and where qualified personnel must be involved. The paper is intended to encourage the use of low cost sustainable timber in the countryside to build much needed facilities to help improve the health of the nation.

Introduction

The Forestry Commission (FC) manages the biggest land area estate in the UK. The government have a clear policy to encourage the general public to use the countryside as part of an ongoing campaign to improve the health of the nation. Coincident with this initiative, recent legislation on the 'Right to Roam' has imposed certain obligations on landowners. To this end, the FC is developing recreation on its estate. The main activities

are walking, cycling, horse riding and orienteering.

To develop these activities, facilities are required to improve access to all. This means that footpaths are now made to a high standard with gradients suitable for all abilities. Many new bridges are required which must be safe for cyclists, horses as well as wheelchairs. However, over very recent times mountain biking has become a major attraction and is being encouraged because it involves whole families. Recently, the FC has started to build elaborate structures to make this sport exciting while maintaining acceptable safety standards. Similarly, families with young children need playgrounds which are exciting and safe.

The FC not only wishes to attract large numbers of people to its estate, it also has a strict environmental policy with sustainability at its core. While it takes care of the flora and fauna it wants sustainability to govern all of the design principles of anything it constructs on its estate. One of the simplest ways of doing this is to use FSC (Forestry Stewardship Council) timber as far as possible. This is a government approved scheme to ensure timber harvesting has not damaged the environment and replacement trees have been planted. To this end the authors have been developing timber bridges, mountain-bike challenges and children's play equipment from home grown timber.

Timber structures are not new in the countryside but durable safe structures using mechanical stress lamination techniques are. The authors are introducing this branch of timber engineering to rural structures to utilise small sections of timber of relatively low quality, readily available in the UK, to produce very strong durable lightweight structures which are set to revolutionise rural facility structures. Although stress lamination is finding its way into many designs it is not being used where other forms of structure are adequate or more appropriate. For example, pole construction is very attractive for children's play structures and triangulated board structures produce elegant, interesting shelters. Some examples of sculpture structures in timber in the countryside are shown in Fig. 1.

Fig. 1 Timber structures in Beinn Eighe and Glenurquhart

This paper details some recent examples of attractive, durable and sustainable structures designed by Forestry Civil Engineering, a business unit of the FC. It focuses on mountain bike structures, children's play equipment and bridges.

Timber structure benefits

Timber is in plentiful supply in the UK. Harvested output of plantation timber has doubled over the last 10 years and is set to do the same in Scotland over the next 10 years. The traditional markets have been for pulp and paper production, fencing, pallets but these markets are saturated so the new production needs new markets. A number of initiatives have been developing over the last five to ten years to help create those markets. One of the most prominent was the formation of forestry as a cluster industry in Scotland which led to Scottish Enterprise facilitating research and public acceptance of timber in quite a number of new markets. The biggest single market is timber frame housing and in England there is much room for expansion. However, there is still a lack of confidence as the public view timber as a secondary structural material for short-term use.

A number of private companies, Scottish Enterprise and the FC have financed the first ever centre for 'Timber Engineering' in the UK at Napier University. Here the centre is responsible for teaching a new generation of timber engineers and developing many new ideas including mechanical stress lamination.

Timber is the original renewable, sustainable construction material and has numerous advantages:

- it is easy to work and fix to which requires limited special skills;
- the public like the look and feel of timber;
- it has very good strength to weight properties;
- new and more appropriate design codes (e.g. Eurocode 5) are being introduced;
- it is an adaptable material and when used with other materials the composite can be very strong;
- it can be stress laminated to solve the problem of short timber lengths and awkward jointing; and
- stress lamination permits preservative to be applied throughout the section.

Timber mountain bike structures

Mountain biking has grown at an exponential rate over the last ten years. This is partly due to the improved design of the bikes but is also due to the desire to take interesting cycle runs through the forest. In the UK, until recently, it was all about sharing the roads with other users but there have been a number of accidents where cars and bikes meet or indeed bikes and walkers. There is therefore a need to separate them; and bikers are very happy to go off road. However, this brings new problems with erosion, necessitating structures where a trail traverses a delicate piece of ground and there is a need to keep tyre to ground contact to a minimum. This is why timber mountain bike structures were first required. These were log tracks to keep the bikes above the ground.

This was the situation in North Shore, Vancouver, BC and soon any structures to keep bikes off the ground became known as North Shore structures. In time, the designers became more adventurous and built sections for fast moving bikers that were heavily banked. Seesaw features followed this and soon human hamster wheels appeared as special obstacles. In Whistler, USA, the sport has been taken to a new level for thrill seekers. Many high jumps have been introduced and an 'at your own risk' sub culture sport has become the envy of mountain bikers around the world.

This sport has developed in the UK with only minor controls and without applying legislation. Of course there are no

Fig. 2 Trail at Glenurquhart

specific standards to guide the constructors, so it has been very difficult to decide what might be dangerous and what amounts to an acceptable risk. Enthusiasts have built many trails and some may be considered as dangerous. As legislation stands in the UK, a landowner has a duty of care to those on their land, so this situation cannot be allowed to continue.

Since full facilities are being constructed, shelters, seats and other structures are required (Fig. 1). Innovative designs have also been developed for these to create the whole concept.

Recent Forestry Commission control action

Mountain bike trails have sprung up all over the UK and there have been accidents. While accidents are very unfortunate they will eventually lead to precedents and as case law builds designers will gain guidance. However, at the moment, designers and mangers have to apply general legislation and interpret the likely judgements to formulate their own design for safety. Individual managers have been doing this for some time but, with the great numbers of trails being built, it is quite obvious that a national policy, based on informed interpretation, is required.

In 2003, the world championships were held in Fort William and the appetite for more variety developed. Erosion is becoming an increasing problem with greater numbers of visitors, so North Shore structures are becoming common. Recently, a group of enterprise developers offered substantial funding for a trail with very sophisticated North Shore structures, if they could be built to operate safely within UK law. FCE was approached and took on the challenge. Six special feature obstacles, similar to those at Whistler in the USA, were requested.

Mountain bikers in the USA ride these obstacles at their own risk but this is not an acceptable approach in the UK. The demand is for the same level of excitement but this must be provided without unseen risks of injury. To achieve this, the basic requirements are such that:

- a duty of care exists because the bikers have been invited onto the land;
- the Health and Safety at Work Act applies, therefore risk assessments must be carried out on the entire operation of the trail;
- riders must be informed of all risks and how to use the equipment;
- dangers must be visible and not hidden;
- structures should be designed and constructed with great care;
- access for ambulance and emergency personnel must be possible and informed;
- moving structures must have failsafe mechanisms;
- a regime of inspection and maintenance must be set up; and
- all literature concerning the trail must be stored for five years in case there is a claim as a result of an accident.

The above list is by no means complete but it is a good basis from which to work from for the first set of structures. Trails will also have gravel and earth areas but this paper does not advise on these; however, the same tenets apply.

Design and construction

FCE took on this project because stress lamination could be used to ensure strength and durability while forming interesting shaped structures from timber. The majority of the current North Shore structures are built using recently felled timber, sawn in the forest and connected with nailed joints. This means that constant maintenance is required and when something comes apart the resulting accident could be serious with protruding nails. Stress laminated structures are robust and load sharing. They will use dried timber with preservative treatment. To form the difficult shapes on trail decks, the laminates will sometimes be 25 mm wide and they will be nailed to form the shapes and site drilled after so that the tension anchors can be added.

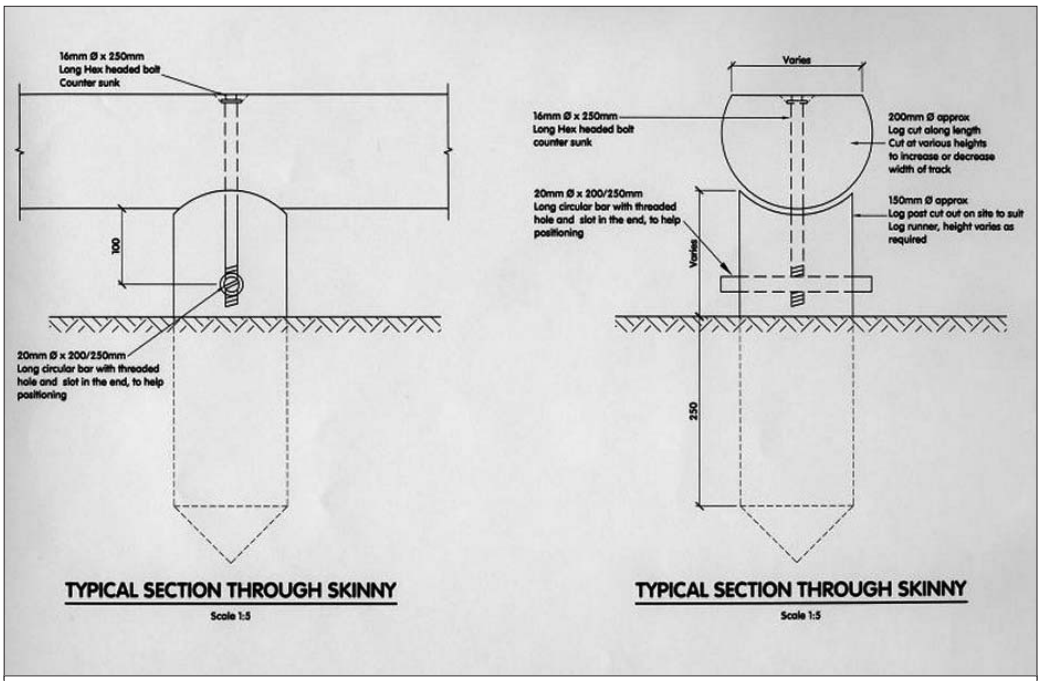


Fig. 3 Detailed design of a typical section through a skinny

Fig. 4 Construction of skinny structure: bench saw (top left); skinny top log (top right); longitudinal logs (bottom left); and skinny runway constructed using skinny top logs fixed to the longitudinal logs (bottom right)

The design loadings used are the same as for countryside pedestrian bridges (2.5 kN/m^2) with some allowance for dynamic loading. The speeds can be high but the masses involved are small so structures are unlikely to become overloaded by dynamic forces. Stability is important, so bracing against sway and lateral loads is essential. Stresses will generally be low but poor fixings will be the source of rupture. By applying stress lamination, redundancy will be built in through effective load sharing which is essential where structures can be abused. The Construction Design and Management Regulations places a responsibility on the designer to look forward to how structures could be used even if not specifically designed for the use and ensure they are safe. Support posts will be bored into the ground to add stability for smaller structures (Fig. 2) while pinned feet on concrete bases will be designed for larger ones to ensure quality control and prevent rot.

This is the simplest North Shore structure and the most common. It is usually a log split up along its centreline and supported, flat face up, above the ground. It is common for these features to be 2 m above ground but this will be limited to 600 mm in the UK for safety reasons (Fig. 2). They are set level or at a very small gradient. They may be built at a high level as a special feature but if over 1.5 m it will have a handrail. The rails are designed not to interfere with handlebars while being in reach of an outstretched hand and infilled to catch a falling rider.

Good design aspects of this feature are a ribbed surface and a strong, longitudinal joint (Fig. 3) between logs which can accept an angle of up to 135 degrees and can be tightened after some use. Bolt heads are recessed to avoid sharp edges coming into contact with riders. The bolts pass through the log 200 mm from the ends and are linked with a metal strap below.

The skinny logs are supported by posts driven into the ground which are notched at the top to accept the longitudinal log. They are fixed with a recessed vertical bolt through the horizontal log and down the middle of the support and screwed into a steel bar passing through the support log 200 mm below. All of this timber is prepared in the forest on a chainsaw bench and power drill (Fig. 4).

Berm

This obstacle is a banked 'U' shaped piece of track. The approach and exit legs are 500 mm widths of 100 mm deep stress laminated deck with vertical curves and the inside curve is 100 mm x 50 mm boards screwed to 50 mm x 50 mm runners laid on an earth bank for support.

The whole structure climbs up one side of a spur shaped land feature, over the top and down the other side. This minimises the fall at the most dangerous part of the feature.

The stress laminated approach and exit ramps are nailed and site drilled and supported by driven posts with sawn crossheads. The tight 'U' curve is set by driving posts into the ground at position and level so that their tops are at ground level. Over them the 50 mm x 50 mm runners are laid and fixed with screws. The deck boards are then fixed to the runners.

The philosophy behind this obstacle is that the riders must go fast to create centrifugal force otherwise they will fall at the inside curve.

Seesaw

This is a piece of flat stress laminated deck pivoted and weighted so that, as a rider advances along the deck, it drops down for his exit and returns for the next rider. It is made from lengths of 100 mm x 50 mm and can be predrilled before pressure treating with preservative. A proprietary pivot, made from a 75 mm diameter circular hollow steel section (CHS) welded to a 5 mm thick flat plate fits below the deck. The flat plate is drilled for screw fixings and the CHS rests on a separate support structure.

The important safety feature with this obstacle is that only one rider is allowed at a time, so a portal entrance with a caution sign and a gate is arranged just before the seesaw. The gate is triggered, by the seesaw mechanism, to open when the rider is clear of the obstacle. The surface of the deck has an application of anti slip material.

Human hamster wheel

This obstacle is to provide the spectacular centrepiece of the trail. The running deck, or wheel rim, is made from 75 mm curved, sawn, stress laminated timber (SLT). This is supported by 200 mm x 50 mm timber spokes which hold cradles under the rim. They are connected at the centre by a proprietary bearing housing and it all spins on a 75 mm diameter CHS. The crucial factor with this obstacle is that it is light enough to be moved around by the rider.

Again, this will have an entry portal triggered by the lock mechanism. It may take some time to traverse the wheel, so it has been arranged to support the wheel on SLT arch structures which provide bypass routes at either side of the wheel.

The running surface will have anti skid material applied. The wheel will be counterweighted so that it returns to its 'ready' position when the rider exits. The entire structure will be made from presawn, pre-drilled treated timber. This structure is designed as permanent.

Vortex

The main object of this obstacle is to enable the rider to travel beneath a location previously cycled (Fig. 5). It is a spiral structure which fits into a steep slope in the landscape. It is a continuous section of curved stress laminated track from the top of a bank which returns to the bank at a lower level where it is fixed to the ground. This repeats to the

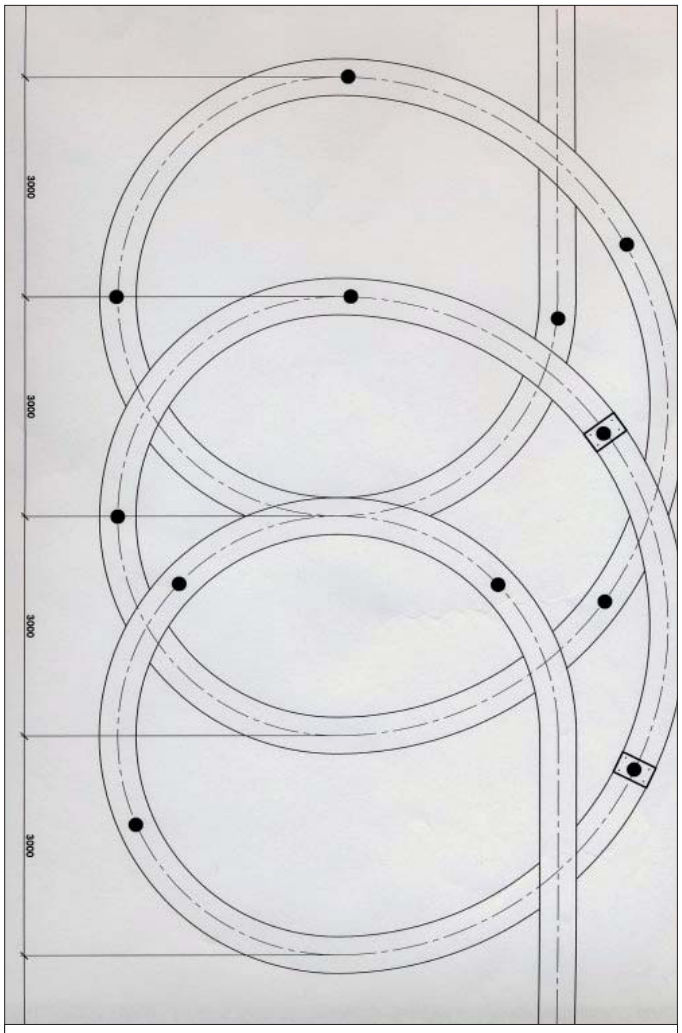


Fig. 5 Details of the vortex structure

bottom of the slope.

This obstacle is currently under development and will require some trial and error to achieve suitable safety limits. A handrail is provided where the fall is greater than 1.5 m.

The track is 500 mm wide, made from 100 mm x 25 mm stress laminated timber curved into a 6 m diameter turn. The laminates are nailed into their shape and when the obstacle is complete the deck is drilled through at 600 mm centres to take through bolts to form the final robust stress-laminated structure.

Rib tickler

This is a short 3 m length of elevated track made from horizontal laminates and longitudinal stressing bars. The horizontal laminates alternate with spacing blocks to form a ladder like structure. When the rider passes over, it cleans the tyres by shaking the wheels. These are positioned before an obstacle where the tyres need to be clean for safety reasons.

Handrail detail

The handrail must give clearance to the rider's handlebars but must be within reach of a rider's outstretched arm. It must also be close enough to catch a falling rider before the fall creates too much momentum. This led to the 'V' formation with posts bolted beneath the track. This robust shape resists the dynamic loads. The infill rails are designed to catch the rider while minimising risk of injury.

Shelters

An exercise in three-dimensional triangulation using oriented strand board (OSB) was tested for shelter construction (Fig. 6). Two options have been built and have given guidance for future improvements. The concept has proved itself but larger triangles will be used in future so that the modules provide a wall and roof rather than just a roof.

Children's play structures

This is another very important use of sustainable timber in an environment which can promote wood while making use of its best features. There are a number of manufacturers of specialist equipment which usually take the form of standalone units, e.g. swings or roundabouts, which can be linked into continuous frames, etc. This paper deals with in situ built structures which form the platform for swings and chutes etc. All structures and equipment must comply with the requirements of European Standard EN 1176 [British Standards, 1998] which is a dedicated standard, unlike those used for mountain bike structures (Fig. 7).

When planning it is important to:

- hire a designer who is experienced, competent and qualified to accept the responsibility;
- hire a contractor who is experienced and has the capacity;
- ensure regular supervision is built into the contract;
- ensure budget is adequate;
- allow enough time to gain Planning permission, etc.;
- ensure enough time is allowed for construction to avoid rushed finish.

Design and analysis

EN 1176 provides detailed guidance on all aspects of

Fig. 6 Example of a shelter and and a scaled model

design including a sensible statistical approach to static and dynamic loading. This is particularly significant for this type of structure where these loads are difficult to quantify and the consequences of failure would be particularly severe.

Robustness is very important when building in timber. Strong joints can be made in structural steel because of its high bearing capacity and the ease of welding and bolting. However, it is difficult to make durable timber joints. The designer needs to think away from the localised area and spread the loads into members. This requires techniques that have been known to craftsmen for centuries but, often, young designers are inexperienced in this type of detail.

There will be joints where bolts are required to take the local shear and torque and lesser joints where screws and nails are good enough. However, for main structural joints, braces and struts can help to reduce and distribute the bending moments. The important consideration is that all joints must be designed to be sure of code compliance. Stress lamination is a useful technique when considering robustness especially for walkways (Fig. 8). Normally, a walkway would be constructed of nailed boards onto joists. The joints can come loose with use and dampness which can penetrate the joints where the nails have punctured the preservative treatment. However, a through bolted stressed slab of timber will be treated after holes are drilled and the final composite will be strong and durable.

Bracing is very important for structures which take dynamic loads. Highly stressed moment connections in timber come loose with use when the bearing stresses on the nails or bolts are high and stresses are constantly reversed. Joints will be designed to take the loads

Fig. 7 Playground structures at Grizdale: elevation of walkway (top); and slide structure (bottom)

Fig. 8 Underside of walkway at Grizdale

but good design will result in lower stresses at critical points and increase long-term durability. This criterion should be observed particularly on swings and slides where there are high concentrations of use involving dynamic loads.

Prevention of accidents

Royal Society for the Prevention of Accidents (RoSPA) recommend the use of EN1176 and should lead to safe structures but state that compliance does not remove the operator's responsibility to ensure that equipment is safe which implies other considerations are required. RoSPA believes that it is essential that a level of assessed challenge and risk should be provided to enable children to properly develop their survival skills. Risks must be assessed and even high risk is acceptable where development value to the child is high.

It is recommended that all completed facilities are inspected by RoSPA who will carry out risk assessments and provide a certificate to the operator. This especially takes into account the details concerned with children trapping fingers, hands and heads while commenting on fall heights, padding and sharp corners, etc. The operator will receive an equipment report on each item making up the facility. It is a checklist which is useful to the operator for correcting any faults but also as future reference to focus inspections during operations of the equipment.

Children's play equipment is an excellent use of timber but it can be a difficult material to work with to ensure the equipment is completely safe: surfaces must be smooth; edges rounded and joints robust. There is a major distinction between facilities for children under 36 months and those over. Most facilities will contain equipment for all ages so the design becomes more complex. Accidents are bound to happen so the designer and operator must ensure the equipment complies with codes in every respect including correct warning signs and regular inspections. Correct records must be kept which will stand up in court in the event of an accident and if equipment breaks, the liability will most certainly rest with the operator or designer. There are many parallels with mountain bike trails. The same ethos and procedures should be followed for both.

Timber recreation bridges

Mountain biking is developing exponentially and children's play areas are an important development area in the deputy

Fig. 9 Log bridge, USA

Fig. 10 Simply supported beam bridges: Glentrool bridge, Argyll

Prime Minister's strategy to improve the public's health by getting people out into the countryside. However, neither is as important as encouraging walkers. They are the backbone of countryside recreation and forests are particularly attractive and interesting to walk through. This leads to increased number of footpaths and of course bridges (Fig. 9).

Five years ago, a national survey identified a need for 1000 new or replacement bridges in the countryside. This mainly came about because of the restructuring of local authorities and their lack of investment, due to pressures on cash for education, etc. Today the demand for new bridges is probably even greater especially with so many sources of funding through National Lottery, charities, government agencies, etc., all wanting to help the public to get out into the fresh air. It is now one of the most politically correct activities.

Specification for recreation bridges

When constructing recreational facilities the most important facets are aesthetics and sustainability. The users of countryside facilities want to feel that they are in harmony with the experience. Visitors to the countryside usually care deeply about the flora and fauna and their welfare. They do not want the harshness of an urban experience.

Structures in the countryside are focal points of interest which attract walkers to stop and study. Structures are often scrutinised in more detail than anything in town. Bridges are structures which allow walkers to stop and rest and view the surroundings. They can study the water and fish below or enjoy the view from the vantage point above.

The safe way to satisfy most of the criteria is to build timber structures and hide harsh industrial influences like steel, concrete and plastic. The ultimate vegetation in the countryside is trees and the ultimate feature in the countryside is a structure, therefore, if the materials are the same, some harmony is achieved.

Available material

Most of the big trees worldwide have been felled. Today we only have smaller timbers, usually from plantations, and therefore can only build smaller span bridges with whole timber. Expensive glue lamination is of course available but it does not compete with the use of steel or reinforced concrete. Economics will always be an important consideration in the choice of material so timber has a difficult task to compete in large structures. It is generally used as a secondary structural material, e.g. for a bridge deck, rather than for the main beams which tend to be in bending and steel and reinforced concrete are good in bending.

Current standard countryside designs

In 1984, the Countryside Commission for Scotland produced a publication on this subject in conjunction with the Forestry Commission and it became the basis of best practice for countryside recreation bridge design. Many of the designs are out of date because of changes in materials prices, availability of skills, new innovative ideas and cost effectiveness. More than 20 years on, 'Paths for All', some local authorities and Forestry Civil Engineering are rewriting the book. New designs will appear, some for use by the general public and volunteer groups and some which will be designed and built by professionals.

Litigation is affecting design criteria in recreational bridge design. With the public being given a freedom to roam and landowners having a duty of care to all visitors, all structures now must be built fit for purpose and the only way to be sure of that is to have the bridges certified by a competent person when complete. Guidance to volunteers must be clear and designs engineered so that they cannot be misinterpreted or abused. One very important aspect here is the design and detailing of handrails and posts. They must comply with loadings and dimensions given in national guidance documents and must be durable and easily maintained.

Designs for volunteers

The three standard designs for use by volunteers will all have deck and post details following a similar theme but with three different types of beam support. They will be restricted to 9 m span and have post fixings taken from a design invented and patented by the first author and the Forestry Commission in conjunction with a manufacturer (Fig. 10).

The three beam options will be log, sawn timber and light steel. The specialist post fixing can be seen in Fig. 10. It takes the form of a galvanized steel angle above and below the beams, fixed to the beams or clamped around them, while their extension provides the support for the posts. This

Fig. 11 Aerial mast bridge; Stewarton bridge (shown)

Fig. 12 Example of stress laminated timber bridges: 5 m span flat deck Pucks Glen (top left); 9 m arch and flat deck at Stewarton (top right); 9 m span Mallards Pike (bottom left); 17 m span Achray (bottom right)

structure forms a mid span torsional restraint which stiffens the bridge while giving a strong support to the posts. The post joint is exposed to the air so that regular drying will avoid rot setting in.

Innovations for professional designs

Aerial mast bridges with timber decks

This design uses factory produced triangular steel truss units 3 m long which are bolted together on site to form beams of length up to 26 m. The base of the beam is 500 mm wide and the height is either the same or 750 mm for spans greater than 15 m. Beam units are laid sided by side to give a bridge the desired width and they are linked laterally using steel angles 'U' bolted to the top and bottom tubes of the mast sections (Fig. 11). A timber deck is fixed to the top of the beams and handrails are attached to the lateral steel angles.

The advantages of this design are that:

- every piece of the structure can be carried to site;
- it is very lightweight;
- the structure is easy to build; and
- it has good torsional resistance at mid span.

The design is very popular with local authorities and countryside groups because of the ease of construction and all the parts can be carried to inaccessible locations. More than 100 have been built in the last 10 years since the design was patented.

Stress laminated timber bridges

This is a relatively new form of bridge construction using 50 mm thick sawn timber joists as vertical laminates (Fig. 12) [Freedman & Kermani, 2004]. The laminated timbers are predrilled at their neutral axis to take pre-stressing bars which are jacked up to very high tensions to produce an orthotropic slab. The timbers are individually pressure treated after drilling so the slab becomes a durable mass of timber evenly treated throughout. This is not possible with large timbers. These decks are very strong because they laterally distribute all loads to the full width of the deck.

Until two years ago, these bridges were built as flat decks but recent research by the authors on arched decks has produced some remarkable results. The flat decks use timber in bending but the arches utilise the compressive properties of timber which are much greater. About 20 arches and a number of flat decks have now been built with depth to span ratios of up to 1 to 100. Load capabilities are easily sufficient for any footbridge design and the bridges are very attractive. The design will be in the public domain late in 2005 when the research project is complete but in the meantime they are available through Forestry Civil Engineering as part of the development programme which is taking place at Napier University.

Preservative treatment

Creosote and copper chromium arsenate (CCA) are the most effective treatments but are now outlawed except for special uses, e.g. railway sleepers, telegraph poles and bridge decks. However, it is very unlikely that timber with these treatments will be available from treatment yards because the market will be too small. The ban has been introduced for a number of reasons but it is the risk to children, operatives working with the materials and the problems of disposal which were the major factors.

The next generation of 'less toxic' preservatives, e.g. copper chromium phosphate, will not afford the same protection so timber structures will have to be justified on a shorter life. This is a challenge and not necessarily a disadvantage. Softwood timber will cost much the same as at present for many years because international markets set the price. Economic designs, financially appraised over, for example, 15 years must be developed. This will avoid the need for costly maintenance, therefore giving timber an advantage over steel and concrete. In a whole life appraisal, the locking of carbon on the ground in structures, will significantly add to the credit side.

Conclusion

There are new markets for timber structures in the countryside and there is a plentiful supply of sustainable homegrown timber. The government is committed to improving the health of the nation by encouraging the general public to get into the great outdoors. There has been a resurgence of timber engineering throughout the world but the UK is lagging behind. However, the international effort has been responsible for developing many new ideas which UK designers can use. Scotland has just intro-

duced the first dedicated centre for 'Timber Engineering' at Napier University which will be training engineers in the design of timber as well as carrying out the much needed research. With all of these factors coming together there is a positive future for timber recreation structures in the UK. Good design will be the key to public acceptance, safety, cost and reliability. However, timber has a head start on other materials because it looks good and feels good. People like timber but do not trust it to last or create strong, low maintenance facilities. These are the challenges to timber engineers who should use timber wherever possible in the countryside to demonstrate its competitiveness to steel and concrete, and its enhancement to people's lives and surroundings.

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RoSPA. Play safety. Royal Society for the Prevention of Accidents, Old Village Hall, Kingston Lisle Business Centre, Wantage, OX12 9QX

HARVESTING AND DISTILLATION OF LAVENDER OIL FOR THE COSMETICS INDUSTRY

Nick Cobb

Lavender harvester in operation at Norfolk Lavender

Lavender oil and uses

Norfolk Lavender has been growing and distilling lavender for use in toiletry products for over 50 years.

Good quality lavender oil for the perfumery industry comes from *Lavandula angustifolia* plants, not to be confused with the higher yielding but more camphourous *Lavandula intermedia*. Norfolk Lavender primarily grows the former but much of the lavender grown abroad is the latter type.

The focus for Norfolk Lavender is now firmly on it's own range of products, although in years gone by oil was also sold to Yardley's.

Lavender is an important ingredient in a surprising number of perfumes and aftershaves because it blends with and complements many other oils. Despite this, it is generally thought of as a single, somewhat old fashioned, fragrance, albeit an extremely popular one. Lavender oil is also very popular with aromatherapists due to its calming and healing properties.

Harvesting

The timing of harvest is critical as the best results are achieved by cutting the lavender when it is either in full flower, or at least has not dropped any flowers. Lavender flowers which are past their best and are beginning to brown still hold the vital oil; however, a heavy rain at this stage can knock these flower heads off the bush, taking the oil with them. Therefore, as with many types of harvest, the weather must be watched closely.

It is generally accepted that five mature bushes are required in order to produce enough oil for a bar of soap, so every drop is precious. As large quantities of freshly cut lavender can be susceptible to mildew, a balancing act is required to ensure that the harvesting does not take place so quickly that the distillery cannot keep up.

A commercial crop is not usually obtained until plants are four years old; however, they are harvested from year one as this also prunes the bushes and ensures that they retain their shape.

Cropping history

Lavender was originally cut by hand using small sickle shaped knives with serrated edges. This continued until 1964 when a mechanical cutter was introduced. One or two prototypes were used, until in 1971 a unique machine was introduced. This was a self-propelled machine loosely based on a pea harvester. The small diesel engine was slow but adequate, although the Land Rover running gear did get through half shafts quite quickly, if the machine became bogged down in rabbit burrows.

BIO NOTE

Nick Cobb, who prepared the article by invitation and also supplied the front cover image is Quality Manager at Norfolk Lavender Ltd, Caley Mill, Heacham, King's Lynn PE31 7JE. Tel: +44 (0)1485 570384. E-mail for customer enquiries and mail order sales: customer.services@norfolk-lavender.co.uk

The hopper is an adaptation to the original cutter, where the lavender piles up in a hopper which is now situated directly behind the tractor

Lavender is a Mediterranean crop and will grow in quite poor soil. Many of Norfolk Lavender's fields are sandy with a healthy population of rabbits. Two lifting arms were positioned to lay just under the edge of the dome shaped rows of lavender and lift the plants so that the horizontal cutter blade could cut the sides as well as the top of the bush. The lavender then moved up a rolling belt beside the offset driver's seat and flowed up to the back of the cutter where it was gathered in a suspended hessian sack.

Two men continually flipped over a guard so that whilst one of them was filling the sack the other was tying his filled sack and stacking it on the drop down sides of the cutter. These 'wings' would pile up with sacks of lavender which were unceremoniously tipped off at the end of the row for subsequent collection by tractor and trailer.

In 2002, a new cutter was introduced. The same principles were applied but this was a much more modern machine. Still in use today, it is attached to the side and rear of the tractor rather than being a self-propelled machine. The lifter arms, cutter blade and belt remain however, with the adaptation that the cut lavender piles up in the main hopper behind the tractor. When this is full the sides of the hopper are lowered and the crop is belt fed into potato boxes for transportation to the distillery.

Distillation

Lavender oil is extracted using steam distillation. An electric boiler provides the steam which is passed into a large still full of approximately 250 kg of lavender. This causes the lavender oil to vaporise and pass through a condenser and out into a separator where the lavender oil floats on top of the water. This quaint process still uses pre-war copper stills and lavender continues to be manually forked into these. Ropes are laid in each still to enable the 'dross' to be removed more easily. Sadly the entertaining practice of a

Distillation of lavender oil continues to use pre war copper stills into which the lavender is forked manually

The still lid is clamped down and processed for twenty minutes at a pressure of between 3.5 and 5 bar

Ropes are used to extract the near sterile dross from a still once the distillation cycle is complete

Separator: the vessel in which the lavender oil and water settle until the oil separates and sits on top of the water, ready to be tapped off

person climbing into the still to trample the lavender has been replaced by an hydraulic press which looks rather like a giant bath plug. This is to ensure that the still is not under-filled but definitely has less tourist appeal than a person treading the lavender, whilst trying to avoid inquisitive bees from progressing beyond his ankles!

The still lid is clamped down and processed for 20 minutes at 3.5 - 5 bar with a targeted yield of one litre of oil. This has found to be the best compromise, although the permutations for time/yield ratios are endless and, of course, vary depending on the condition of the lavender being distilled.

Whilst the still is processed the second still is filled with lavender. When the first still has finished processing the steam is turned off and the lid removed. The second still is connected and starts to process whilst the first still is emptied. To achieve this, the still is pivoted backwards through small doors in the back wall of the distillery and the ropes are used to pull out the near sterile dross. Many potential uses have been considered for this ranging from fine mulch to fragranced barbecue bricks. However, on a commercial scale none of these have proved successful.

Settling and bottling

Having passed through the condenser and cooled back down to liquid, the pure oil flows into a separator. This is a vessel in which the lavender oil and water settle until the oil separates and sits on top of the water. It is then tapped off and bottled throughout the day. Any potential impurities are removed by using filters of sodium sulphate on top of the glass separator vessel. Once sufficient quantities of oil have been produced drums are filled, weighed, labelled and stored in a cool, dark storeroom.

SILSOE RESEARCH INSTITUTE

LIBRARY COLLECTION

Due to the closure of Silsoe Research Institute, the library collection is being dispersed to various academic and research organisations to complement their own libraries. Science and agricultural engineering books and some journals are being transferred to places such as Cranfield University (Silsoe campus), Harper Adams University College and Rothamsted Research.

It has been agreed in principle that the Museum of English Rural Life at Reading University will receive the archive material including photographs from the early work of the National Institute of Agricultural Engineering. We are also ensuring that the British Library has a complete set of our Divisional Notes.

Scientific and technical research journals are being offered to UK universities, but there are still many titles, especially foreign language titles, that have yet to find a home. Titles still available are listed on the website at **http://www.sri.bbsrc.ac.uk/general/library.htm**

We still have books on agriculture and agricultural engineering available for transfer to academic or not-for-profit research organisations. There is also a collection of ASAE papers (hard copy and microfiche) from 1971 -1994, ASAE standards yearbooks 1967 -1992 and SAE Handbooks 1950 -1988. For historians we have a collection of extension literature and reports published from mid 1960s to 1980s, largely from the farming organisations in the USA, Europe and the former USSR. Our patent collection on agricultural engineering equipment and processes goes back to the 1940s!

The stock will be freely available for transfer until the end of 2005, but we would appreciate the recipient to arrange collection from Silsoe.

For further enquiries please contact Anne Jarvis Tel: 01525 860000 or e-mail: anne.jarvis@bbsrc.ac.uk

STATISTICS

Getting the measure of environment, society and economy

Environment Minister Elliot Morley has unveiled a new user-friendly snapshot of the UK's environmental, social and economic performance. A free booklet – '*Sustainable development indicators in your pocket*' – contains the latest set of pointers to whether things are getting better or worse across a range of concerns including health, housing, jobs, crime, education, and pollution.

The new set of 68 indicators includes 'traffic lights' to signal where there has been improvement, deterioration or no change. The indicators highlight the links between people's lifestyles, industry, health, the environment and other issues, and will map the UK government's progress in delivering its sustainable development strategy, 'Securing The Future'.

They show, for example, that while the UK economy has continued to grow, air pollutants have been reduced – ammonia by 19%, nitrogen oxides by 44%, particulates by 51% and sulphur dioxide by 74% (1990 - 2003).

In 2004, UK emissions of carbon dioxide (CO_2), the main greenhouse gas responsible for climate change, were 4% lower than in 1990, but had increased by about 1.5% between 2003 and 2004.

CO_2 emissions from industry fell by 21 per cent between 1990 and 2003, emissions from domestic users were down 3 per cent, despite having increased over the preceding four years, and transport emissions (excluding international aviation and shipping) were up 8%, although in recent years the rate of increase has slowed.

Greenhouse gas emissions from aviation fuel use (based on refuelling at UK airports) increased by almost 90% between 1990 and 2003. International aviation emissions are not included in the Kyoto target, but if they were included the UK's total greenhouse gas emissions would be about 5% greater.

Mr Morley said: "These indicators help us to chart progress and help to see whether we are succeeding in our goal of securing a better quality of life for everyone, or whether we need to change direction and act accordingly.

"What we do in one area of our lives can have an impact on many others, so joined-up thinking and action across central and local government is crucial, as is the need to show people how they can make more sustainable choices and to help them get involved in decision-making that affects their future."

Copies of the latest pocket-sized set of indicators are being sent to all schools, colleges, libraries and local councils in England in an effort to stimulate interest and discussion in sustainable development issues.

There has been extensive public consultation on the government's new sustainable development strategy, and '*Together We Can Secure The Future*', gives communities a bigger say and a bigger role in tackling issues such as climate change and energy efficiency. It shows how government and communities can help secure a more sustainable future for everyone and can get involved in tackling priorities such as protecting natural resources and creating a fairer world.

Mr Morley added: "The UK was one of the first countries to produce a set of indicators, and the new user-friendly booklet is designed to help illustrate more clearly the range of issues covered by what we call sustainable development."

MORE INFORMATION

Copies of *'Sustainable development indicators in your pocket'* are available from Defra Publications. Tel: +44 (0)8459 335577. Website: www.sustainable-development.gov.uk

"The UK was one of the first countries to produce a set of indicators, and the new user-friendly booklet is designed to help illustrate more clearly the range of issues covered by what we call sustainable development."

Bimonthly AUTUMN 60(5)

MEMBERSHIP MATTERS

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

Membership Changes

Admissions

Fellow

R Marchant (Dumfries)

Member

J E Dale (Lincolnshire)
A Jones (Ayr)
C D Jones (Bedfordshire)
G P Leversha (Lincolnshire)
J McKie (Lanarkshire)

Associate

I J Booth (Buckinghamshire)
S P Mitchell (Warwickshire)
O Ojo (Nigeria)
D Wood (Suffolk)

Student

Cranfield University:
H A Clewes
E Kethobile
A D Morgan
J M A Robbins

Transfers

Member

Y O Bankole (Nigeria)
D W Barraclough (Leicestershire)
P W Danks (Oxfordshire)
R G Donald (Oxfordshire)
A A Lock (Buckinghamshire)
G R Tulloch (Wiltshire)

Engineering Council

Registrations

CEng

D Bentley (Durham)

EngTech

S R Bazeley (Canada)

Transfers

CEng

A E Moore (Staffordshire)

Society for the Environment

Registrations

C M Bentley (Wiltshire)
C J Cronin (Ireland)
P W Danks (Oxfordshire)
R G Donald (Oxfordshire)
M A Ede (Bolivia)
C English (Hertfordshire)
C J Friedman (China)
R M Frost (Lincolnshire)
S A Jabbar (Sri Lanka)
J P Metcalfe (West Midlands)
R D Metcalfe (West Midlands)
I J Muir (Kent)
B Noonan (West Midlands)
C R B Orr (Uganda)
J Shewring (Norfolk)
M Sterling (West Midlands)

A warm welcome to new members and congratulations to members achieving a further phase of their professional development and qualifying as Chartered Engineers, Chartered Environmentalists and Engineering Technician.

News of Members

Charles Nicklin has recently been appointed Engineering Manager for JCB Landpower (Fastrac Tractor's).

Congratulations to **Maxwell Mutema** who has recently been awarded a PhD by the University of Reading, School of Agriculture, Policy and Development. A brief of his study is given below:

'The focus of my research was land reform in Zimbabwe, more specifically I was looking at the impacts of land rights on agricultural efficiency, investment and land markets. I also looked at some aspects of sustainable agricultural practices. The main finding was that in the smallholder farming sector of Zimbabwe land tenure makes no difference to the efficiency of agricultural production. Agricultural production under the different tenures found in the sector is largely efficient, thus subscribing to the widely accepted observation that peasants are efficient farmers because they can utilise family labour efficiently on their landholdings. Factor market failures (inputs, services, finance, markets) were found to be more important constraints to agricultural production in the sector than effects of tenure security. It is, however, important to point out that a wide range of tenure issues that limit the exclusivity, security and transferability of property rights to land in the sector were identified, and must not be ignored in the country's land policy formulation.'

Tony Chestney

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

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Oxfordshire
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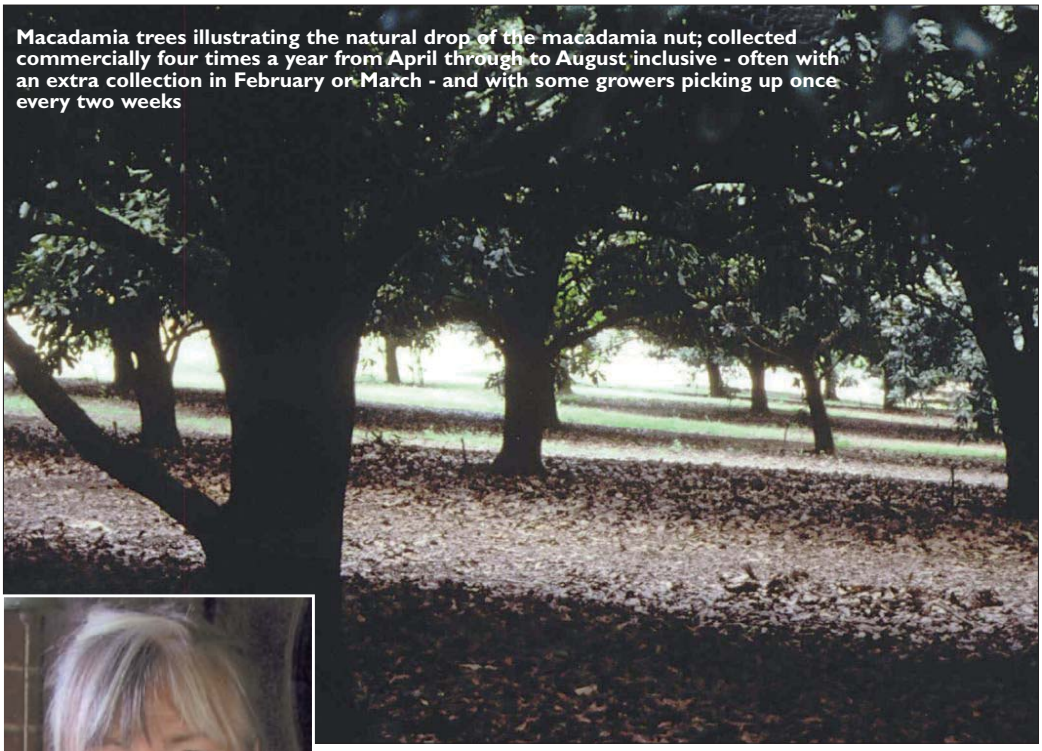
Long service certificates

Name	*Grade*	*Date of Anniversary*
50 years		
Derek John **Greig**	CEng FIAgrE	8 Sep 2005
35 years		
Devathasan **Paul**	MIAgrE	24 Sep 2005
Peter John **Hulbert**	EngTech MIAgrE	15 Oct 2005
Richard Eady **Robinson**	CEng FIAgrE	15 Oct 2005
Harry Narine **Lalsa**	AIAgrE	15 Oct 2005
25 years		
Christine Scott **Clark**	CEng FIAgrE	16 Sep 2005
Peter **Grissell**	CEng MIAgrE	23 Sep 2005
Simon Daniel **Duff**	IEng MIAgrE	24 Sep 2005
John Tavender **Reader**	AIAgrE	7 Oct 2005

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

MACADAMIA NUTS:
ABOUT GROWTH AND CULTIVATION

Dorothy Hollamby



Macadamia trees illustrating the natural drop of the macadamia nut; collected commercially four times a year from April through to August inclusive - often with an extra collection in February or March - and with some growers picking up once every two weeks

BIO NOTE

After bringing up their family and running her own beef herd enterprise, life took an unexpected turn in 1999 when Dorothy Hollamby joined her husband on his flight across Australia in a 'Flying Flea' microlight aircraft. This adventure with its dramatic aerial landscapes triggered a latent passion for photography. Mrs Hollamby now combines plant and rural photojournalism with her main work in the hop gardens on the family farm in Sussex. This article was invited following the publication of a similar contribution to the Royal Horticultural Society's journal 'The Garden'.

Discovery of *Macadamia integrifolia*

An indigenous rain forest tree of Australia, the macadamia was first discovered by Europeans in the 1840's when the German explorer Ludwig Leichhardt discovered it in the Conondale ranges (just north of Brisbane). It was found growing naturally along this subtropical East Coast of Queensland between the 25° and 31° South latitudes; this gave it its nickname the 'Queensland Nut'.

Although there are several different types of macadamia, it is only the *Macadamia integrifolia* and the *Macadamia tetraphylla* that are commercially grown to produce nuts. The Macadamia is also related to the *Grevillea*, *Banksia* and *Hakea*.

Long before European settlement, the aboriginal people knew of this tree and were using its delicious nut, known to them as 'kindal-kindal', 'burrawong' or 'boombetta', as a valuable food source.

The plant was officially named after Dr John Macadam, a medical man and chemist, by Ferdinand von Mueller in 1857. However, it was not until the following year that they learnt that they were good to eat.

The aboriginal people were reported to have told von Mueller that this nut was poisonous! The story told is that in 1858 one of von Mueller's co-workers, Walter Hill, gave some nuts to a young boy to crack, in order to germinate them but the boy ate some and declared them to be delicious. Hill overhearing this was supposedly surprised, the adults waited and when the lad didn't die they also tried them.

The macadamia nut

The macadamia is reputed to be the world's finest nut. This could, arguably, be a matter for personal taste but the discovery that its oil contains no cholesterol and 80% mono-saturated fatty acids, whilst retaining a high burn temperature and a nutty flavour, makes it a valuable resource for today's health conscious society, topping even olive oil. The kernel is protected inside an extremely hard shell which is

itself covered in a thick green husk.

There is an increasing demand worldwide for macadamias as a natural health food. Germany and Japan are the largest importers of the nuts for confectionery, cakes and biscuits; besides cooking, the oil is used for moisturising oils and creams as well as other products. The shelf life of an uncracked nut is around twelve months and can be longer depending on the product.

History and now

The first macadamias were planted commercially in Queensland in 1870 but they had also been exported to Hawaii by 1890's, where they began to be grown and where they became known as the Hawaiian Nut!

Today with the demise of the pineapple and sugar cane industries in Queensland, many growers have now turned their land over to macadamia production. The crop is currently estimated to be worth A$100 million in export and home markets, making macadamias one of Australia's best horticultural industries.

The nuts are exported to over 27 countries where world demand continues to increase, despite Hawaii and a number of other countries continuing to grow these nuts.

Australia is the largest producer of macadamia nuts in the world. They have 800 plantations and produce 10,000 tonnes of kernels with many more plantations either underway already or planned.

Macadamia nuts in January; nuts consist of a kernel which is protected by a hard shell, itself covered in a thick green husk

Macadamia nuts are harvested from below the trees with the 'natural drop' gathered by a pickup machine around four times a year

Harvesting

Plantation planning is, by nature, a long term investment - the grafted trees, at only three metres tall, will produce a light crop after three years which can be collected by hand. After five years they will produce a commercial pick-up, however, it will take at least eight years for a macadamia tree to reach full maturity and return a proper full cropping level.

Macadamia nuts are allowed to fall naturally, once they ripen, and a machine similar to a golf ball pick-up machine then gathers them. This natural drop is collected commercially four times a year from April through to August, inclusive. Often, there is an extra collection in February or March, with some growers picking up once every two weeks.

As the plantations mature and their canopies become denser, they begin to form their own microclimates in this steamy subtropical regions where they are grown, providing perfect conditions for tree ferns to develop and flourish under the canopy.

Due to the eventual size at maturity (over 8 m), macadamia trees in plantations are trimmed back to keep them in good order and to ensure there is sufficient light and air, where required. However, these trees can also be grown in a garden situation, as they are non labour-intensive and do not require pruning. Macadamia trees flower on the old wood and have a scent like honey.

Low on disease

They are relatively disease free, with aphids, leaf miner, a nut borer (*Cryptophlebia ombrodelta*) and a husk spot caused by a fungus which will discolour the kernel as the most common troubles. The most devastating disease is stem rot which will occur if the root is too wet. Areas of clay-based soil would immediately produce stem rot amongst any macadamia trees grown, so these areas are totally avoided by growers.

Growth

The Glass House Mountains with their slightly surreal 'Hobbit' like appearance are part of an old volcanic landscape which has provided areas of a deep, red, sand and loam soil that is extremely free draining. It is in these areas where pineapples with their cactus style requirements traditionally grew. Such are the similarities between the conditions required to successfully grow pineapple and macadamia nut crops that a changeover in production is now taking place. Pineapples attract low revenue and are an extremely labour intensive crop, whereas the demand for macadamias and their oil is growing worldwide and they require far less labour. The conditions in these areas are completely suited to the growth of healthy macadamia trees which produce abundant cropping.

The Macadamia Nursery is situated in the Glass House Mountains. Red and Josh Waterworth, together with their father, purchased the nursery in 1972. Upon purchasing it, they changed from landscaping to growing their own plants and diversified into producing macadamias. This changeover has proved a wise investment as demand has increased and their trees have been a sell-out, with forward orders currently running into Autumn 2006.

The Macadamia Nursery - owned by Red and Josh Waterworth and situated in The Glass House Mountains, Beerwah, Queensland - has found their trees in such popular demand that they currently have forward orders well into Autumn 2006

Macadamia nut husks used as garden mulch; a naturally biodegradable waste product extremely useful to protect areas of planting against Australia's high temperatures

At the nursery, ten different varieties of macadamia trees are grown. However, up to around 200 varieties have been evaluated in trials and rejected – the trees were judged on nut and kernel quality in addition to yield – to arrive at the ten varieties of tree which the nursery now stock. They have 200 stock trees growing at the nursery.

The ripe nuts are collected from the trees, of which 42,000 of these 'seeds' are sown annually. This takes place in autumn when the temperatures are milder. In this area of Queensland, there are hot wet summers with hot nights, whereas moving into the winter months there are clear sky days which are warm and dry with cooler nights temperatures. For this same reason growers will buy their plants in autumn or spring. With the high humidity during the summer months, the nursery has to lightly chlorinate its water supply to stop the build up of algae within the irrigation systems.

Propagation

The shells, of the macadamia nuts, do not have to be cracked prior to sowing, the nuts are collected fresh and therefore greener, allowing germination through the casing as it softens naturally with the effects of the moisture and heat. They are planted in a growth medium with Osmacote, a slow-release fertiliser.

After 12 months, when the seedlings are about one metre high, propagation is completed by bud grafting. This is done outside, not under cover or in a shade house as it is attempted in autumn, when temperatures are not as fierce. Grafting is into the bark about 20-30 cm up from the base between two leaf nodes and is called a 'punch bud'. This is painted with a tree wound dressing and taped. They are grown on in soil-less potting mix. After six weeks the tape is removed and if the bud is still green the tree is cropped off above the leaf node and graft; 10% usually need to be re-grafted. Once the graft has grown to 40-50 cm long the main stem of the original seedling is trimmed at 45° right above the graft.

The young trees are sold as root stocks at eighteen months old and are by then growing-on in eight litre bags of a soil-less potting mix, importantly they are also fully sun hardened. The cost per tree is A$13.00 which includes goods and services tax (GST).

Processing

Ripe nuts from the plantations go to a processing factory. The outer husks are removed; these are sold as garden mulch, a naturally biodegradable waste product which is useful in a country which uses a lot of mulch material to protect against high temperatures. The shell and kernel are then separated with the kernels being graded at this point before further processing. The shells are sold to the power station to be burnt for electricity production. The kernels once graded can then go for cold pressing for oil, or for roasting and maybe coating in a number of either savoury or sweet coverings, e.g. natural, wasabi, chocolate, or honey coated.

It is now believed that by eating 6 - 20 nuts per day you can actively reduce your risk of heart disease. Here, at last, is a product which is not only a natural health food but also tastes hugely enjoyable as well.

A display showing just some of the macadamia nut products available - including dressings, sauces, biscuits and coated nuts to name but a few

LANDOWNERS SOUGHT

Poplar solution to farm diversification

Over the last 30 years intensive 'fruit & veg' farming at Lower Lulham, Madley in Herefordshire has largely given way to tree plantations as the farming partnership of H A Snell & Sons has diversified into The Poplar Tree Company.

Poplar is a fast-growing crop that can attract Woodland Grant funding and the family has diversified not only by planting trees on several hectares of it's own land, supplementing the retained fields of blackcurrant and cider fruit, but also helped over 100 other farmers by planting 1,300 hectares across the country. Much of the poplar currently being harvested by the company during thinning operations is processed into the packaged kindling wood seen on garage forecourts or for use as fire-lighting spills. Waste wood chippings from that production process will then provide a ready source of fuel to help heat the wood-drying process.

Now, with a grant of over £152,000 from Defra's Rural Enterprise Scheme (RES), The Poplar Tree Company is installing a veneer plant to process more of the poplar crop now coming to maturity. The peeler will be capable of processing 5,000 m^3 of poplar each year.

Veneers will be used to manufacture the type of ply currently used for boxes containing fruit, cheese or wine and for chair backs, table tops, window shutters and blinds. Applications in the building industry are finding Poplar being used as an ideal replacement for some plastic uses and dispensing with pallets on transported brick stacks.

Careful thinning, pruning and maintenance of the existing poplar tree plantations ensures that timber felled after 20 years is high quality, with a purer grain and fewer knots, enabling it to be processed for use in functional and decorative items such as furniture, carvings and ornamental woodwork.

To sustain the necessary supply of timber, the search continues for landowners with a few hectares or a few thousand hectares suitable for the planting of poplar as attractive woodland, screening, crop shelter or viable land use. The Poplar Tree Company's full service is not only in site appraisal, planting, pruning, maintaining, thinning, felling and transporting timber but also provides advice and guidance on applying for grants and felling licences.

Starting at around 1-1.5 m planting height, the poplars achieve a base diameter of around 40 cm at 25-30 m height in 20 years. Generally 5-6 different certified varieties from the nursery are planted at each location to give a greater visual appeal, prolonged leaf cover and greater protection against disease.

Hugh Snell, senior partner and father of George and Nick Snell – along with forestry manager, Simon Tambling – each possess expertise in their respective areas of the business. A Nuffield Farming Scholarship enabled George to study poplar wood production and marketing in Chile, Argentina, Spain, France and Italy while Nick's Nuffield scholarship in a marketing field will prove invaluable in furthering the aims of the company.

"The importance of poplar as a profitable crop cannot be overstated – particularly when viewed in the context of the destruction of tropical forests."

George Snell said: "The importance of poplar as a profitable crop cannot be overstated – particularly when viewed in the context of the destruction of tropical forests. Plantations absorb CO_2 emissions and are an ideal way for landowners to combine farmland with woodland. Poplar plantations require less-intensive maintenance for the farmer than most crops and there is no capital outlay for the farmer or landowner.

"Thanks to the Forestry Commission and the Department for the Environment, Food and Rural Affairs (Defra), landowners eligible for grant aid start with a positive cashflow from the outset. Preferred plantation sites are sheltered flat areas of land with good access and high water table but we assess all potential sites before expecting a landowner to enter into an agreement. A family investment of £240,000 in the production facility has started the next stage of growth for The Poplar Tree Company but we would not have been able to progress so swiftly without the grant from Defra. To fully utilise that production facility, we will need to plant and harvest more poplar plantations".

Stephen Hart, Rural Development Service Adviser said: "Given the right circumstances poplar can be a viable diversification for any farmer with more than 1 ha available to plant woodland. Poplar plantations visually benefit the environment and have the ability to encourage a wider array of flora and fauna than managed woodland. This RES project for a veneer processing plant will benefit all the farmers who plant Poplar to supply this Herefordshire facility and provide more jobs in the local community."

MORE INFORMATION

More information can be obtained from www.poplartree.co.uk

ENVIRONMENTAL IMPACT

Report sheds new light on 'food miles'

Food transport has a significant and growing impact on road congestion, road accidents, climate change, noise and air pollution according to a new report published recently by the Department for the Environment, Food and Rural Affairs (Defra). The environmental and social costs of the impacts are estimated at £9 billion per year with more than half due to road congestion. Consumers travel an average of 898 miles a year by car to shop for food and the quantity of food transported by heavy goods vehicles has doubled since 1974. Food transport now accounts for 25% of all heavy goods vehicle (HGV) kilometres in the UK.

The government is working with the food industry to reduce this by encouraging widespread adoption of best practice and by measuring performance. It has consulted on proposals in the draft Food Industry Sustainability Strategy developed with stakeholders and published for consultation in April that the sector prepare by 2006 a plan for achieving a 20% reduction in the environmental and social costs of food transport by about 2012.

The report shows that in general higher levels of vehicle activity lead to higher environmental impacts. But it is not a simple matter of so-called 'food miles'. The mode, timing, location and efficiency of food transport is important as well as the distance.

Sustainable Food and Farming Minister Lord Bach said: "This study is an interesting contribution to the 'food miles' debate. It shows that the issue is complex and that a range of factors have an effect on the overall impacts of food transport, not purely the distance travelled by individual products.

We will update and publish these trends each year and I hope it will lead to a healthy debate between consumers, food producers, supermarkets, environmental groups and public authorities. It provides some pointers for consumers. For example internet buying and home delivery can cut vehicle kilometres and reduce road congestion."

"It shows that buying local products has the potential to greatly reduce the distance food is transported but that the benefits can be offset by increased road congestion if they are supplied in a less transport efficient way. It is clear that organic and seasonally-available food can reduce environmental impacts but that these can be offset by the way they are transported to the consumer's home."

"It is also clear that transport and trade of food has the potential to lead to economic and social benefits, for example, through economic gains for both developed and developing countries, reduced prices for consumers and increased consumer choice."

Findings include the following.

- The environmental, social and economic costs of food transport are estimated at £9bn per year of which £5bn is due to road congestion; £2bn is due to road accidents; £1bn is due to pollution and £1bn to other factors. Looked at another way food shopping by car accounts for 40% of the total costs.
- Food transport produced 19 Mt of carbon dioxide in 2002 of which 10 Mt were emitted in the UK, representing 1.8 per cent of the total annual UK CO_2 emissions.
- 'Food miles' alone is too simple a concept to capture the impacts of food transport. Instead the report recommends focussing on four aspects all of which are proposed in the draft Food Industry Sustainability Strategy as key performance indicators of the food industry's sustainability.
- To cover the impact on road congestion the report recommends monitoring distances travelled transporting food in urban areas. Urban food kilometres increased 27% between 1992 and 2002.
- To cover wider congestion the report recommends monitoring food transport by heavy goods vehicles. Food transport accounts for 25% of all HGV kilometres in the UK.

AUTHOR SUBMISSIONS

Agricultural Engineering for A Better World

World Congress, Bonn, 3rd-7th September 2006,
Deadline for abstracts: 1st February 2006

CIGR, EurAgEng, VDI-MEG and FAO invite you to their joint World Congress, which will be held from 3th to 7th September 2006 in Bonn, Germany. The World Congress will combine the 'XVI CIGR World Congress' with 'AgEng2006' and the '64th VDI-MEG International Conference Agricultural Engineering'. As part of the congress, FAO will hold a workshop on 'Agricultural Engineering Contributions to Solve Future Agricultural Problems' covering two half days.

The scientific sessions, posters, Technical Section meetings, and Special Interest Group meetings of the World Congress will deal with the latest developments in agricultural engineering. The following topics will be discussed: Land & Water Use and Environment, Power and Machinery, Information Systems and Precision Farming, Livestock Technology, Processing & Post Harvest Technology and Logistics, Energy and Non-Food Production Technology, Systems Engineering and Management, Fruit & Vegetable Cultivation Systems and Global Issues.

Meetings will be held mainly in the baroque building of Bonn University and in the International Congress Centre 'Bundeshaus Bonn', which includes the former parliament building of the Federal Republic of Germany.

MORE INFORMATION

Abstracts should be submitted together with the Author Identification to the congress webpage, until 1st February 2006.
VDI-MEG, Graf-Recke-Strasse 84, 40239 Düsseldorf, Germany. Tel: +49 (0)211 62 14 266. Fax: +49 (0)211 62 14 177. E-mail: info@2006cigr.org Website: www.2006cigr.org or

FOOD RESEARCH

£5m to help put better food on our plates

A £5m package of research grants to help deliver food which is healthier, tastier and safer has been launched by Professor Howard Dalton, Defra's Chief Scientific Advisor. The Department for the Environment, Food and Rural Affairs (Defra) will spend at least £5m over the next five years in supporting scientific research under its new Food Quality and Innovation programme. Part of the FoodLINK system, this encourages industry and academic experts to work together on ground-breaking projects to improve food quality, especially between farm gate and shop shelf.

Food Quality and Innovation puts special emphasis on sustainability and waste reduction. Funding is more likely for research proposals which work towards these goals, for instance by reducing packaging or preserving food's nutritional content without sacrificing quality or safety.

Food and Farming Minister Lord Bach said: "This money will help improve the quality of our food. At the same time it will fund research projects which deliver environmental and social benefits and improve efficiency. Good science which takes these into account will help us meet the targets in our Food Industry Sustainability Strategy which include a better national diet coupled with a thriving food industry that uses less power and water and produces less waste."

Defra makes research grants on condition that its funding is matched by industrial partners. The programme is also funded by the Biotechnology and Biological Sciences Research Council (BBSRC) and the Scottish Executive Environment and Rural Affairs Department (SEERAD).

Professor Dalton said: "We now want people to bring us their ideas for research projects to be funded by the new programme. We have identified five key research themes which reflect Defra's priorities for Sustainable Farming and Food and we hope these will be included in many of the applications for funding.

"The LINK system is a proven way of encouraging effective co-operation between Government, industry and academic scientists. The food-processing sector can make a key contribution to sustainable development. The grants we make will support that aim and, at the same time, improve food quality."

MORE INFORMATION

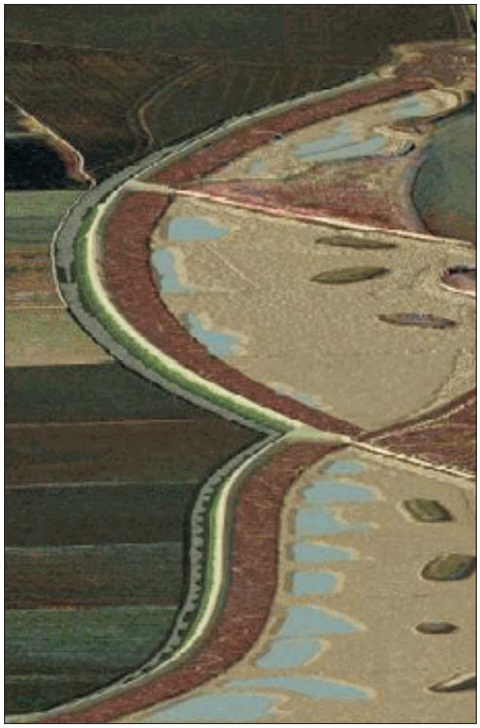
Defra, Nobel House, 17 Smith Square, London SW1P 3JR. Tel: +44 (0)8459 335577. Website: www.defra.gov.uk

ENVIRONMENTAL ASSESSMENT TECHNIQUES

ABPmer helps secure planning permission for creation of new coastal habitat

ABPmer, Associated British Ports' marine environment research subsidiary, has helped secure planning permission for the creation of 108 hectares of new coastal habitat on Wallasea Island on Crouch Estuary in Essex. ABPmer provided the scientific research that supported the Department for the Environment, Food and Rural Affairs (Defra), European Wildlife Division application to the Planning Authority to grant permission for the scheme.

A series of assessments and a number of detailed modelling studies were conducted to produce a scientific assessment of the likely impact the scheme would have on the surrounding environment. Innovative computer-generated three dimensional images were also produced, to demonstrate what the proposed changes to the island's coastline would look like. The project, which is the largest of its kind within Europe, is being driven by the European Wildlife Division and Wallasea Farms Ltd, the island's owners. ABPmer's contribution to the project drew great praise from the project leaders. A spokesman for Defra said: "…the environmental statement and hydrodynamic assessments (were) the best we've ever had. The computer visualisation also went a long way in assisting with obtaining all consents, licences and planning permission."



MORE INFORMATION

Ian Townend, ABPmer Managing Director. Tel: +44 (0)23 8033 8100. Website: www.abports.co.uk

RENEWABLE ENERGY

Industry calls for action to safeguard tallow fuel

Britain's meat industry is united behind calls for changes to legislation governing the use of tallow as a fuel. At a meeting hosted by the United Kingdom Renderer's Association (UKRA), representatives from the farming unions, Government agencies, meat processors, abattoirs and renderers signed up to a campaign for change.

Tallow is used in many household products including soap, cosmetics and paint. It is also a clean green fuel that has been used to power renderers, abattoirs and power plants in the UK since the early 1990s. The Animal By-Products Regulation (ABPR) classifies tallow as a waste when burned, and until now that hasn't been a problem. But, with the introduction of the Waste Incineration Directive (WID) at the end of this year tallow users will have to be WID compliant.

UKRA technical director Stephen Woodgate told the meeting: "In many cases, compliance simply isn't an option. Users will have no alternative but to revert to fossil fuels. Aside from the financial implications, many abattoirs and renderers simply don't have the space to accommodate additional plant and equipment."

In his welcome address, independent chairman and former Agriculture Minister John Gummer MP spoke of "the unforeseen consequences of two otherwise sensible pieces of legislation". He added, "the UKRA's action to promote the issue with the Department for the Environment, Food and Rural Affairs (Defra), the Environment Agency and in Europe has undoubtedly opened minds. The Government has recognised the seriousness of the matter, but we must still press hard for change to take place."

Speaking after the meeting, UKRA Chairman Gordon Braide said: "Together, the British meat industry is determined to be heard on this issue. Common sense dictates that it would be wrong to effectively prevent the burning of a green, clean fuel such as tallow. And as a consequence, drive an industry back to using fossil fuels, with all the negative implications that will have on our environment."

Delegates are now lobbying Government ministers, local Members of Parliament and Members of the European Parliament to reinforce the need for change. They are working, too, with European counterparts to draw support from other member states. Their goal: in the short term, an exemption for tallow under WID; and longer term, reclassification of tallow as a product, not a waste.

RESPIRATORY HEALTH GUIDELINES

HSE publishes revised guidance on the correct selection and safe use of RPE

The Health and Safety Executive (HSE) has published extensively revised and updated guidance covering the correct and safe use of respiratory protective equipment (RPE). *'Respiratory Protective Equipment at Work: A Practical Guide'* provides employers, safety reps and manufacturers who use or supply RPE with advice on ensuring it is selected and used correctly, as required by law. RPE is a type of personal protective equipment designed to protect the wearer against inhalation of potentially hazardous substances in workplace air.

The booklet features a new 'RPE Selector' tool, which takes the user through a simple step-by-step questionnaire to allow them to decide when it is appropriate to use RPE and to select the correct level of protection, such as filter types, required for a given hazardous substance. For ease of use, the booklet contains illustrated examples to ensure the most comfortable RPE design for each individual wearer and the environment they work in is worn. In addition, the book describes examples of significant misuse of RPE, and how to prevent it. It also includes tips and advice on ensuring RPE is adequately maintained so that it continues to work safely.

Dr Bob Rajan, HSE Chemical Risk Assessment and Control Group, commented: "Every year, UK industry spends around £250 million on RPE, but a sizeable portion of this money is wasted because the equipment selected is not right for the job or is used wrongly. This can result in RPE wearers being exposed to avoidable hazards to their health or even life. Chronic ill health, respiratory sensitisation, and – particularly in confined spaces – deaths have all occurred because employers have failed to provide RPE matched to the risks, the work environment and the user."

MORE INFORMATION

Copies of Respiratory Protective Equipment at Work: A Practical Guide, (HSG53, ISBN 0 7176 2904 X), price £10.95, are available from HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA. Tel: +44 (0)1787 881165. Fax: +44 (0)1787 313995. Priced publications are also available from good booksellers.

AIR QUALITY

Air quality for sustainable development

In urban areas in 2004, air pollution was recorded as moderate or higher on 22 days on average per site, compared with 50 days in 2003, 20 days in 2002 and 59 days in 1993. In general there has been a long term decline in the number of air pollution days, largely because of a reduction in particles and sulphur dioxide, but fluctuations from one year to the next can occur because of differences in weather conditions.

Average number of days of moderate or high air pollution per site

Year	Air pollution, days	
	Urban sites	Rural sites
1993	59	33
1994	47	44
1995	50	44
1996	48	41
1997	40	42
1998	24	29
1999	33	48
2000	21	27
2001	25	34
2002	20	30
2003	50	61
2004	22	42

In rural areas, the figure for 2004 was 42 days on average per site, compared with 61 in 2003 and 30 in 2002. The number of days has fluctuated between 21 days in 1987 and the 2003 figure of 61 days. The series can be volatile from one year to the next, and there is no clear trend. This reflects the variability in levels of ozone, the main cause of pollution in rural areas. More ozone is produced in hot, sunny weather, as was the case during 2003.

The indicator is one of the Government's 15 former headline indicators of sustainable development and remains an indicator in the new UK Government Sustainable Development Strategy. It measures the average number of days on which levels of any one of a basket of five pollutants (carbon monoxide, nitrogen dioxide, ozone, fine particles and sulphur dioxide) were 'moderate or higher' according to the Air Pollution Information Service bandings. These five pollutants are recognised as the most important for causing short term health effects.

The main causes of days of moderate or higher air pollution at urban sites are ozone and fine particles (PM10). Sulphur dioxide also used to make a significant contribution but has now fallen to relatively very low levels. The other two pollutants included in the index, carbon monoxide and nitrogen dioxide, have very rarely reached moderate or higher levels since the urban index began in 1993.

Between 1993 and 2004, the average number of days of pollution at urban sites caused by fine particles, solely or in combination with other pollutants, fell from an average per site of about 43 days to 5 days per year. Particles come from numerous man-made and natural sources, and can be generated in the UK or transported from abroad. UK emissions of particles have been reduced substantially in recent years, but the number of pollution days can still fluctuate from year to year due to variations in weather conditions, as demonstrated by the unusually high figure of 17 in 2003.

The average number of polluted days caused by sulphur dioxide, solely or in combination, fell from an average per site of 20 days in 1993 to an average of one-tenth of a day per site in 2004.

Ozone causes the great majority of pollution days in rural areas. Since 1999 it has also caused more days of poor air quality in urban areas than particles have, as pollution by particles has declined. The number of days caused by ozone pollution has fluctuated in both rural and urban areas, with no clear overall trend. Production of ozone is strongly influenced by the weather, being created on sunny summer days. The hot summer in 2003 led to the greatest number of days of moderate or higher ozone pollution since this series began in 1987. The high in 1999 was also associated with a hot summer. A proportion of the ozone experienced in the UK originates from releases of pollution that are blown over from mainland Europe.

Ozone concentrations are generally lower in urban areas than in rural ones. This is because urban areas tend to have higher levels of oxides of nitrogen than rural areas, which in certain circumstances can react with ozone, so reducing the ozone concentration. As pollution from nitrogen oxides in urban areas has been reduced however, this ozone-suppressing effect is smaller than it was.

When interpreting the headline indicator the following points should be borne in mind. First, in terms of public exposure, days of air pollution in urban areas have more impact than their rural counterparts since many more people live and work in urban areas. Second, days of pollution in rural areas are concentrated in the warmer months, whereas those in urban areas are spread more evenly throughout the year.

MORE INFORMATION

Information about the health effects of air pollution can be found in the leaflet 'Air Pollution – what it means for your health', obtainable from the Defra website or ordered by calling the Defra free publications service.
Department for Environment, Food and Rural Affairs, Nobel House, 17 Smith Square, London SW1P 3JR. Tel: +44 (0)8459 556000. Website: www.defra.gov.uk/environment/airquality/airpoll/index.htm

INNOVATION

Converted golf buggy is the answer to disabled farmer's mobility issues

Having lost the use of his legs in a motor cycle accident twenty years ago, Nigel Woodrup could easily have opted to abandon the farming life he knew. But his severe lack of mobility is more than compensated for by resourcefulness, courage and determination. He simply downsized his enterprise and found ways to make it work. Nigel is a practical man who has found a practical solution to mobility in his chosen workplace – a golf buggy, converted to operate with hand controls.

In the Spring of 2005, Nigel purchased a three year old E-Z-GO golf car from his local dealership P.J.Flegg at a cost of £2,150 including the adaptation for disabled use. He already owned a privately imported E-Z-GO, which had given good service. In his words "It was getting on a bit, so I decided to do the job properly."

He employs the E-Z-GO buggy as a genuine multi-purpose vehicle allowing him to respond promptly and effectively to the diverse animal husbandry needs of a small livestock enterprise (and to get his daughter to and from the village school!). These include tending the Wiltshire Horn rare breed (33 ewes & 28 lambs on a 4 ha field and 9 rams on a 1 ha field), taking out the feed and spraying the paddock (the basket on the back takes a 100 litre sprayer).

Nigel has been delighted with its performance and says, "The E-Z-GO is great value at the price I paid and it's going brilliantly. It has easy access, hand rails for support and a clear bench seat which allows me to slide across from the open side. There is plenty of room for my feet. In a perfect world it would have wheelchair storage too, but it is actually a golf car!

"By using a combination of the hand accelerator and hand brake I can hold it on the occasions when it starts to slip and having it licensed for road use is a real bonus, as it allows me to run our daughter to and from her school."

CONTACT

Ransomes Jacobsen Ltd, West Road, Ransomes Europark, Ipswich, Suffolk IP3 9TT.

SOCIAL SOFTWARE

Scientific research in the developing world to benefit from free GenStat statistical software

VSN International, developers of the GenStat statistical system, has launched a free version of their commercial software available to non-commercial users and not-for-profit organisations in developing world countries.

"The discovery project demonstrates that it is possible to strike a balance between commercial activities and social responsibility," said Roger Payne, Chief Scientific and Technical Officer, VSN International. A close relation to VSN International's commercial version of GenStat (edition 8), the GenStat Discovery Edition addresses one of the major constraints to scientific research in the developing world; the unavailability of proven analytical software.

CONTACT

GenStat for Windows Discovery Edition is available for immediate download. Website: http://discovery.genstat.co.uk

COMPOSTER

Cost effective green solution for organic waste

Teg Environmental's unique in-vessel composting system provides a cost-effective, green, safe and sustainable solution to the growing problem of organic waste disposal – treating biodegradable municipal waste, animal by-products, catering and supermarket food waste, biosolids and many other organic waste streams.

Teg has designed and produced a specialised composting system that provides a proven, efficient and cost-effective disposal alternative to landfill or incineration as a means of treating organic waste. Potential customers for this solution include contractors, local authorities, waste management companies, food processors, farmers and landowners.

The Company's expanding market is driven by increasingly stringent EU and UK legislation regulating the treatment and disposal of organic waste.

Existing and forthcoming legislation will make landfill an un-economic or illegal option, so high capacity, continuous-flow in-vessel composting systems are increasingly becoming the answer, as demonstrated by the City and County of Swansea and Banham Compost Ltd.

The Teg system has a major price advantage in capital and operating costs against the alternatives. The silo-cage process is a continuous-flow system, with a small footprint and high throughput, ensuring no wasted capacity. The Teg silo-cages can be housed within a self-contained barn, are not unsightly and are environmentally friendly alternative to landfill or incineration. Natural aeration with no agitation yields low power usage and minimum emissions - making this the best low cost, environmentally safe choice.

Teg Environmental's unique in-vessel composting system - the most cost effective green solution to organic waste

What is more this unique British design, at the forefront of green technology, recycles organic wastes into a safe, pathogen-free, humus-rich, natural fertilizer of recognised quality that adds value to the soil. Containing no added chemicals, it improves crop yields, increases disease resistance and reduces the need for pesticides. Peat-free, this fertilizer is suitable for use by supporters of the peat-free charter. The resultant mixture also adds useful levels of magnesium and sulphur which is attractive to farmers.

CONTACT

Teg Environmental, Unit 6, Meadowcroft Business Park, Pope Lane, Whitestake, Preston, Lancs, PR4 4BA. Tel: +44 (0)1772 422220 Fax: +44 (0)1772 422210 Email: fiona@tegenvironmental.co.uk Website: www.tegenvironmental.co.uk

POWER TOOLS

Makita launch lithium-ion battery technology

Makita, Britain's No. 1 professional power tool manufacturer is introducing a new battery science – lithium-ion – that provides maximum energy capacity long-life and, at the same time, a dramatic 40% saving in weight.

The introduction of lithium-ion batteries for cordless power tools provides the operator with greater working capacity. Lithium-ion batteries feature a high energy density technology that will deliver nearly 300% more working capacity during the lifetime of the battery when compared to traditional Ni-Cd batteries.

Lithium-ion batteries provide high-energy capacity and accept more repeat charges giving a real 'long-life' service. At the same time the substantial weight saving provides increased operator comfort and safety. Like nickel metal hydride there is no charge cycle memory and lithium-ion provides non-fading power throughout the battery charge cycle.

The first tools to be launched by Makita with lithium-ion batteries as standard are the BTD130F 14.4V Li-ion high performance impact drivers. These impact drivers can deliver a massive 140 Nm of driving torque, capable of installing a M12 high tensile bolt. With up to 3,200 blows per minute available the BTD130F has a compact (146 mm) body length and with the new lithium-ion battery fitted weighs just 1.4 kg.

These highly efficient impact drivers also meet the latest 'fashion' trends of younger tradesmen, as Makita offers three alternative body colours, the recognised Makita blue, a stylish red and an elegant white version which could potentially appeal to those working in the food or medical environment.

Stylish, powerful, lightweight and with lithium-ion battery technology these new Makita impact drivers set new levels of power tool performance.

CONTACT

Makita (UK) Ltd, Michigan Drive, Tongwell, Milton Keynes, Bucks, MK15 8JD. Tel: +44 (0)1908 211678 Fax: +44 (0)1908 211400

SPARES

Allmakes Filter replacement tractor parts catalogue

Exeter based Vapormatic Co. Ltd., has just released the latest edition of their Allmakes Filter catalogue, which is already proving to be a market leading source of replacement agricultural filter parts.

Vapormatic have been selling quality agricultural and industrial replacement parts and accessories to the farming sector for more than 50 years. With vast experience of the market's needs, each time tractor users order from Vapormatic they can have total confidence in the company's desire to supply a first class product.

Filters featured in the catalogue include items for 14 different makes of agricultural tractor and combine harvester, covering all the critical parts, for both major and minor servicing requirements and breakdowns, including: fuel, engine oil, air system, coolant, hydraulic, transmission, power steering and cab air.

Allmakes Filter catalogue - a leading source of replacement agricultural filter parts

Carefully compiled, the updated catalogue features cost-effective replacement parts for 2082 models dating back more than fifty years to 1950. Around 430 filters are sized to cover 17,062 individual tractor applications in the power range 17 - 141kW and it includes 145 new items.

Supplementing the 'tractor search' feature on the Vapormatic website, at **www.vapormatic.com,** the new 350 page catalogue is now available from the Vapormatic Sales Department in Exeter.

Vapormatic's expert technicians have carefully compiled the Allmakes Filters catalogue in an easy to understand format, with user-friendly features designed to both simplify and speed up replacement tractor parts sourcing. Parts can be searched via the tractor model number, machine area and original part number.

All parts in the catalogue are equivalent in application to the original equipment and are covered by Vapormatic's industry leading 12 months parts and labour warranty. Vapormatic provide tractor users across the UK with *'The Genuine Alternative'.*

CONTACT

To obtain a catalogue contact the Vapormatic Sales Department in Exeter. Tel: +44 (0)1392 684000 Email: enquiries@vapormatic.com

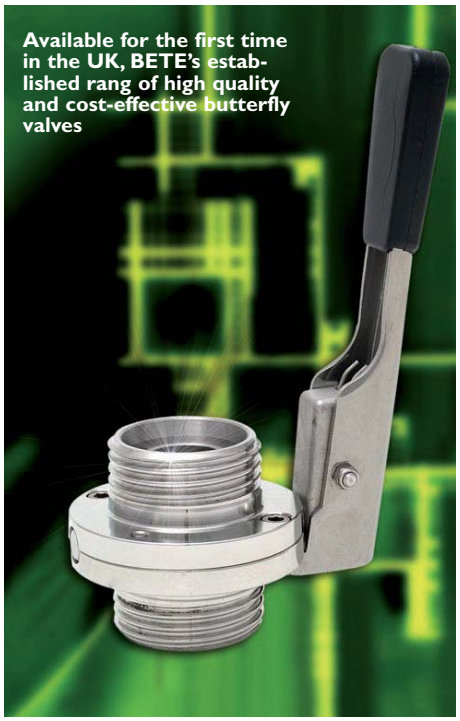
FLOW VALVES

High-performance range of butterfly valves now available in the UK

An established range of high-quality and cost-effective butterfly valves is available, for the first time, in the UK. Supplied direct from BETE Ltd, the valves meet the highest standards in performance and efficiency and are ideally suited to a wide variety of sectors including the wine, brewing, distilling, dairy, chemical and pharmaceutical industries.

Established in 1950, BETE has been acknowledged as a pioneer and market-leading developer of specialised spray nozzles for a wide range of sectors, particularly industrial, pollution control and fire protection applications.

Designed to meet the strictest hygiene standards, BETE Butterfly Valves are manufactured in BS 316 stainless steel with rugged construction for extreme durability and ease of operation. Delivering superior flow control for both liquids and gases, the quick-opening devices allow a high coefficient of flow and, unlike ball valves, do not contain pockets in which fluids may become trapped when the valve is closed.



Available for the first time in the UK, BETE's established rang of high quality and cost-effective butterfly valves

Resistant to a wide range of chemicals and cleaning fluids - either hot or cold - the hard-wearing components are available in a number of fitting arrangements to suit every application, including: BSP threaded, flanged, sanitary 'quick fit' or combination thereof.

Butterfly valves are available in sizes from 25 mm to 101 mm and weigh between 725 g and 6.555 kg. A range of ergonomic handles and pneumatic actuators are also available.

CONTACT

Beesh Zytynski, BETE Limited, PO Box 2748, Lewes, East Sussex, BN8 4HZ. Tel: +44 (0)1273 400092 Web: www.beteuk.com

GANG MOWER

Pristine grass airstrip wins award for International airport

Northrepps International airport, located close to the north Norfolk coast near Cromer, has won the Brian Cosgrove Award for the Best Kept Airfield in the United Kingdom for 2004.

Presented by the British Microlight Aircraft Association, this award acknowledges the high standards maintained at the airfield, especially the condition of the grass airstrip which is particularly microlight friendly.

The airstrip measures 493 m by 23 m and there's also a grass parking area, both of which are mowed once or twice a week depending on the weather conditions, by local contractor Hayden Ltd, using a Ransomes Highway ride on triple mower.

There has been an airfield on the Gurney family estate since the early 1930s and one located at the present site since 1968. Chris Gurney operated the airstrip on a part-time basis until 1982 and since then it has become a full time business. Various companies use the facilities as a base for crop spraying, air taxi services and for servicing the offshore oil and gas industry.

Ransomes Highway ride on triple mower outstrips the competition, to achieve the Brian Cosgrove Award for the Best Kept Airfield in the UK for 2004, for Northrepps International airport

Northrepps is open all year round and accepts single and twin engined light aircraft, civil and military helicopters and is used by the emergency services including the Air Ambulance and RAF Air-Sea Rescue helicopters for training air and ground crews.

Chris Gurney commented, "We are obviously thrilled and delighted to have won such a prestigious award as this and it's a testament to the effort and resources that we have applied to Northrepps over the past 23 years. It's also a reflection on the superb efforts of Colin Hayden and his team using the Ransomes machine. With his previous mower it took around four hours to cut the strip, but with the recently purchased Highway it takes about an hour."

International is a pertinent description for Northrepps as pilots from Holland, Belgium and Germany are regular visitors. The furthest visitors arrived on a flight from the Pyrenees on the French/Spanish border.

CONTACT

CNH. E-mail: j.hewett@cnh.com Website: www.cnh.com

OUTDOOR EQUIPMENT

Makita expands petrol hedge trimmer range

Makita has doubled the number of petrol engine hedge trimmers in its expanding range of outdoor power equipment: four models provide powerful performance suitable for all domestic and commercial operations. Two models feature an innovative swivel handle that turns through 180 degrees and locks in five different positions, enabling the operator to hold and control the trimmer more comfortably at various angles, particularly making vertical trimming easier.

The Makita HTR4900 has a 49 cm blade length with double action blade operation for fast, high capacity trimming. Powered by a 21 cc engine delivering 0.62 kW, this new lightweight machine with swivel handle is a responsive machine with wide trigger control and low vibration soft grip handle. For tougher jobs, the HTR5600 has a 24.5 cc 0.89 kW motor with a 56 cm double action blade. The HTR7610 has the same 24.5 cc engine and offset handles and extra durable gear head for the toughest commercial work.

The top of the range HTB7600 hedge trimmer has a mighty 28.3 cc two-stroke motor to power the giant 76 cm single sided blade through the toughest hedging. Weighing just 5.1 kg and with the swivel rear handle this versatile machine with low vibrations of just 1.6 m/s^2 at the back handle and 2.6 m/s^2 at the forward handle, this machine will become the main choice for municipal and commercial ground care contractors.

CONTACT

Makita (UK) Ltd, Michigan Drive, Tongwell, Milton Keynes, Bucks, MK15 8JD.
Tel: +44 (0)1908 211678
Fax: +44 (0)1908 211400

LANDSCAPE MAINTENANCE

Rubber crawlers for Kyoeisha's hammer knife mower

Since 2004, Yuasa is the importer and distributor of Kyoeisha hammer knife mowers for all European countries. Kyoeisha is the leading manufacturer in Japan for garden and landscape maintenance equipment. Founded in 1910, they have an experience of more than 90 years.

For starting the distribution in Europe, Yuasa has chosen two models of the HM Series, the HMA1560 and HMA1720. These machines are designed for cutting, collecting and removing grass from areas that range in size from small empty lots to airports. Soft ground and steep riverbank slopes are no problem for the strength and efficiency of the Kyoeisha hammer knife mowers.

Cutting width of the HMA1560 is 1,540 m with an adjustable cutting height of 30 to 280 mm (maximum 420 mm). The low ground pressure of 2.5 kPa allows the machine to run on soft and wet surfaces while still keeping a high working speed. Fast job is guaranteed also on steep slopes. Thanks to a very low centre of gravity, the static roll over angle is 60° to the side and 70° to the front and rear side.

The Kyoeisha hammer knife mower has a very low center of gravity; the static roll over angle is 60° to the side and 70° to the front and rear side enabling it to work on steep embankments.

Users of HMA1560 and HMA1720 can enjoy a productivity of 0.9 ha/h. This is reached by the mechanical drive connection of the hammer knife mower which uses free-standing cutting blades that cannot be damaged so easily by small rocks or dry twigs. This makes the machine ideal for work on riverbanks and other rough, irregular and uneven terrains.

Both models are equipped with a 27 kW Mitsubishi diesel engine. The drive system is fully hydrostatic and controlled by only one lever. Oscillating rollers, an emergency stop system, an automatically adjustable (to inclination) operator's step, etc., guarantee comfortable and safe working conditions.

Maintenance is easy due to the typical Japanese high quality-finish in every technical detail.

CONTACT

S. Kawasaki. Tel: +44 (0)6152 977811
E-mail: S.Kawasaki@yuasa-europe.com.
Website: www.yuasa-europe.com

ROBOT

SCARA delivers improved speed to food industry

TM Robotics has launched the Toshiba Machine TH450 SCARA robot, which greatly enhances the speed capacity of the previous models. Perfect for the food industry, and the quickest SCARA robot in its class, it achieves goalpost cycle times of less than 0.3 seconds. The new robot meets the increased speed and productivity demands from European manufacturers, struggling to compete with cheaper labour costs overseas.

As well as the traditional users of robot systems, this powerful package should be of great interest to manufacturers operating high-speed processes such as food processing or packaging. "This extremely cost effective solution, with very short payback times, should attract manufactures of all sizes," commented Nigel Smith of TM Robotics. "Smaller companies will be interested in its affordability, while manufacturers specifying larger lines will note the extremely attractive return on investment cycle."

TM Robotics has launched the Toshiba Machine TH450 SCARA robot which greatly enhances the speed capacity of the previous models

An arm length of 450 mm and a payload of 5 kg complement the TH-450's enhanced speed capability. Meanwhile, linear and circular conveyor synchronisation capabilities represent a very powerful package when combined with easily integrated vision systems.

The new robot's user-friendly TS2000 controller features a built-in programmable logic controller (PLC), allowing complete system control to be handled from the robot controller. The TS2000 controller is equipped with 70 input/output (I/O) as standard but extendable up to 166, to satisfy even the thirstiest of I/O requirements.

The robot programming language is SCOL, which is similar to BASIC and this can be used across the complete Toshiba Machine SCARA and Cartesian robot range, creating an easy upgrade migration from previous models to the TH450. Motion control commands include single axis motion, synchronous motion, linear interpolation, circular interpolation and arc motion.

An extensive range of control options includes Toshiba Machine's Windows based TSPC programming software, inclusive of three dimensional (3D) simulation of the robot movement. Ethernet, DeviceNet and Profibus communications provide advanced programming flexibility.

MORE INFORMATION

Nigel Smith, TM Robotics (Europe) Ltd, Unit 15, The Weltech Centre, Ridgeway, Welwyn Garden City, Herts, AL7 2AA. Tel: +44 (0)1707 871 535

INSECT CONTROL

Protest as Calor launches portable midge catching device

A new portable version of the Calor Midgeater - the Midg-it - has been launched amidst a mock protest from the newly formed Midge party.

The new device - like its big brother the Midgeater Plus is developed and manufactured in Scotland by Texol Technical Solutions - has been designed mainly for the domestic market.

At the launch Calor Scotland's Graeme Anderson said: "Since we launched the first Midgeater two years ago, demand has exceeded our expectations. However, there have been constant calls from the outset for a smaller more portable product.

"The Midg-it has been tested in the field by Texol and leading midge expert and Director of Advanced Pest Solutions, Dr Alison Blackwell. It meets the criteria of portability without compromising performance, delivering the main benefits of the larger machine but in a simpler and more compact housing.

"As we were launching in the midst of a General Election, we thought we could add a little light relief," joked Graeme, as he mimicked the politicians and unveiled the first Midg-it poster. However, a giant six foot midge was also on hand to get the biting insects' view across.

The Midge Manifesto says: "Midges have been in Scotland for a very long time. People are here to provide us with blood-feeds and we believe devices such as Midg-it are giving them an unfair advantage.

Dr Alison Blackwell from Edinburgh University putting the case for midge control devices such as the Midg-it™, with the Midge Manifesto candidate holding his own against the original Midgeater Plus™ in the background

"All we want is a tiny amount of their blood. Instead they are installing devices which lure us under false pretence into a machine. I am calling on the human political parties to think again about rights for midges, after all there are a lot more of us than there are of the people they claim to represent."

Providing balance to the midge's comments Edinburgh University based Dr Blackwell pointed out why midge control devices such as the Midg-it are desirable:

"Whilst I would not subscribe to suggestions that we should look at totally eradicating biting-midges, I do believe there is significant potential for localised midge management programmes.

"Devices such as the Midg-it can help with local midge management by drawing biting insects away from humans and trapping them. Midges look for blood-feeds before they breed, so each midge caught potentially stops hundreds more being hatched.

"In the height of the midge season, there are millions of them about and each female is on the hunt for a blood-feed. To put some idea of scale to their population, my team have previously recorded around half a million midges emerging from a two metre square area of ground in just one night.

"Local midge management tools such as the Midg-it will never have a significant impact on the overall midge population but they can help humans co-exist with midges by reducing local numbers."

The Midg-it is the third Midgeater product to be developed for Calor by Dundee based engineering firm Texol Technical Solutions. Like the Midgeater Plus - which is aimed primarily at larger gardens and commercial use - the Midg-it uses a catalytic process to generate heat and carbon dioxide from Calor Patio Gas.

As it is the main constituent of exhaled breath carbon dioxide is a strong attractant for midges, especially when it is at body temperature. The carbon dioxide produced by the Midg-it is passed over a specially scented bait to further entice midges to the machine.

In addition to ensuring that the carbon dioxide is warm enough to mimic exhaled breath, the heat produced by the catalytic burning of the Calor gas is also used to generate the electricity needed by the Midg-it to power its suction fans. Consequently the Midg-it does not require any external electrical power-supply, thus aiding its portability.

"The Midg-it has been designed to complement the successful Midgeater Plus, by added portability to our proven midge catching technology," explained Alistair Todd. "It is compact and light enough to be moved around the garden as required and can easily be put in the boot of a car, to take on holiday trips to midge infested areas."

The Midg-it went on public display alongside its big brother the Midgeater Plus at Scot-Hot, the catering-trade exhibition at the SECC. It is now available to order online at **www.midgeater.co.uk** or by visiting one of the selected Calor retailers throughout Scotland. The Midg-it is priced at £499 (inc. VAT and delivery to mainland Scotland) and the Midgeater Plus is priced at £649 (inc. VAT and delivery to mainland Scotland).

CONTACT

Brian Frame, Texol. Tel: +44 (0)1382 618402 Mobile: +44 (0)7970 241378 E-mail: brianf@texol.co.uk Website: www.texol.co.uk

New one-man auger

Minimised vibrations for outstandingly comfortable operation

The new one-man auger Stihl BT 121 sets standards with its high power and outstandingly comfortable operation.

A newly designed handle frame, with highly effective vibration damping and a large new hip pad, reduce vibrations to an exceedingly low level - allowing holes to be drilled with considerably less energy and without tiring. The powerful petrol engine and robust drilling gear with high torque, give this light earth auger the power needed to drill holes with a diameter up to 20 cm - ideal for planting or for fence posts, supports or marking poles.

The new one-man auger is designed for use on farms and in the forestry sector, for landscape maintenance, in orchards and parks. Its low weight and compact dimensions make it easy to transport from one place to another so that the powerful auger is always on hand whenever holes have to be drilled.

Stihl BT 121 with new vibration damped handle frame for outstanding user comfort; powerful, high torque engine and robust drilling gear are designed to drill holes up to 20 cm diameter

Saves user energy

The Stihl BT 121 has been designed to make work comfortable, safe and efficient. The new vibration damped handle frame, for example, reduces vibrations by more than two thirds in comparison to its predecessor. This tangibly saves the user's energy and lets them work without tiring, and a large new hip pad fitted as standard, brings additional comfort for the operator. The auger also scores highly when it comes to safety at work: incorporating the innovative Stihl QuickStop drill brake which was first introduced in the mid 1990's and this proven system remains popular today. If the auger's drill jams in the ground, the Stihl QuickStop drill brake is triggered, bringing the drill to a halt and thereby preventing the user from losing control of the machine. The brake also enables the user to 'unscrew' the auger from the ground should it get jammed. Safety and convenience are further promoted by the location of controls on the multi-function handle - enabling the user to control all engine functions without needing to let go of the machine.

Powerful on the job with little maintenance effort

The auger is driven by a powerful 1.3 kW 2-stroke engine which can be started quickly and easily, even after long breaks in use, thanks to the additional manually actuated fuel pump. The carburettor with compensator ensures long intervals for cleaning the air filter, while reliably protecting the power unit. The range of accessories for the low-vibration auger includes earth drills from 4 to 20 cm in diameter, a planting auger and planting hole drills for a whole variety of uses.

CONTACT

For a catalogue on the comprehensive range of outdoor power equipment from Stihl, and details of local authorised Stihl dealers, visit the website : www.stihl.co.uk, or Freephone 0800 13 7574 quoting PRSTP.

CULTIVATOR

Lynx launch Streamline

Developed to complement rear mounted and trailed stubble cultivator and drill systems, the twin disc Streamline TD is the latest front cultivator from Lynx Engineering. Designed to meet the growing need to reduce the number of cultivation passes required to produce a seedbed, the Streamline TD will initially be offered in 4 m hydraulically folding form, with 3 m rigid and 6 m folding units to follow later in the year.

To ensure good trash clearance, the Streamline TD has its 510 mm paired discs staggered over two rows. Each disc set is in turn supported on a rubber cushioned trailing leg to provide shock load protection at high working speeds. Working depth is controlled via a pair of adjustable wheels.

Twin disc Streamline TD is the latest front cultivator from Lynx initially offered in 4 m hydraulically folding form, with 3 m rigid and 6 m folding units following later in the year

Lynx has also completed development of its rigid tine Streamline T model. Working a wide range of soils, and in varying conditions, the prototype was used by a number of farm operators. Following feedback, detail design changes have been made to the front depth wheels and headstock. The basic design which includes a mechanically adjusted cracker board behind two rows of shearbolt protected rigid tines, is unaltered. Three hydraulically folding versions of 4 m, 6 m and 8 m are available, plus two rigid units of 3 m and 4 m.

'Our Streamline cultivators have been purpose designed for front mounting," says Nick Ewbank of Lynx. "The TD twin disc unit offers extremely good mixing of the top soil, this making it a good choice when matched to a tillage drill combination on the rear of the tractor. The fixed tine Streamline T performed extremely well last autumn and is a good tool for opening up the soil ahead of a rear mounted cultivator or set of discs. It also works well directly into ploughed ground and helps produce a firm, level surface ahead of trailed equipment".

CONTACT

Nick Ewbank, Lynx Engineering, Wharf Works, Long Buckby, Northampton, NN6 7PP. Tel: +44 (0)1327 843215 Fax: +44 (0)1327 844341

FLAIL MOWER

New off-set mower for verge and bank maintenance

Ferri has introduced a new verge mower which is off-set completely outside the wheel tracks of the tractor to give full-width cutting on banks and verges with angle adjustment down to 450 below horizontal.

The new Ferri ZMTE is available in 1.6 m, 1.8 m and 2 m cutting widths for use with tractors from 37.5 kW to 60 kW minimum, depending on the width. Swinging steel front safety flaps prevent foreign objects being thrown out, and an adjustable rear hood controls the discharge in different conditions. Rotor speed is 2430 rpm or 2511 rpm, depending on the model, and the pto, which operates at 540 rpm, has an over-run clutch. The hydraulic side-shift

Ferri ZMTE; a verge mower off-set outside the wheel tracks of the tractor to give full width cutting on banks and verges

cylinder is positioned within the parallel arms to protect it during work, and for transport the machine is rotated directly behind the tractor.

Other features include a height-adjustable rear roller, self-lubricating bushes on joints, a double-skin housing for longer life, and a 'tidy point' for holding hydraulic connections when the machine is disconnected from the tractor. Y-shaped multiflails or forged hammer flails can be fitted.

Ferri mowers are distributed in the UK by Rustons Engineering of Huntingdon.

CONTACT

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

Sprayer mounted Outcast spreads slug pellets further

The Outcast uses three satellite distribution heads (inset) across a 36 m sprayer boom to achieve an even and accurate slug pellet spread across the entire width

A new innovation from Techneat Engineering will now enable the accurate spreading of slug pellets during crop spraying operations with machines of up to 36 m boom width. The Outcast features three satellite precision spinning disc distributors, fed from a centrally mounted hopper and metering unit.

The cyclone distribution heads are an entirely new Techneat design, each enabling the accurate application of slug pellets across a 12 m bout width. The Outcast is primarily designed for potato and field vegetable growers but will prove equally valuable for slug pellet applications in autumn oilseed rape and cereal crops, according to designer, Tom Neat.

"Quality potato and field vegetable production has zero tolerance for slug damage. Applying fresh low dose of slug pellets when weather conditions are conducive to slug activity can help to minimise overall pellet use and improve the levels of control," he says. "Weather conditions requiring blight and fungicide sprays usually coincide with highest levels of slug activity. Repeated applications of fresh pellets offers the most effective control.

"The Outcast is a quick and efficient means for spreading slug pellets, without need for an additional pass through the crop. With full in-cab controls operators can simply switch on applications for headlands or high risk areas of known slug damage, where required," he adds.

Hitherto most operators had been trying to spread slug pellets across 36 m from a single centrally mounted distributor which was proving extremely inaccurate. Options were to fit two distributors along the boom, with inherent problems of weight distribution and extra cost. Alternatively, mounting hoppers high up on the spray rig, in an effort to increase spread width, did little to improve accuracy, and made loading a dangerously precarious operation. The Outcast overcomes all these problems, according to Mr Neat.

The centrally mounted 90 *l* capacity hopper can be lowered with the boom for easy and safe filling. Holding around 70 kg of mini-pellets, each fill will cover 35 ha at a low dose 2 kg/ha rate - the same as a 3,500 *l* capacity sprayer operating at 100 *l*/ha.

The Outcast distributes slug pellets from the single, fully adjustable, metering mechanism to the satellite spreading heads with a high capacity electric fan. "Calibration and tray tests have shown the cyclone distribution heads provide an extremely accurate and even spread of pellets across the entire width," added Mr Neat.

In the first week of its commercial launch the Outcast has already been fitted to three 36 m sprayers for major potato and field vegetable growers across the eastern counties.

Fitting kits are available for most leading 36 m sprayer manufacturers. The Outcast can also be fitted with two distribution heads for 24 m sprayers.

CONTACT

Techneat Engineering Ltd., Henry Crabb Road, Littleport, Ely, Cambridgeshire, CB6 1SE. Tel: +44 (0)1353 862044 Fax: +44 (0)1353 862644 Mobile: +44 (0)7801 152545 E-mail: info@techneat.co.uk Website: www.techneat.co.uk

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