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LANDWARDS

Spring 2006

- Tillage Dynamics
- Engine Development

Canefield Cultivator

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Ethics in Engineering: Academy launches Statement of Principles

The decisions and actions of engineers have a profound impact on the world we live in, and society at large. Making a clear and public commitment to operating with integrity and honesty is essential to create a greater level of trust and confidence, and a positive perception of the engineering profession.

The Royal Academy of Engineering, in collaboration with Engineering Council (UK) and a number of the leading professional engineering institutions, has created a Statement of Ethical Principles to which it believes all professional engineers and related bodies should subscribe.

"Engineers have a profound impact on the world in which we live. To ensure that this impact is always directed towards the public good, it is essential that we operate with a real commitment to honesty and integrity," says Lord Broers FREng FRS, President of the Royal Academy of Engineering. "We can only be proud of our profession if we behave, and are seen to behave, ethically."

Engineering is the knowledge required, and the process applied, to conceive, design, make, build, operate, sustain, recycle or retire, something of significant technical content for a specific purpose – a concept, a model, a product, a device, a process, a system, a technology.

Engineers are individuals who apply this creative process. Professional Engineers work to enhance the welfare, health and safety of all whilst paying due regard to the environment and the sustainability of resources. They have made personal and professional commitments to enhance the well-being of society through the exploitation of knowledge to create new things and the management of creative teams.

This statement of Ethical Principles establishes the standard which the members of the engineering profession adopt to regulate their working habits and relationships. The values on which it is based should apply whether or not an engineer is acting in a professional capacity.

There are four fundamental principles which guide an engineer in achieving the high ideals of professional life. These express the beliefs and values of the profession and are amplified below. To aid interpretation in practical situations guidance notes will be provided.

Accuracy and veracity

- Professional Engineers have a duty to ensure that they acquire and use wisely and faithfully all knowledge relevant to the engineering skills needed in their work in the service of others; they should:
- act with care and competence in all matters relating to duties;
- maintain up to date knowledge and skills and assist their development in others;
- perform services only in areas of current competence;
- not knowingly mislead, or allow others to be mislead, about engineering matters; and
- present and review engineering evidence, theory and interpretation honestly, accurately and without bias and quantify all risks.

Honesty and integrity

There are fundamental common values that bind all humanity together: the profession derives its ultimate value from people. Accordingly, all dealings with others should be conducted with fairness and honesty and Professional Engineers should accord the highest importance to freedom of choice, equality of opportunity and social justice; they should:

- be alert to the ways in which their duties derive from and affect the work of other people; respect the rights and reputations of others;
- avoid deceptive acts and takes steps to prevent corrupt practices and professional misconduct; declare conflicts of interest;
- reject bribery or improper influence; and
- act for each employer or client in a reliable and trustworthy manner.

Respect for life, law and the public good

In making choices, Professional Engineers should give due weight to all relevant law, facts and guiding principles and to the public interest; they should:

- ensure that all work is lawful and justified;
- minimise and justify any adverse effect on wealth creation, the natural environment and social justice whilst ensuring that all developments meet the needs of the present without compromising the ability of future generations to meet their own needs; and
- act honourably, responsibly and lawfully so as to uphold the reputation, standing and dignity of the profession.

Responsible leadership: listening and informing

Professional Engineers should exercise high standards of leadership in the exploitation and management of technology. They hold a privileged and trusted position in society and have a duty to ensure that their position is not used to the benefit of personal or sectional interests or to the detriment of the wider community but is seen to reflect public concern; they should:

- identify and be aware of the issues that engineering raises for society; listen to the aspirations and concerns of others;
- lead in promoting public awareness and understanding of the impact of engineering achievements; and
- issue public statements only in an objective and truthful manner.

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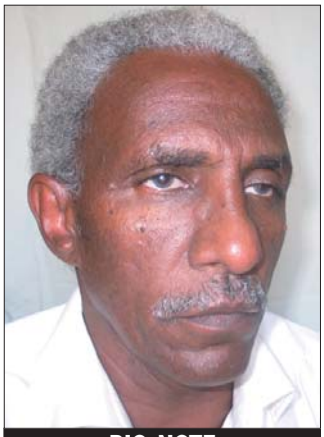
Front cover: *Straw bales for cattle bedding handled with the Maxxum 100x tractor and LRX loader (Photo: Case IH)*

ISSN 1363-8300

The canefield cultivator; a two-furrow, tractor mounted machine designed to comprise functional components of a chisel cultivator, two fertiliser applicators and a ridger.

A CANEFIELD CULTIVATOR FOR RATOONS

Elbashir A Hammad



BIO NOTE

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Abstract

Sugar cane is grown in Kenana Estate (Sudan) as an irrigated crop using the ridge and furrow system. Cultivation practices for ratoon cane establishment are rather intensive. Conventionally, four to five operations are performed to reform the ridge and furrow system and to incorporate fertiliser in the furrow soil.

A ratoon cane field cultivator was designed to accomplish in a once-over manner, required ridge and furrow profiles with granular fertilisers placed and covered at the sides of the furrows, adjacent to the cane rows.

Ridge and furrow profiles produced by the cultivator were similar to those produced by Kenana conventional practice. However, with the cultivator, energy in kWh/ha and tractor-hours/hectare to reform the profiles and incorporate fertiliser, were respectively 67% and 30% of those required with the conventional practices.

Introduction

Sugarcane in the Sudan is grown as an irrigated crop in the Central Clay Plain situated between latitudes 10° and 16° north and longitudes 32° and 37° east. The plain is Vertisolic, of 60 to 80% clay, with a dominance of smectite clay minerals (Blokhus, 1993).

In Kenana (latitude 13° N and longitude 30° E), the largest and leading sugar estate in Sudan, sugarcane is grown over an approximate area of 40,000 hectares, using the ridge and furrow system. A cane production cycle starts with plant cane and may continue to the 9th ratoon according to the productivity of the particular field. Ratoons constitute more than 80% of the total area under cane.

Adopted cultivation practices for ratoon cane establishment are intended to enhance adequate irrigation, to incorporate fertiliser in the furrows and to provide traffic lanes. Operations start with chiselling the furrows (inter-rows) to an approximate depth of 10 cm to loosen surface soil, followed by reformation of ridge and furrow profiles using double-row ridgers. Triple superphosphate and urea fertilisers are then separately broadcast on the furrows and

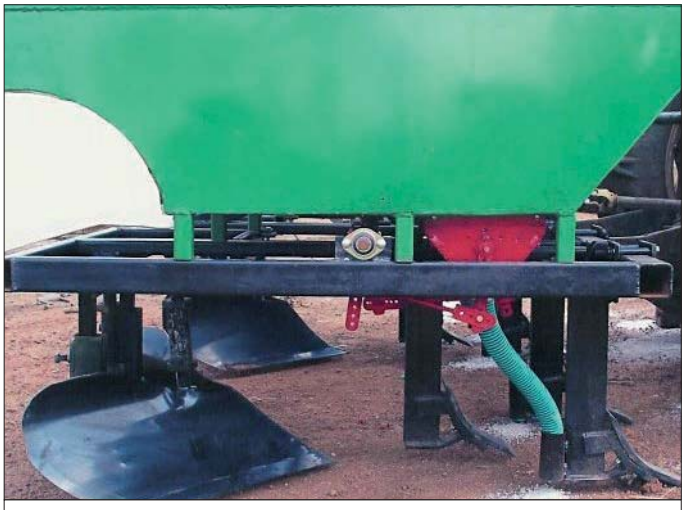

Fig. 1 Close-up of a canefield cultivator

incorporated in the soil with rigid tine cultivators. Alternatively, single row disc ridgers are sometimes used to reform the ridges without prior loosening of the furrow soil. In such cases, the chisel cultivator is used only for incorporation of fertiliser. Four to five operations are therefore necessary to re-establish the ridge and furrow profiles, with fertiliser incorporated in the furrows.

The majority of evidence, according to Wilson (1968) appeared to support the conclusion that the fewer the operations that are necessary in a field, after planting or harvesting, the better the performance of the subsequent crop. Inter-row cultivation according to Bakker (1999) is likely to be of no benefit to the root system of sugarcane.

Under Kenana conditions, El Negay (1996), found chiselling of the inter-row to depths of 10 and 20 cm to have no significant effect on cane and sugar yields. Leibbrandt (1985) investigated the effect of ripping with tines or chisels on irrigated ratoon cane on five soils in Swaziland. His results showed no significant benefits from the treatment, and in one experiment, ripping actually produced significant yield reduction. In Colombia, Torres and Villegas (1993) reported that ripping of the inter-rows seemed to have detrimental effect, thought to be due to root pruning that affected the growth of the succeeding ratoon crop. Therefore, avoiding stool pruning altogether was considered the most effective method for crop

Fig. 2 Root removal using a chisel cultivator

maintenance (de Beer et al., 1993).

However, according to Hunsigi (1993) in normal soil conditions, research results are in favour of minimum tillage for sugarcane plant and subsequent ratoons. It is necessary to explain here that, the concept of minimum tillage includes not only the elimination of avoidable field operations but also the combination of as many operations as possible in a single passage of a tractor through the field (Wilson, 1968).

Application of commercial fertiliser is an economic necessity on many soils to promote crop production. According to Verma (2002), fertiliser should be placed close to the root zone to enable the roots to derive the benefit immediately. Such placement (or banding), according to Deere & Company (1993), promotes rapid and uniform growth as the young plant roots quickly penetrate the fertiliser zone and absorb nutrients. Besides increasing cane yield, proper placement also reduces volatilisation losses of nitrogenous fertiliser and lowers the fixation of phosphatic fertiliser.

In the light of preceding information, a canefield cultivator that could accomplish a number of cultural operations in a once-over pass across the field, with minimum disturbance to soil, seems an obvious requirement for sugarcane fields. A prototype of such a unit was developed and tested under Kenana field conditions (Sudan). The objective of this article is to document:

(a) the general design features of a canefield cultivator that could, in a single pass, reform furrow and ridge profiles, apply and cover two granular fertilisers at the sides of the cane ridges in ratoon fields; and
(b) the results obtained during evaluation trials of the machine.

Description of the canefield cultivator

The canefield cultivator (Fig. 1) was a two-furrow, tractor mounted machine, designed to comprise functional components of a chisel cultivator, two fertiliser applicators and a ridger as described below.

Chisel cultivator

The chisel cultivator of the machine consisted of six rigid tines equipped with replaceable points, staggered on a rugged tool bar (main frame), in two rows, 30 cm apart (Fig. 2). There were four tines in the front row and two tines in the second row. The arrangement provided three tines for each furrow. The front row tines were intended to work the sides of two adjacent furrows, where fertiliser is to be placed. To serve this purpose, the distance between the outermost tines was set at 2.1 m, and that between the two innermost ones at 0.9 m. The second row tines were intended to loosen the middles of the furrows to ease reshaping of ridge and furrow profiles and to cover the applied fertiliser. The distance between the two tines in this row was 1.55 m, to match the centre to centre distance of the furrows.

Fertiliser applicators

The fertiliser applicators of the canefield cultivator were pto driven units intended to simultaneously apply granular triple superphosphate and urea fertilisers to the field. The machine has two hoppers, each consisting of two separate compartments; one for triple superphosphate and the other for urea. The hoppers were supplied with metering devices

Table 1 General specifications of the canefield cultivator

Capacity, kg		
Urea	400	
Triple superphsphate	200	
Dimensions, cm		
Length	163	
Width	250	
Height	117	
Ground clearance, cm	60	
Weight (unloaded), kg	540	
Input torque for metering mechanism, Nm	0.95	
Average drawbar pull, kN	8.8	
Speed for normal operation, km/h	8-10	
Average field capacity, ha/h	2	
Average ridge and furrow dimensions, cm	*Furrow*	*Ridge*
Width at the bottom	60	95
Width at the top	115	40
Ridge height	18	18

that could separately meter and displace to the outlet of the device, a required amount of each fertiliser. The amounts of the two fertilisers would eventually mix while flowing down through the outlet. Delivery tubes, attached the outlets and clamped to the shanks of the chisel cultivator, would thereafter direct the fertiliser mixture into grooves made by the cultivator, at the sides of the furrows.

Ridger

This was a two-body implement fabricated to suit the dimensions of the cane furrows in Kenana. In addition to the primary function of reforming ridge and furrow profiles, the ridger was also intended to complete coverage of the fertilisers. Two screw links were used to attach each ridging body to the main frame. This method of attachment was intended to allow easy adjustment for the:

lifting angle of the ridging bodies; and

relative clearance between bottom edges of the ridging bodies and surfaces of the furrows.

Those two adjustments, which characterised the canefield cultivator ridger, allowed setting the ridging bodies to accomplish the required operations without smearing the furrow surfaces. Two vertical sliding links were added to the rear of each ridging body to offer greater lateral stability during operation. The lower parts of the sliding links were of rectangular cross-sections while the upper parts were of square cross-section. The sizes of the two cross-sections were chosen to prevent lateral movement while allowing vertical and angular movements for adjusting the ridging bodies.

General specifications of the canefield cultivator and essential performance indicators in Kenana cane fields are shown in Table 1.

Field test and experiment

The canefield cultivator was designed and fabricated in 2000 and tested under commercial field conditions for more than two seasons, on areas over 100 ha to measure its performance in terms of field capacity, speed for operation, and power requirements. For comparison, performance of the implements for conventional practices was also measured. That was then followed by two experiments conducted during the cane harvesting seasons 2003/2004 and 2004/2005 on two different ratoon fields to measure the ridge and furrow profiles produced by Kenana conventional methods and those produced by the canefield cultivator (CFC). Conventional methods (conv1 and conv2, respectively) used in the experiment were:

(1) loosening the furrow surface soil to an approximate depth of 10 cm with chisel cultivators, attachment and use of two-body ridgers to reform the ridge and furrow profiles, broadcasting of triple superphosphate fertiliser, followed by broadcasting of urea fertiliser and then incorporation of the two fertilisers in the furrows with chisel cultivators; and

(2) ridge reshaping with a single-row disc ridger and then followed, as in the conv1 by the broadcasting and incorporation of the fertiliser with chisel cultivators.

A randomised complete block design was used with the treatments (conv1, conv2 and CFC) replicated three times. In 2003, the plots were 6.2 m wide (four cane rows) and 950 m long. In 2004, they were 9.3 m wide (6 cane rows) and 200 m long.

Kenana fields are of heavy clay soil with 15% sand, 22% silt and 63% clay. Plastic and liquid limits range, respectively, from 30 to 37% and 66 to 74% gravimetric soil content. Soil moisture content during the test varied widely across the field and within the top 10 cm. Composite soil samples from cultivated zones along the field, were found to have gravimetric moisture contents ranging between 12% and 30%. Bulk density for the top 10 cm before the operations was found to range between 1230 kg/m^3 and 1420 kg/m^3.

Ridge and furrow profiles were measured using a profile meter, consisting of a rectangular frame with horizontal wires fixed parallel to its length at 2.5 cm spacing, and vertical sliding rods at 10 cm spacing across the length. Three ridge and furrow profile measurements were taken from each replicate (nine in total for each treatment). The average of the two seasons for each treatment (18 in total) was worked out to approximate the general shape produced by each method in normal field conditions.

Table 2 Performance of cultivation implements in Kenana fields

Implement	*Drawbar pull, kN*	*Speed, m/s*	*Capacity, ha/h*
Chisel cultivator	5.9 (1.2)*	3.6	3.2
Ridge reshaper (two-row)	3.2 (0.71)	3.6	3.2
Disc reshaper (single row)	3.8 (0.8)	5.5	1.9
Fertiliser applicator	0.2**	4.2	2.5
Canefield cultivator	8.8 (1.2)	2.8	2.0

* Standard deviation

** Average rolling resistance of loaded applicator, also with a torque demand of 0.95 Nm at the input shaft of fertiliser metering mechanism

Drawbar pull for each implement was measured in commercial fields using a simple hydraulic pull meter consisting of hydraulic piston and cylinder and a pressure gauge. The tractor carrying an implement was pulled by another tractor, running at the normal speed for the operation. Values for drawbar pull were averaged from readings recorded over distances of more than 500 m, in at least two different fields, to encounter variations normally found in large scale conditions. Each time, the same tractor was also pulled with the implement raised to measure the rolling resistance

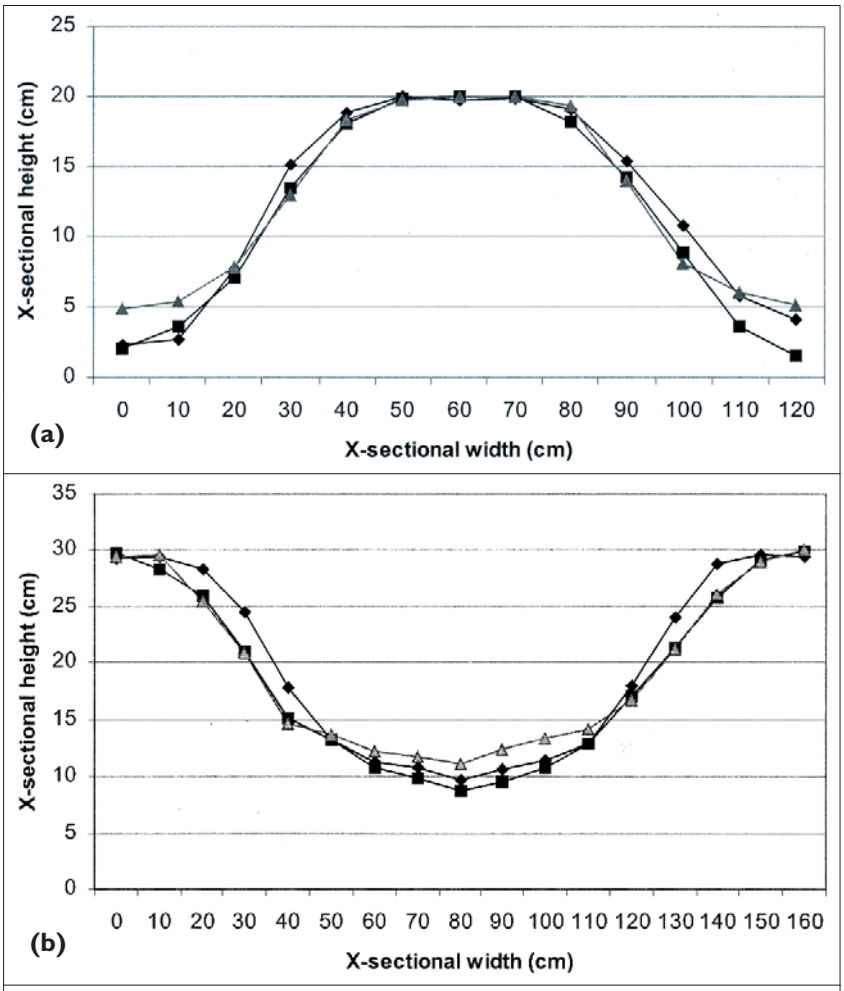

Fig. 3 (a) Ridge and (b) furrow profiles created by three cultivation methods: the conventional techniques, conv1 and conv2; and the canefield cultivator (CFC)

of the tractor. The value was then subtracted from the average values of drawbar pull to obtain the net force for pulling each implement. Drawbar pull in kN was calculated by multiplying the gauge pressure reading by the effective area of the pull-meter piston.

For fertiliser broadcasters, power is required to operate the metering mechanisms and to overcome the increase in rolling resistance resulting from loading the hoppers with fertiliser. Power to operate the mechanism of the metering devices was obtained by measuring the torque necessary to start turning the mechanism by gradually increasing a weight hanging at a known length from the centre of a power input shaft used to drive the mechanism. The torque was then multiplied by the rated angular velocity of the tractor pto (rated speed of 540 rpm). To measure the power related to the increase in rolling resistance, the tractor was pulled with empty and loaded hoppers and the two readings were then subtracted. As the weight of the hoppers gradually decreased with the application of fertiliser to the field, the value obtained was divided by two to average the situations of empty and loaded hoppers.

Results

The summary of performance in commercial fields is shown in Table 2. Average ridge and furrow profiles produced by the three cultivation methods are shown in Fig. 3.

Energy in kWh/ha was calculate from Table 2 by dividing the product of drawbar pull in kN and speed in m/s by the machine capacity in ha/h. Time for doing each job was obtained from dividing unit of area (1 ha) by the machine capacity in ha/h. Results of the calculations are shown graphically in Figs 4 and 5, respectively.

Discussion

Ridge and furrow profiles

Profiles created by the three cultivation methods were, as shown in Fig. 3, practically similar in shape, with some small differences in favour of the canefield cultivator. The machine produced slightly thicker ridges which were favourable to plant anchorage and slightly flatter furrows which were good for distribution of irrigation water to the sides of the cane ridges. Conventional methods involved four to five tractor passes through the field to accomplish the required profiles, with fertiliser incorporated in the furrows. With the canefield cultivator, that was achieved in a single pass of a tractor similar in size to those used for the conventional methods (54 kW tractors).

The energy requirement per unit area was highest with conv2 followed by conv1 and

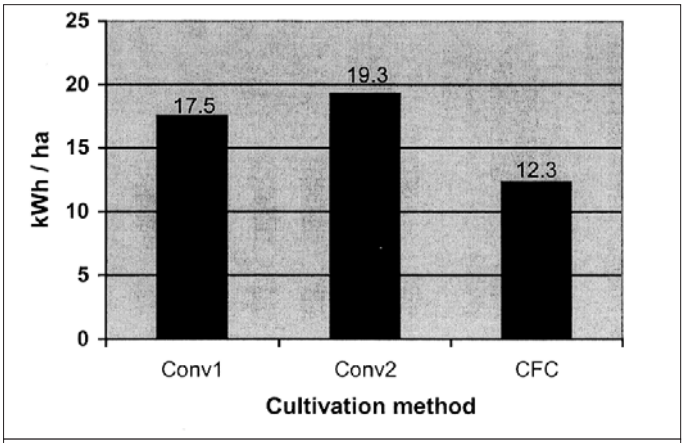

Fig. 4 Power requirements; the energy requirement per unit area was highest with the conventional technique conv2 followed by conv1 and lowest with the canefield cultivator (CFC)

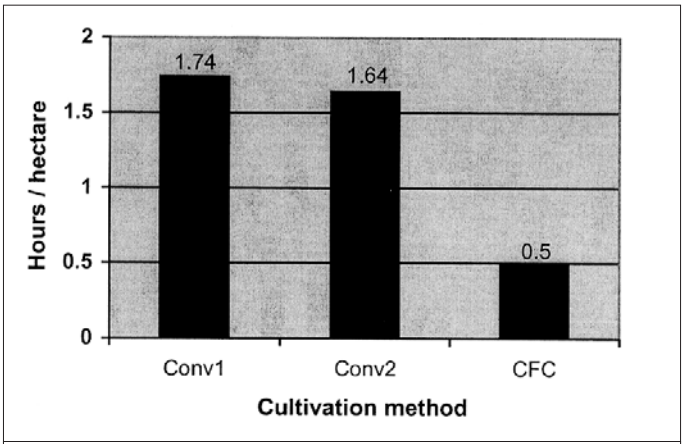

Fig. 5 Time requirements; time per unit area with the canefield cultivator was only 29.6% of the average time required using conventional methods.

lowest with CFC (Fig. 4). Conv1 was 8.8% lower than conv2, while CFC was 30.1% and 36.2% lower than conv1 and conv2, respectively. Therefore, CFC consumed about 67% of the average energy required by the conventional practices. This was mainly attributable to the number of tools utilised in each method. The conventional methods used three separate soil engaging implements for profile reformation and incorporation of fertiliser, while the canefield cultivator accomplished those tasks with two soil engaging tools. Besides, in the conventional methods, implements were mounted on separate tractors, each adding rolling resistance to the total energy required for the method. With the canefield cultivator all functional components were attached to one frame almost similar in weight to that of an individual implement.

Time per unit area with the canefield cultivator from Fig. 5 was only 29.6% (approximately 30%) of the average timea required with the conventional methods. The main contributing factor in this respect was the portion consumed in the application of fertiliser. While the canefield cultivator eliminated that portion through application of fertilisers during the reformation of profiles, time for fertiliser application (as could be calculated from Table 2) averaged 47% of the total time per hectare for the operations of the conventional methods.

Power for the actual application of fertilisers was very small (less than 1 kW) in comparison to the size of the tractor carrying the implement (54 kW). Such improper matching of tractors and implements, according to Deere & Company (1999), can increase operating costs as much as from 15% to 20% in wasted fuel. It is therefore not unusual to find that the difference of profit from one farm to another is due solely to differences in machinery and the way it is managed. Good machinery management, according to Hunt (2001) requires that the individual operations in a machine system must be adjusted and combined in a manner so that their overall performance returns the greatest profit to the farm business. Any time a grower can eliminate a pass through the field, compaction is reduced and time and fuel are saved (Plaster, 2003).

Application of fertilisers

In both conventional methods, fertiliser was first broadcasted and then incorporated in the furrow soil with chisel cultivators. Due to root pruning which was inevitable with soil engaging implements such as chisel cultivators (Fig. 2), fertiliser incorporated in the middle of the furrows, away from the sides of the cane rows, would not be easily accessible to the roots of the ratoon cane. Additionally, the operation did not completely cover the broadcast fertiliser and that would eventually lead to some nitrogen loss from the urea through volatilisation. Moreover, it was observed that during broadcasting, fertiliser sometimes drifted to the top of cane rows, where it could not be incorporated and that would add another factor for losing nitrogen to the atmosphere.

The canefield cultivator placed and covered the fertiliser at the sides of the furrows, near the base of the cane rows to make them accessible to the old and new roots of the ratoon cane and to decrease the chance of losing nitrogen from urea to the atmosphere. Therefore, in addition to power and time saving, the canefield cultivator allowed performing the operations in a way that was advantageous to the ratoon cane crops.

Conclusions

(1) Conventional operations for reformation of ridge and furrow profiles and application of fertiliser in ratoon cane fields of Kenana were rather intensive, did not properly utilise available tractor power and did not ensure good placement and coverage of applied fertiliser.

(2) The canefield cultivator provided furrow and ridge profiles comparable to those provided by the conventional methods with the advantage of placement and coverage of the fertiliser at the sides of the cane rows.

(3) Energy in kWh/ha and tractor hours per hectare for the canefield cultivator, on average, were respectively 67% and 30% of those required with conventional practices.

Acknowledgement

The author finds real pleasure in acknowledging the invaluable assistance of the General Manager of Cane Production in Kenana Sugar Company, Syd. Yahia Mohammed Yousif, during the fabrication phase of the machine and also during tests in commercial fields. Appreciation should be mentioned to the Director of Sugar Cane Research of Kenana, Dr Ibrahim S'eed, for offering experimental fields for testing machine performance.

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HOME GROWN BIOMASS

Geoffrey F D Wakeham

Using the wood in the trees?

There is State encouragement to produce electricity from biomass and a number of units are in place. Waste materials from wood processors and poultry farms are examples of working power stations. Though these may not be economically justified, they are producing power from 'renewable' sources and can be classed as approaching carbon neutral.

There are many countries producing replacement liquid fuels from farm grown crops. Short rotation coppice or elephant grass can be used as fuel for electricity production. These provide a diversified income to farmers.

The storage and transport of these latter materials reduces their viability when used in large scale power stations. It has been suggested that on-farm generators that burn locally grown biomass maybe a better option. Units with a power rating of 100 kW are available and are reported to require some 50 hectares of land to provide fuel for 8000 hours output per year (91% availability). Approximately 1500 hours of tractor work would seem a reasonable figure for establishing, harvesting and re-establishing 50 hectares of elephant grass on a 10 year cycle. This could require an average of 4500 litres of fuel per year releasing some 11 to 12 tonnes of CO_2 into the atmosphere. These small units do however fall outside the tight emission regulations of normal power stations.

To produce a similar amount of energy using a petrol/diesel generator would release some 550 to 600 tonnes of carbon dioxide per annum but would take up far less space and capital to install. Owing to the lower carbon to hydrogen ratio in methane based fuels, this figure could be reduced to less than 180 tonnes of CO_2 if natural gas were used. As with a petrol generator this provides 50 hectares of land for growing crops.

Leaving the trees in the wood?

If this land was set aside to grow trees, it is not unreasonable to expect some 400 tonnes of wood to be produced *per year* (roots and non commercial material included) over a 100 year period and for it to survive for one thousand years. This equates to the equivalent of 400 tonnes of CO_2 being locked up each year.

The prime purpose of developing renewable sources of energy is not to save fossil fuels but to reduce CO_2 emissions. It is therefore far better to generate power in large centralised, efficient and clean power stations using low carbon fossil fuels, rather than coal, and pay for the establishment of forests/woodlands close to every community. The 100 years leeway can then be used to find either clean fuel sources or economical ways of capturing the carbon from plentiful coal or other freely available fossil fuels.

The woods and forests would replace sterile blocks of elephant grass or inaccessible willow coppice with amenity areas open to the public *and* reduce atmospheric CO_2. It might be possible to own an oak tree and bury ones family in its shade. This will provide a living memorial to the generation that turned the tide on global warming that will stand for a thousand years.

Geoffrey F D Wakeham MIAgrE

Footnote: The numbers used in this article are based on a range of sources that provide wildly dissimilar data and measures of greenhouse gasses. Manufacturers of hardware and industry-based tests are often at variance with environmental web sites and, where possible, very basic science has been used to generate data compatible with these varying figures.

IAgrE MEETINGS DIARY OF EVENTS

APRIL 2006

Monday 3 April 19.30 h
West Midlands Branch
Farm Energy Services – Concentrating on recent specialist work and projects
Speaker: Andrew Kneeshaw
Venue: Farm Energy Centre, NAC, Stoneleigh
For further details e-mail: westmids@iagre.biz

Tuesday 11 April 19.30 h
South East Midlands Branch
Patenting to Production – "Confronting the Dragon's Den"
Speakers: Alan Wilcher + others
Venue: Stumble Inn, Cranfield University at Silsoe
This is a joint Meeting with IMechE Automobile Division

MAY 2006

Monday 8 May 19.30 h
South East Midlands Branch
From Farm to Fork
Further details to be advised.

Monday 8 May 19.30 h
Wrekin Branch
The New Trantor
Speaker: Graham Edwards
Venue: Harper Adams University College

Tuesday 9 May 19.30 h
West Midlands Branch
Wind Power
Speaker: Antony Johnson – National Grid
Venue: Friends Meeting House, Stratford upon Avon
For further details e-mail: westmids@iagre.biz

Sunday 21 May 14.00 h
East Midlands Branch
"***Linking Environment Agriculture and Farming Agriculture" – Farm Walk***
Hosts: Andy and Sue Guy
Venue: Thorney Abbey Farm, Southwell, Nottinghamshire
Meet at Farm 13.45 h. If you are interested in joining this event, please could you let Nigel Penlington know beforehand – e-mail nigel.penlington@tiscali.co.uk or telephone 0115 968 0902

SPREADSHEET MODELS FOR THE PREDICTION OF SOIL TILLAGE IMPLEMENT FORCES

Richard J Godwin and Michael J O'Dogherty

Introduction

The use of tillage implements has long been a fundamental operation in agriculture. The action of the various types of implement has been of great interest both in relation to the soil disturbance produced but also from the viewpoint of the forces acting upon them. The latter are of critical importance in the design of components of appropriate strength but also from the need to be able to predict the draught requirements of particular equipment.

A number of mathematical models has been developed over many years to predict the forces acting on tillage tools in relation to the tool geometry, the soil physical properties and the nature of the soil disturbance ahead of the tool. Such knowledge of the tool forces during soil working is an aid to producers of cultivation equipment in the design of the working elements and their supporting frames. In addition, an understanding of the mechanisms of tool-soil interaction is of use in designing the most effective elements for soil disturbance and implement penetration. The manner in which the physical properties of the soil affects how the tool interacts with it is important in understanding how to produce cultivation equipment which is effective over a wide range of soil types and conditions.

The majority of the models which have been developed are for symmetrical tools and evaluate the draught force and the force acting vertically to the soil surface. In some cases, however, such as for disc cultivators and mouldboard ploughs, lateral forces are also predicted.

Development of force prediction equations

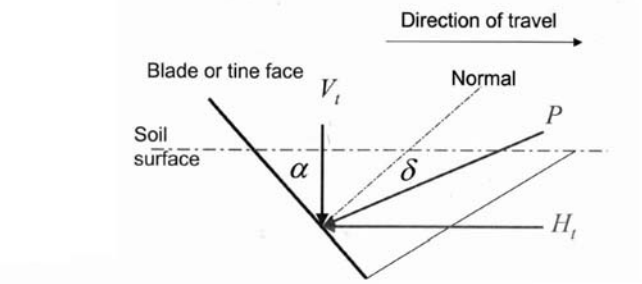
Tines

The models used to predict soil-implement forces are based on quasi-static Mohr-Coulomb soil mechanics using both passive retaining wall and bearing capacity theories; theoretically, it is the peak force which is predicted at the point of shear failure.

The force prediction equations, first developed, apply to simple rectangular blades passing through soil (Figure 1). Three categories of such blades were considered depending on their depth/width ratio (d/w). The values given below are for vertical tines with a rake angle (α) of 90°, for brittle types of soil failure with soil in the friable-hard moisture range:

- wide tines (blades) for which d/w < 0.5;
- narrow (chisel) tines for which 1 < d/w < 6; and
- very narrow (knife) tines for which d/w > 6.

For narrow and very narrow tines the soil failure is three-dimensional (Fig. 2). A key concept used in the force prediction for narrow tines is that of critical depth. The essential feature of critical depth is that there are two modes of soil failure resulting from the action of the tine: crescent failure near the soil surface and above the critical depth, with soil moving forwards, sideways and upwards; and lateral failure below the critical depth, with the soil moving forwards and



$$H_t = \left[\left(\gamma d^2 N_\gamma + cdN_{ca} + qdN_q\right)(w)\right]\sin(\alpha+\delta)$$

$$V_t = -\left[\left(\gamma d^2 N_\gamma + cdN_{ca} + qdN_q\right)(w)\right]\cos(\alpha+\delta)$$

+ vertical forces act ⬆

Fig. 1. General soil mechanics equations and two dimensional passive soil failure: P, resultant force; H_t and V_t, horizontal and vertical forces; d and w, blade depth and width; α, rake angle; δ, angle of soil-metal friction; c and γ, soil cohesion and density; q, surcharge; N_{ca} N_γ and N_q, dimensionless numbers

BIO NOTE

Professor Dick Godwin FEng HonFIAgrE is Head of Engineering at the National Soil Resources Institute, Cranfield University and a Past President of the IAgrE. E-mail: r.godwin@cranfield .ac.uk A Visiting Professor of Cranfield University, Mike O'Dogherty DSc CEng FIAgrE has been actively engaged in the development of the comprehensive spreadsheet model. E-mail: m.j.o.dogherty@cranfield.ac.uk

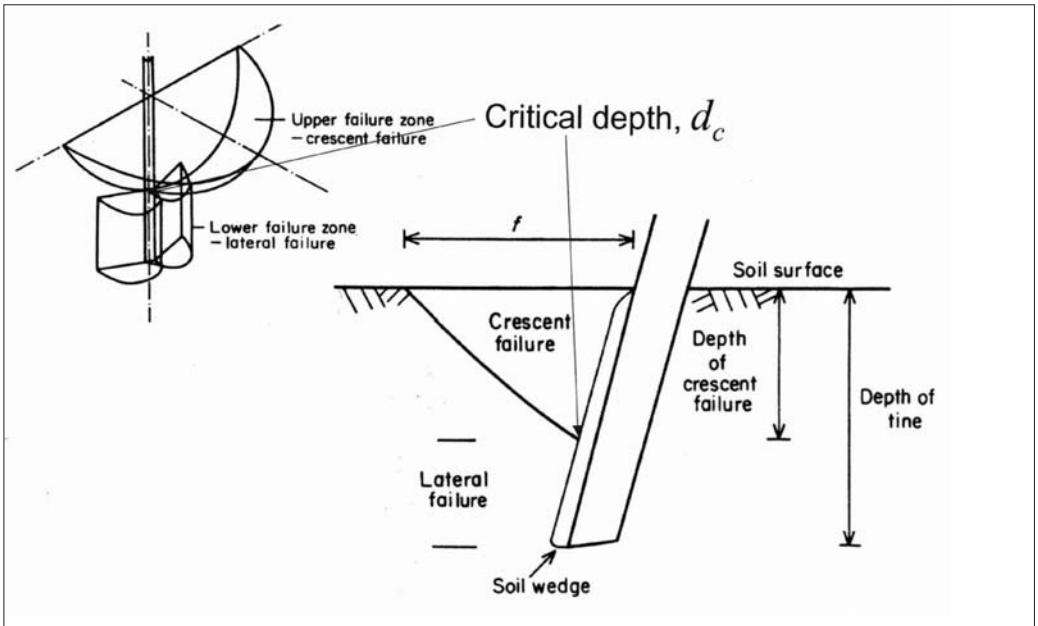


Fig. 2. Soil failure patterns for narrow tines: f, rupture distance

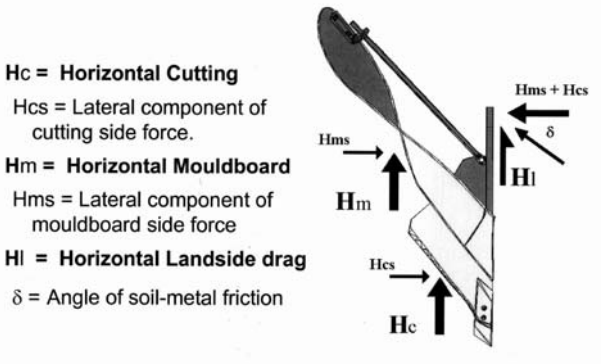


Fig. 3. Mouldboard plough forces

sideways only.
A wedge of soil exists on the tine face at all depths and tine rake angles.

The narrow tine model predicts the passive force above the critical depth taking into account the crescent shaped failure patterns observed in front of the tine at the soil surface. These were found to be dependent on tine depth. The soil below the critical depth is assumed to fail two-dimensionally in a horizontal plane, independently of rake angle. The lateral force component is calculated from a logarithmic spiral method used to determine the bearing capacity of a deep narrow footing.

Knowledge of the critical depth is required to be able to determine the tine force components and this is determined by a complex calculation procedure which can be easily accommodated by the use of a spreadsheet method.

Tine arrangement and multiple tines

The relative position of tines on a tool frame both laterally and in the direction of motion, has a significant effect on implement performance and tine forces. To predict such forces, the single tine model was adapted to include the effects of tine interaction and the modified model includes a number of possible toolbar arrangements, including combinations of deep and shallow tines.

Effect of tine velocity

The earlier prediction models did not consider the inertial effects of the soil on the tine forces. In later work, an inertial factor was introduced which takes into account the volume of disturbed soil and the amended model includes a force term which incorporates the kinetic energy imported to the soil.

Discs

A force model was developed for cultivating discs which considered:
passive cutting reaction on the concave face of the disc using modified tine theory; and scrubbing reaction force of the convex section at the rear of the disc.

The prediction of the rear scrubbing forces was based upon the bearing capacity reaction on the underside of the disc by adapting theoretical work for determining the maximum vertical stress under shallow footings.

Mouldboard plough

More recent work has used a modification of the fundamental tine force equation to predict the draught force exerted by the plough point and share. The total plough draught force includes, however, additional terms for the forces required

Soil parameters					Tine parameters				Draught force (D), kN	Vertical force (V), kN
Bulk unit weight, kN/m^3	Cohesion (c), kN/m^2	Internal friction angle, deg	Surcharge (q), kN/m^2	Interface friction angle, deg	Depth (d), m	Width (w), m	Rake angle, deg	Velocity (v), m/s		
15	10	35	0	22	0.2	0.025	30	1	1.2	-0.93
15	10	35	0	22	0.2	0.025	40	1	1.51	-0.80
15	10	35	0	22	0.2	0.025	50	1	1.84	-0.60
15	10	35	0	22	0.2	0.025	60	1	2.39	-0.34
15	10	35	0	22	0.2	0.025	70	1	3.00	0.10
15	10	35	0	22	0.2	0.025	80	1	3.56	0.52
15	10	35	0	22	0.2	0.025	90	1	4.00	0.81

Fig. 4. Section of a spreadsheet showing input data for a simple tine together with calculated values for draught and vertical forces for a range of rake angles

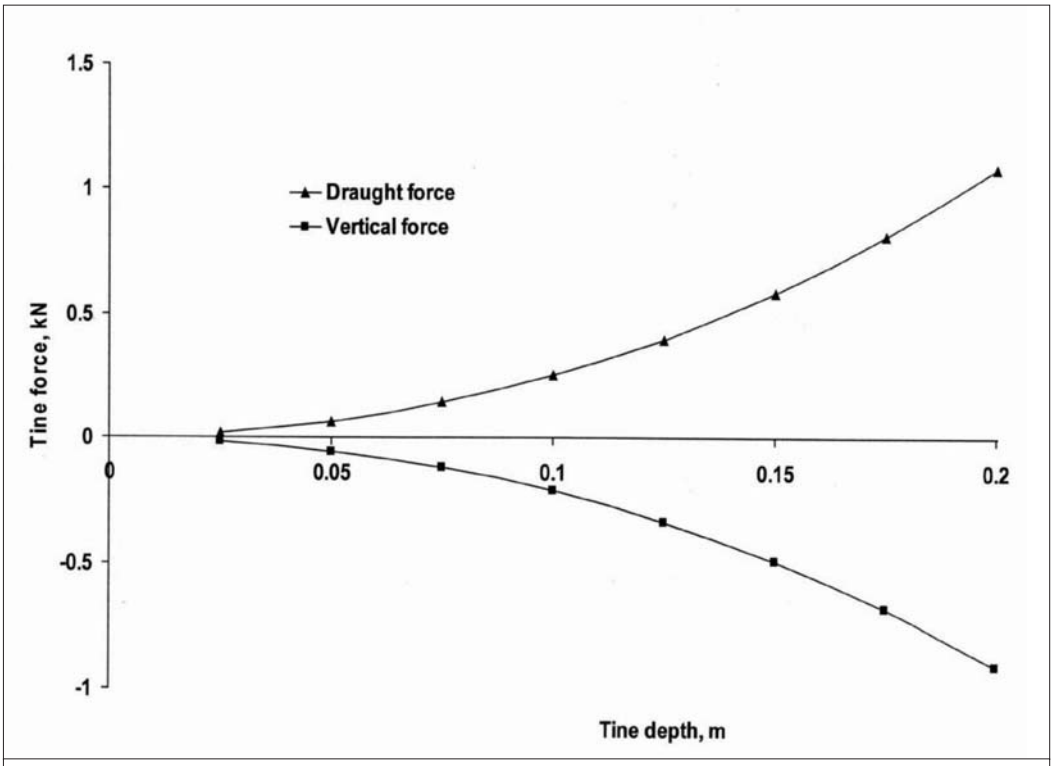


Fig. 5a. Effect of tine depth on draught and vertical force for a 25 mm wide tine with a 30 deg rake angle in a sandy loam soil with the properties shown in Fig. 4

for soil turning and lifting at the mouldboard and landside frictional force (Fig. 3). Newtonian mechanics was used to predict the mouldboard forces taking into account soil kinetic and potential energy and also the frictional force. Frictional forces at the landside were described from prediction of the lateral forces acting on the share and the mouldboard.

Land anchors

The prediction equations for tines were used to develop an equation to estimate the maximum sustainable pull exerted by a land anchor, together with a model of the static equilibrium conditions acting at the anchor components.

Spreadsheet calculations

The procedure for the calculation of implement forces is not mathematically difficult but requires considerable computation. In addition, the final results depend upon a number of interdependent and complex expressions and derivations which require some experience in their use. In order to facilitate the calculations, spreadsheets are particularly useful and a number has been prepared by the authors to enable the relevant forces to be more easily calculated. These cover the following models:
simple tines;
interacting tines;
cultivating discs;
mouldboard ploughs; and
land anchors.

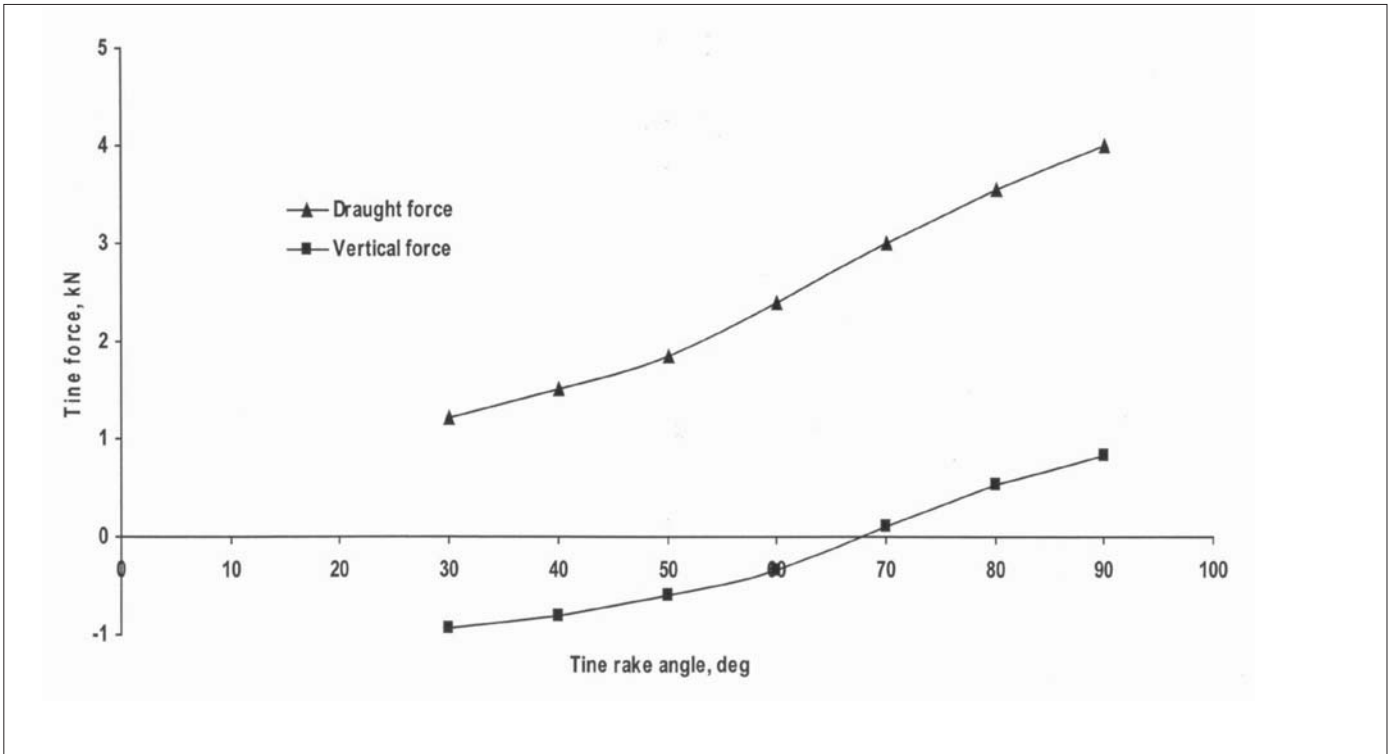


Fig. 5b. Effect of tine rake angle on draught and vertical force for a 25 mm wide tine at 200 mm depth in a sandy loam soil with the properties shown in Fig. 4

The spreadsheets enable both soil properties and implement parameters to be specified by the user. In particular, the input to the model requires the specification of the soil bulk unit weight, friction angle, cohesion and metal-soil friction angle, together with a number of implement geometric factors such as rake angle, depth of working, implement width and working speed. In the use of the models for discs and mouldboard ploughs, a number of other geometric features are incorporated. The output from the programs gives the draught force and vertical force acting on the implement and the lateral force for the disc model.

All subsidiary calculations such as the derivation of critical depth and soil non-dimensional factors are made within the spreadsheet structure and entered for the user to view. It is possible to examine the effects of a range of changes in soil and implement parameters on the implement forces and the results can be presented graphically using the spreadsheet facility.

A section of a typical spreadsheet is shown in Fig. 4 for typical input data for soil properties and tine parameters, together with the calculated draught and vertical forces acting on a simple tine.

Figures 5a and 5b are typical graphs which can be produced from the spreadsheet showing how the depth and rake angle of a simple tine affect the draught and vertical forces.

The spreadsheets also enable comparison of predicted and measured forces. The suite of models provides a means for researchers, designers and development engineers to examine the effects of a wide range of variables for the optimal design of cultivating machinery. The suite of programs is available on the Cranfield University at Silsoe website at the address http://www.silsoe.cranfield.ac.uk/caee/tinemodels/htm.

Acknowledgements

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WATER QUALITY

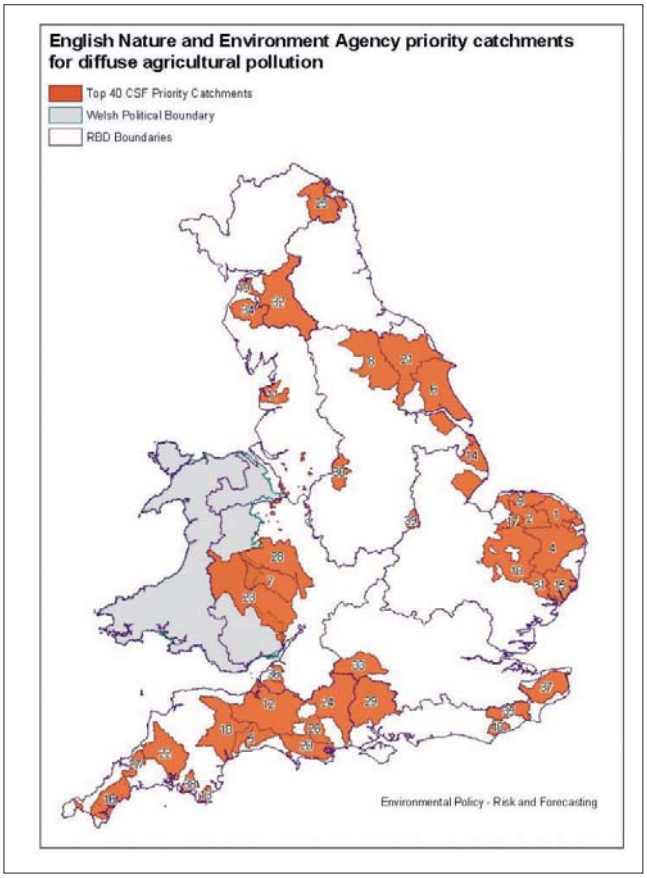
Water friendly farming: target areas announced to curb agricultural pollution

Dedicated advisers will soon be on hand to help farmers tackle the causes of harmful water pollution, Environment Minister Elliot Morley announced. Forty catchments across England, identified as priority areas for action, will be targeted under a range of measures aimed at improving farm practices and reducing water pollution from agriculture. Newly appointed advisers will work on a one to one basis with farmers, as well as leading a series of initiatives including workshops and farm demonstrations to encourage best practice.

Pollution caused by agriculture can have serious effects on local rivers, lakes, estuaries and coastal waters. An overloading of nutrients lost from fields can boost the growth of algae, which in turn squeezes out plants like stoneworts and water buttercups. Oxygen levels can also become depleted, suffocating fish.

River plants like the brook water crowfoot are at risk from soil-loss from fields which leads to the siltation of rivers – also hampering the breeding of trout and salmon as well as a range of insects.

Treating such pollution is often expensive; it is estimated that the cost of removing harmful pesticides and nitrates from drinking water is £7 a year for every water customer. Diffuse pollution from agriculture can reduce the quality of bathing water, with detrimental effects for the tourist industry. Taking action to address diffuse pollution will help us with the measures being developed under the Water Framework Directive to improve water quality.



Elliot Morley said: "One of the greatest challenges we face in boosting the quality of our water environment is in tackling pollution from agriculture. This new initiative will help address this threat by providing farmers with the understanding and know-how needed to improve farming practices. Working to reduce water pollution will have wide benefits – protecting plants and animals, improving the quality of water at our beaches, and also benefiting tourism.

"We are playing our part by paying for a network of expert advisers to provide free advice by establishing a partnership between the Department of the Environment, Food and Rural Affairs (Defra), the Environment Agency (EA), and Natural England, to help farmers to act. Now I am looking for a positive reaction from the farming industry".

The £25 million two year catchment sensitive farming delivery initiative has a particular focus on local engagement, and further partnership working, with farmers, farm advisers, conservation bodies, water companies and a wide range of other interests.

Barbara Young, Chief Executive of the Environment Agency added: "We are fully supportive of this initiative. By working with farmers to agree appropriate targets and practical ways of meeting the requirements of the Water Framework Directive, we can use the skills and resources available to us for the good of the environment and the farming economy.

"Acting early and in partnership at a local level will secure strong working relationships that are founded on good science, monitoring and support for measures to reduce diffuse pollution and the achievement of Catchment Sensitive Farming at the most efficient cost to the industry."

The Chief Executives of the Rural Development Service, John Adams, and of English Nature, Andy Brown, also warmly welcomed this initiative. They said: "We will be combining the technical expertise and experience in engaging with farmers, of both our organisations in the Natural England Partnership with that of the Environment Agency, to make sure this initiative works. Our officials are working with colleagues in the EA and Defra, to develop detailed plans that will enable us to take this forward successfully and hit the ground running from April. We are now proceeding with the recruitment of a network of Catchment Sensitive Farming Officers to spearhead this initiative."

Practices farmers can adopt to reduce the risk of polluting water might include limiting the use of fertilisers, manures and pesticides, fencing off watercourses as well as reducing stocking densities.

MORE INFORMATION

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Quarterly SPRING 61(1)

MEMBERSHIP MATTERS

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

The Weir Shield

The Weir Shield, an annual Scottish national competition to find the top Agricultural Engineering student, has been won by trainee engineers from Barony College, Dumfries.

The competition has run since 1972, and was devised by Jim Weir, an Agricultural Engineer working for the Electricity Board, who wanted to promote the spirit of competition amongst apprentices in Scotland.

Apprentices are chosen by their colleges to compete in the event which is judged by independent IAgrE Scottish Branch members. The competition was held at the Barony College on 19th November 2005.

Tasks set by the IAgrE judges included fabrication, engine and electrical system diagnostics, machinery repairs and use of a forestry forwarder simulator. Apprentices came from across Scotland and Northern England and showed skill levels that made the results for the individual prizes and the aggregate score college prize – the Weir Shield – close.

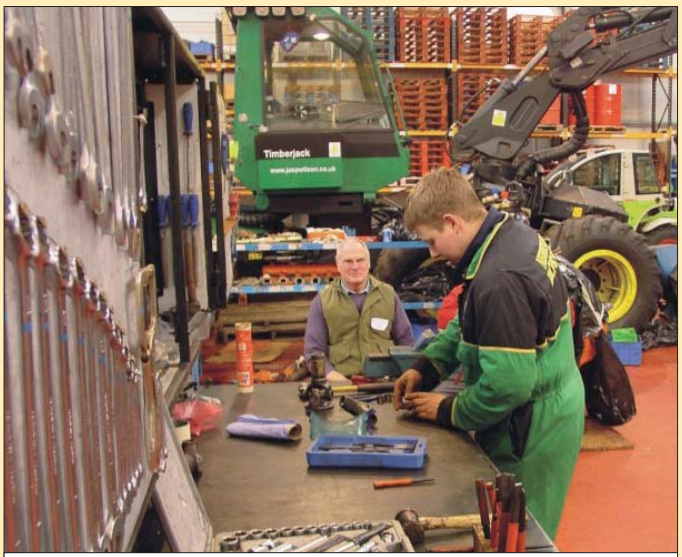
Graham Smith (Barony College) who works for Lloyd Ltd in Dumfries came out on top, winning first prize and the Pascal Trophy. Second place went to Michael McLaren from Oatridge College, and Graham Carruthers, another Barony student who works for Lloyd Ltd in Carlisle, took third place. The Weir Shield was won by the Barony College. Prize money for the event is provided by the IAgrE Scottish Branch.

Drew Easton, Section Head for Engineering at the Barony said: "The competition is run to embrace the latest technology and produce the best of the top apprentices in Scotland. The standard is very high and we are delighted to have two students in the top three places and to bring the Weir shield to the Barony"

Phil Amos, Scottish Branch Chairman added: "The judges were impressed by the standards, ability and versatility of the competitors. The diversity of skills demonstrated in the competition shows them to be true Agricultural Engineers and we are delighted to be supporting these young engineers as they develop their careers."

The event was supported by GRS (Gordon Rickerby Services) in Dumfries who provided some of the machinery for the competitors to work on.

Graham Smith (winner of the Pascal Trophy), Dave Ritchie (Lecturer in Engineering with the Weir Shield), Drew Easton (Section Head for Engineering), Phil Amos (Chairman of the IAgrE Scottish Branch), Graham Carruthers (third place).



Bruce Smith (Elmwood) working on a transmission joint, judged by Gwilym Owen

OBITUARIES

Ian Gibb OBE, CEng, Hon FIAgrE 1923-2005

John Alexander Crawford Gibb, known as Ian, died on 5th December 2005 at the age of 82. He was a greatly respected pillar of the Institution for over 50 years and will be remembered with deep affection by all who were privileged to work with him. Having joined as an Associate Member in 1950, he became a Council member in 1952 and then served as Honorary Editor of the Journal for 10 years. He was at various times chairman of the Examination Board, Membership Committee, Qualifications Group and the Chartered Engineers Registration Sub-committee, and was a member of the Academic Qualifications Panel. He was President of the Institution 1972-74, and wrote the Golden Jubilee (1938-1988) account of the Institution's first 50 years, published as 'Agricultural Engineering Perspective'. This massive contribution was recognised with the awards of Honorary Fellowship (1980) and Award of Merit (1990).

Ian's education was divided by service during the War. He went up to St John's College, Oxford, to study Rural Economy for just one term in 1941, before wartime changes required a transfer to Sydney Sussex College, Cambridge to read agriculture for a year. He then volunteered for service with the Royal Armoured Corps, did officers training at Sandhurst and became a tank commander with the East Riding Yeomanry. Disabling asthma kept him out of the D-Day landings, and he returned to Sandhurst for the remainder of the War. After several months as a tractor driver for the Oxfordshire War Agricultural Committee, he returned to Cambridge in August 1946 to complete his agriculture degree. He spent some months with the (then) National Institute of Agricultural Engineering at Askham Bryan and Silsoe before going on to Kings College at Newcastle for the two-year MSc Agricultural Engineering degree.

In 1949 he was appointed Assistant Lecturer in Farm Mechanisation at Wye College (London University), and in 1952 Lecturer in Farm Mechanisation at Reading University, later becoming Senior Lecturer in Agricultural Engineering. He retired from Reading University in 1988. Over this period, he undertook many overseas consultancy missions and a large amount of voluntary work as a governor of four colleges with agricultural engineering interests, examination work throughout Britain and the Irish Republic, work on many committees, and very notably a period of 22 years when he was chairman of the Berkshire, Buckingham and Oxford Committee of CoSIRA (the Council for Small Industries in Rural Areas). This contribution led to the award of the OBE in 1974. He was a founding Trustee of and took a continuing interest in the Douglas Bomford Trust. After retirement from Reading University he was, on a part-time basis, Secretary of the Council for Awards of the Royal Agricultural Societies for 11 years, a period which saw a major development in the size and status of that group. He finally retired in April 2000.

Ian continued to support all the major Institution events until very recently when fragile health made this impossible. We will miss his presence and his contributions to the discussion. In his private life he was a staunch Christian and supporter of the parish church in Finchampstead. We extend our sincere condolences to Elizabeth, his widow, and the family.

JBF

Robert Henry Marsden IEng MIAgrE 1923-2006

Mick Marsden (actually R.H. Marsden) joined the National Institute of Agricultural Engineering (NIAE) at Wrest Park in 1948, having served in the Fleet Air Arm where he had his flying training in Canada, and having broadened his practical skills through an 'appenticeship' job with Marshalls at Gainsborough. At Wrest Park, he joined a small group in H.J. Hamblin's Engineering Department which tackled a variety of tasks. At first, he was engaged in the winding up of the Institute's development work on sugar beet harvesters. The group also developed special equipment for other research institutes and he was involved in devising fertilizer placement machines for Rothamsted, a special plot spraying machine for the Weed Research Organisation and a potato handling system for use at Sutton Bonnington.

Perhaps his main contributions were when he was developing harvesting systems for rice for use by small farmers. He designed and constructed at Wrest Park small threshers and cleaners which were shipped abroad. He followed these to India, Malaysia and elsewhere to carry out his development work on site.

In 1970, he left NIAE to join CoSIRA (the Council for Small Industries in Rural Areas) as the Engineer Specialist for the West of England and Wales. He much enjoyed meeting and helping many interesting entrepreneurs with a wide variety of design and manufacturing problems. To be more central to this work he moved from Silsoe to Leonard Stanley in Gloucestershire.

Mick sadly passed away on 25th January, just a few weeks short of his 83rd birthday.

HN

David Howat
MIAgrE

The death occurred very suddenly on 2nd February 2006 of David Howat, a well known and highly respected member of the Scottish Branch of the Institution. Dave, as he was popularly known, and his twin brother John were born in rural north Fife in 1942.

Dave studied agriculture at the North of Scotland College of Agriculture in Aberdeen before taking his National Diploma in Agricultural Engineering (NDAgrE) at the West of Scotland Agricultural College in Glasgow. After a short spell on a mixed dairy /arable farm in Fife, he was appointed as an assistant lecturer in Agricultural Engineering at Auchincruive in 1967. He joined the Advisory section of the College in 1968 where he was responsible for mechanisation advisory work in the Central and West Perth areas based in Stirling.

At that time, mechanisation work was broadly based and included land drainage which on the heavy soils of the area involved mole drainage. Dave developed an interest in this area and was responsible for the supervision and demonstration of the Slammannan project and its associated publications. Advice on grain drying and alternative storage systems was much in demand at this time and interest in livestock mechanisation systems including waste management was on the increase. In the upland areas, fencing for cattle and sheep and feed handling were in demand and demonstrations of these were given at the College hill farm at Kirkton.

In 1984, Dave moved to a central base at the Engineering Department at Auchincruive as Senior Mechanisation Adviser heading a team of four advisers covering all aspects of Mechanisation but with greater emphasis on livestock mechanisation, waste management and providing general training for Health and Safety, including Food and Environment Protection Act (FEPA) training and sheep dip requirements. He was also an examiner and National Assessor on behalf of the Scottish Skills Testing Service and the National Proficiency Test Council.

He was held in high esteem by his colleagues and by students and farmers alike who benefited from his practical, down to earth, approach to their problems. He retired from the Scottish Agricultural College (SAC) in 2002 after 35 years of loyal service to the College and continued to serve as an independent consultant until his death.

As a life long member of the Institution of Agricultural Engineers, he held almost every post within the Scottish Branch from committee member to Secretary, Treasurer, Vice Chairman, and Chairman. For services to the Scottish Branch he had been put forward for a Branch Meritorious Award but unfortunately died prior to its presentation.

Dave led a very full life but found time to serve his local Troon Old Parish Church as Elder and Bible Class leader. He will be remembered for his friendly personality, sense of humour and caring approach and will be greatly missed by his many friends. He is survived by his only remaining brother Sandy and by sisters in law, nephews and nieces. His twin brother John and brother Andrew both died within the past year.

Bill Davidson

Letter to the President

Thank you for my 50-year Membership Certificate received in December. As suggested, I submit just a few paragraphs of my working life, which I hope will be interesting and useful.

In 1947, I started working for Norfolk Tractors Ltd, a branch of the Cecil Kay group of companies which included aircraft and American motor vehicle interests. At the same time, the 1947 Agriculture Act was passed which gave farmers the confidence to invest long term; so it was the Golden Age of the agricultural engineering trade.

It was also the Golden Age of the engine reconditioning trade, so I was lucky enough to get part time work in my home village with a firm called Reynolds and Hostler which specialised in crankshaft grinding and cylinder boring.

At the end of the 1940s, the pound sterling was devalued against the dollar from $4 to $2.80. The immediate effect was to ban all US and Canadian machinery imports and replace them with British-made goods which helped our manufacturers and also improved our Balance of Payments.

In the 1950s, most of us were affected by National Service which disturbed one's career and put off the time when we could expect adult wages, especially with the average National Service person being in front-line infantry. Later in the 1950s, I changed to Agricultural Education where I met Ian Constantinesco who featured in the previous issue of *Landwards* **60**(6). Ian had already led an interesting life and I was pleased to read of all his subsequent good works.

For several years, I was employed as a mobile instructor in farm machinery, later being appointed as Assistant Agricultural Education Organiser, Cornwall. The National Diploma in Agricultural Engineering (NDAgrE) has always carried a salary increment in the Education Service as has the Certificate in Education (Cert. Ed.). In addition, I have the City & Guilds full Technological Certificate (C&G Full Tech. Cert.) and was a member of the ASAE for several years.

I had many pleasant years in the Southwest Branch Committee, including two years as Branch Secretary. I must have been under a lucky star because I was in the trade during the good years, likewise my time in education.

Yours truly
J P Law MIAgrE

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CM1 3RR

Growing masses of biomass

Fred Walters (brimmed leather hat in centre of photo) is one of the country's pioneering farmers in the development of the planting and growing of willow as a fuel crop. On our day visit to Sutton Grange near Retford, we were taken through the growing cycle from seed bed preparation to harvesting. The planting machines were demonstrated – he said that a hard brimmed hat was essential when handling three and four metre long whips of willow on the planting machines! The long whips were fed into the planting machines which cut them into short lengths as they planted them. We were also able to study the special header that Fred was developing for the Claas Jaguar forage harvester.

The visit concluded with a field walk through crops at varying ages and stages. It was explained that it is an exceptionally valuable crop for the reclaimed gravel land of the Trent valley, although it grew faster on better land. Willow does not suffer excessively if the field is flooded as harvesting could be left until the ground was dry and firmer: there is no point in creating problems! It was a real, all the year round crop.

From the heap of chips (see photo) that we were studying, we could see five power stations but those chips were being transported down to Slough! This seemed a ludicrous situation. This pile had been made direct from the field in January and such a pile had normally dried enough to burn after six weeks. One of the problems is that the local power stations could only burn powdered coal and the wood needed the 'old' type of grate furnace. Things are due to change in that Drax is planning to develop a wood burning capacity and there is some willow near harvesting in the Thames valley.

The visit was organised by the West Midland Branch in conjunction with the Pioneering Technology Specialist Group and held on Saturday 12th November 2005.

William Waddilove

News of Members

Ian Walker-Munro who lives in Australia is again working in irrigation, for a company called Hugall & Hoille which has irrigation and fertiliser stores across Australia.

Congratulations to **Nigel Oldacre** who received an MBE in the New Year Honours list for services to Neighbourhood Watch.

Tony Chestney

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

Long service certificates

Name	*Grade*	*Date of Anniversary*
50 years		
Anthony James **Simms**	AIAgrE	24 Jan 2006
35 years		
Frank John **Pitkin**	EngTech MIAgrE	17 Jan 2006
John **Bailey**	MIAgrE	28 Jan 2006
Charles Daniel **Mitchell**	CEng FIAgrE	28 Jan 2006
Charles Richard Batterbury **Orr**	CEng MIAgrE	28 Jan 2006
Ralph Ernest Harper **Sims**	CEng FIAgrE	28 Jan 2006
Ayob **Bin Sukra**	CEng MIAgrE	28 Jan 2006
David Suffolk **Culy**	CEng MIAgrE	28 Jan 2006
James Patrick **McAleese**	IEng MIAgrE	28 Jan 2006
Keith Charles **Marsh**	MIAgrE	28 Jan 2006
Michael John **Martin**	IEng MIAgrE	28 Jan 2006
Nigel **Oldacre**	IEng MIAgrE	28 Jan 2006
Ian Frederic **Ruston**	AMIAgrE	28 Jan 2006
Michael C **Sheldon**	IEng FIAgrE	28 Jan 2006
Gordon Alan **Tailby**	MIAgrE	28 Jan 2006
William Charles Timothy **Chamen**	CEng FIAgrE	28 Feb 2006
25 years		
Michael William **von Kaufmann**	IEng MIAgrE	7 Jan 2006
Richard Gladstone **Brooke**	CEng FIAgrE	8 Jan 2006
John Alun Harris **Williams**	CEng FIAgrE	8 Jan 2006
Paul Ashley **Hill**	EngTech MIAgrE	14 Jan 2006
Arthur George **Bellerby**	AIAgrE	19 Jan 2006
Mark William **Tarlton**	AMIAgrE	21 Jan 2006
David Richard **White**	CEng FIAgrE	21 Jan 2006
Charles Stuart Grenville **Cotton**	AMIAgrE	10 Feb 2006
Fergus Robertston **Mitchell**	AMIAgrE	12 Feb 2006
Timothy Philip **Reynolds**	CEng MIAgrE	12 Feb 2006
Richard Adrian **Davidson**	IEng MIAgrE	12 Feb 2006
Rupert Colin **Hennah**	EngTech MIAgrE	19 Feb 2006
Jeremy Paul **White**	MIAgrE	5 Mar 2006
Alwyn Johnson **Cadawallader**	MIAgrE	12 Mar 2006
John Colin **Taylor**	CEng MIAgrE	12 Mar 2006
Murray Anthony **Eaglesome**	AIAgrE	12 Mar 2006
Adrian Guy **Snow**	EngTech MIAgrE	14 Mar 2006
David Adam **Scotchmer**	AMIAgrE	19 Mar 2006

COMMERCIAL MEMBERS

Autoguide
Equipment Ltd
Stockley Road
Heddington
Calne
Wiltshire
SN11 0PS

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

Bomford Turner
Limited
Salford Priors
Evesham
Worcestershire
WR11 5SW

John Deere Ltd
Harby Road
Langar
Nottinghamshire
NG13 9HT

FEC Services
NAC
Stoneleigh Park
Kenilworth
Warwickshire
CV8 2LS

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

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

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

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

White Horse
Contractors Ltd
Lodge Hill
Abingdon
Oxfordshire
OX14 2JD

Membership Changes

Admissions

A warm welcome to the following new members

Member

D J Sulman (Stirling)
N J Worthington (Cheshire)

Associate Member

J G Swain (Leicester)

Associate

P J Clarke (Fife)
A C Cunnington (Lincolnshire)
M W Hogarth (Angus)
C Kennedy (Dumfries)
P G Page (Torfaen)
C J Saunders (Dumfries)
J Smith (Dumfries)
S Stanley (Northumberland)
H Thomas (Carmarthen)
C Tracey (Scottish Borders)
J I Turnbull (Dumfries)
A Turner (Lancashire)
R W W Tyrrell (Dumfries)

Student

Barony College:
S Allonby
K W Amos
A Brannock
G Brough
A Buckley-Jones
A Cave
C Clark
F W Galloway
T A Graham
A J Gray
D Grayson
S Guthrie
S Hiddleston
D W Howe
D Hunter
M Johnson
L S Johnstone
R Jolly
R Lazenby
P McQuillan
K D Peart
J R Picken
A S Potter
G Richardson
N Ritchie
D Shand
J Stewart
J Thomson
J Turnbull
R I Weir
G L Whitehead
D Wilson

Cranfield University:
A P Dain-Owens
M Kokkora

Greenmount Campus Cafre, Northern Ireland:
O Boyd
W Boyd
W J Brown
R Cochrane
A R Colhoun
M Crawford
P Davidson
G Gribbon
P A Haffey
A Irvine
C Kerr
M R McCahon
D McConville
J McKay
J C McSparran
C Marshall
W Megaw
R Middleton
S Murray
D M O'Hare
B Quinn
C T Rea
G V Reilly
L Rickey
M Shiels
A Storer
M Thompson

Myerscough College:
D Ashworth
A M Bland
I R Eddleston
J Fitton
R Freeman
J O Garnett
R E Harrison
D Higham
J Hilton
M J Kenyon
C J Leigh
C Lloyd
T Lomax
M J Lumb
R S Marshall
A D Rhodes
P Rossall
M A Rostron
M Scarisbrick
O Skoczen

Oatridge College:
G Arnott
A W Barr
A Brown
C W Brown
D G Davidson
C D Ford
G B Forrest
A Greenshields
A M Rew
A G Stewart
A L Taylor
S R Walker
E F Wilson

Writtle College:
A P P Cuppen
H P Dinh
S R Gottam
H M A C Ikas
R Karnay
P Kochana
Komarudin
N Medam
B M Muche
S Podla

Transfers

Congratulations to members achieving a further phase of their professional development

Member

J C Archer (Stafford)
D G Blackburn (Aberdeenshire)
G P Fitton (Lancashire)
R D Jones (USA)
S Peirson (East Yorkshire)
J A C Steel (East Timor)
W S Turner (County Wrexham)
T R Underhill (Shropshire)

Associate Member

J G Jones (Ynys Mon)
T King (Ireland)
C T McBain (Fife)
C Patrick (Botswana)
N E Seymour (Wiltshire)

Deaths

With great sadness, we record the death of the following members

J A C Gibb (Berkshire)
R H Marsden (Gloucestershire)
R L Nelson (Gwynedd)
M D B Roberts (Devon)

Engineering Council

Registrations

Congratulations to the following members who have qualified as Chartered Engineer and Incorporated Engineer, entitling them to use the designatory letters CEng and IEng after their name, respectively

CEng

J C Archer (Stafford)
D W Barraclough (Leicestershire)
G P Fitton (Lancashire)
P E Naylor (Staffordshire)
W S Turner (Co Wrexham)
T R Underhill (Shropshire)

IEng

G B Preece (Lincolnshire)
N J Worthington (Cheshire)

Society for the Environment

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

Registrations

M W Bell (Tyne and Wear)
M I H Bennett (Somerset)
D G Blackburn (Aberdeenshire)
I Bown (Derbyshire)
R A Chase (Hampshire)
M J Cooper (West Midlands)
D F Ellam (Channel Islands)
R G Ellis (Bedfordshire)
P D Fisher (Australia)
R R Gladden (Australia)
J P Grindey (India)
M J Hann (Bedfordshire)
P V Hartley (Suffolk)
A A Lock (Buckinghamshire)
P C H Miller (Bedford)
S Peirson (East Yorkshire)
D J Perry (Cheshire)
R W Sneath (Bedfordshire)
J A C Steel (East Timor)
J H Williams (Gwynedd)
A C Williamson (Cumbria)

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

INSTITUTION of AGRICULTURAL ENGINEERS, WEST END ROAD, SILSOE, BEDFORD, MK45 4DU, UNITED KINGDOM. Tel: +44 (0)1525 861096 Fax: +44 (0)1525 861660

THE DEVELOPMENT AND LAUNCH OF THE JCB 444 DIESEL ENGINE

A report compiled by Geoffrey F D Wakeham

*This article is based on a presentation made by **Bob Womersley**, Chief Engineer, JCB Power Systems to the Wrekin Branch of the Institution of Agricultural Engineers at Harper Adams University College on the 7th November 2005. Well over 100 people attended from around the country.*

The background

The presentation started with a short introduction to JCB, now 60 years old and with a turnover of £1.2 billion. This equates to nearly £200,000 per direct employee.

The company had been directed to look at developing their own engine twice in the past once in the mid 1970's and again in the late 1980's as a means of securing supply of a core component of production. In 1970 and again in 1982 engine supply had been a major problem. These projects had not been taken forward to production for commercial rather than technical reasons.

The new engine

In 1998 with the continued development of the company, the need for a short timescale in introducing new products and the continued desire to control specification, quality and delivery of key components, the third engine project was started. This was to be a team exercise with outside expertise as part of the core development group. The main objectives were to develop and put into production a new class leading engine, to produce at a competitive cost, to design to construction specific requirements and to fill the 52 kW to 112 kW range.

It was decided to start with a 'clean sheet of paper' and not try and build on past work. The main consideration was related to the manufacturing of the engine. The production systems would be 'flexible' and lean both on the shop floor and in the administration. The engine was to be robust, high torque at very low revs, reliable and quiet. Clearly it would need to comply with legislation and be future proof through Tier 3. The technical details of the engine can be obtained from JCB but the key features are shown in Figs 1 and 2.

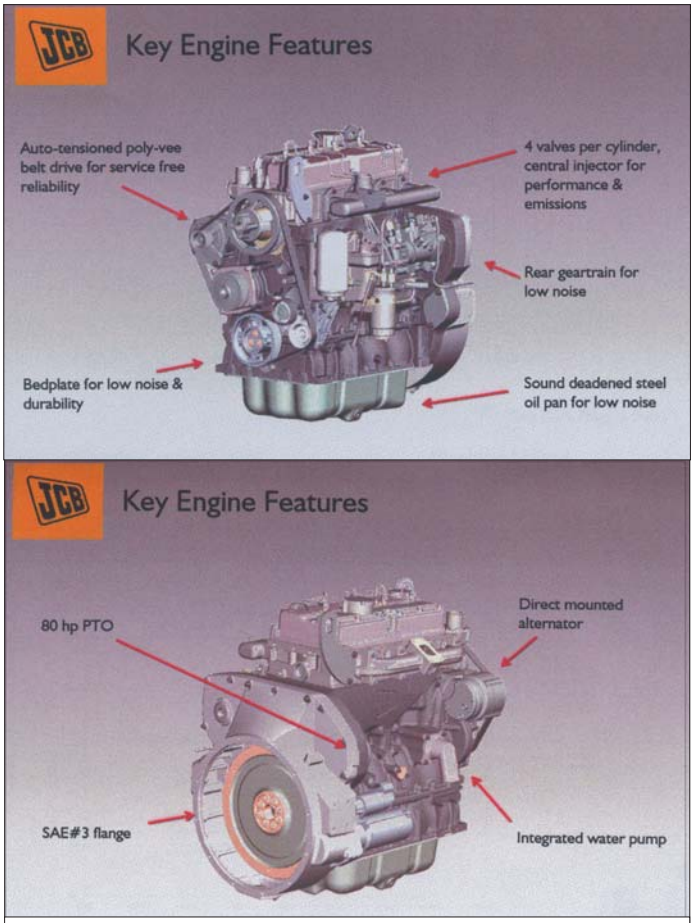

Fig. 1. Key engine features: (a) front; and (b) rear

The target level of noise emissions was bettered and Fig. 3 shows the superior torque characteristics over previous engines fitted.

The development process

The presentation then concentrated on the development process in which the key suppliers were involved from the start. This process was broken down into seven stages as follows.

1) *Planning* - Once the business plan had been accepted and

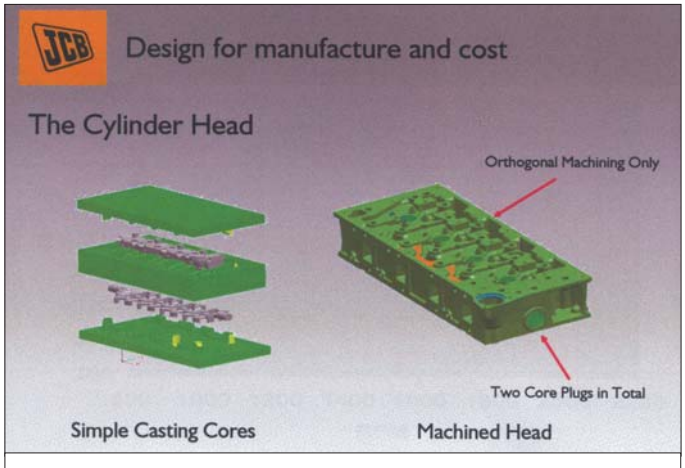

Fig. 2. Design for manufacture and cost.

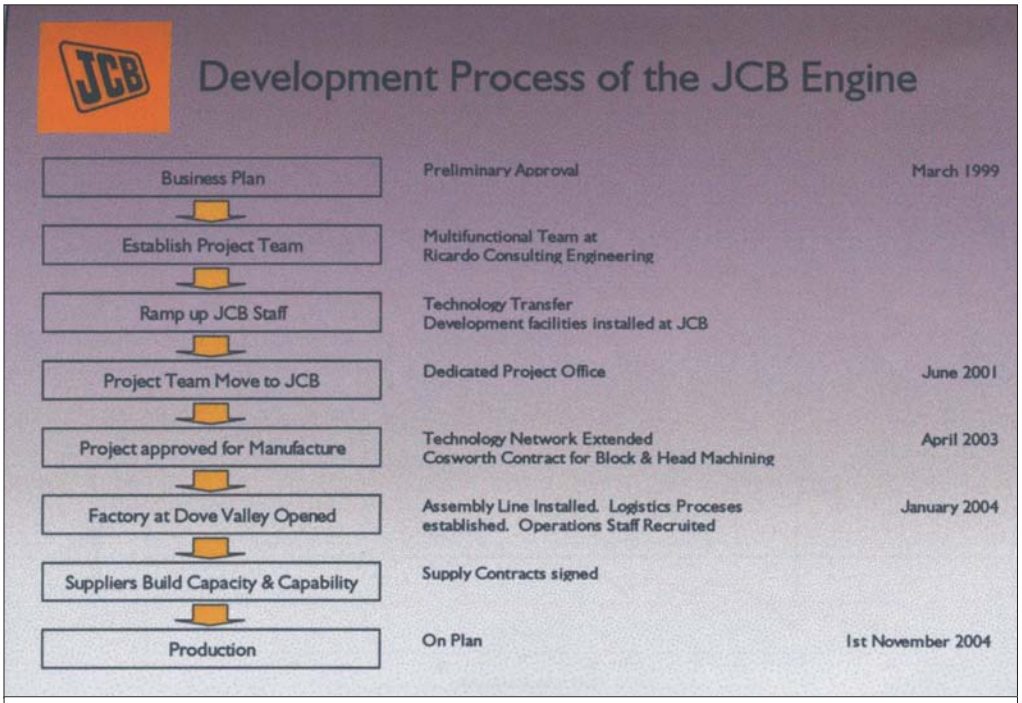

Fig. 3. Low speed torque characteristics.

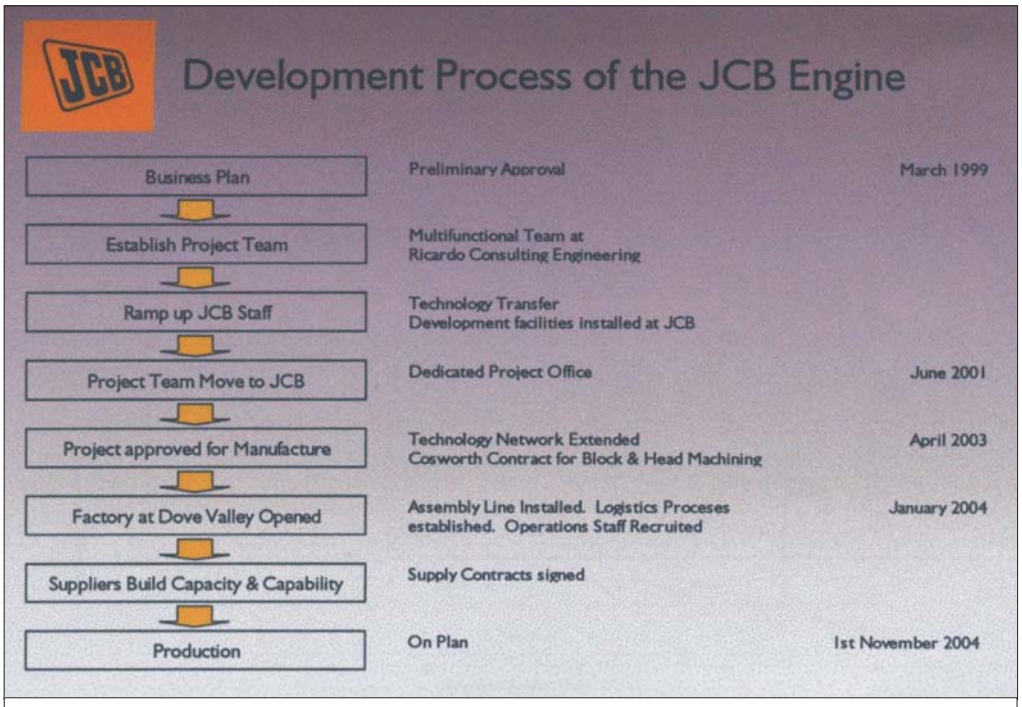

Fig. 4. Development process of the JCB Engine

the team established, QFD methodology was used to position the product and establish customer expectations, this led on to listing the product requirements and detailing the design assumptions.

2) *Concept Design* - Full uses of predictive tools such as computational fluid dynamics (CFD) and finite element analysis (FEA) were used to reduce later cost and time overruns. Valve train and gear train dynamics were modelled along with FIE and turbo matching. The assembly processes were simulated and cost estimates made.
3) *Concept Validation* - 6 prototypes were run for 6000 hours to confirm basic performance, check emissions were to legal requirements and to confirm that the design had achieved or bettered noise emission targets. Part of this testing was carried out in the field.
4) *Detail Design* - Further modelling was used to refine the design and a full cost tracking exercise was undertaken. The design concentrated on ensuring low cost manufacturing and assembly processes could be used. Work on assembly systems detail was carried out.
5) *Design Validation* - 72 engines were built and tested for 84,000 hours with some 22,000 in machines. These engines were tested for performance, noise and emissions, durability and reliability. Customer feedback formed an important part of this stage of development with test carried out from Finland to India. Assembly line design validation was carried out.
6) *Production Process Development* - In house and suppliers were involved in putting in place the necessary systems and equipment to build the engines to cost and to the demanding automotive quality standards using Advanced Product Quality processes (APQP) to assist in achieving these core demands.
7) *Production Validation* - 60 engines in three phases were used to remove any production reliability and quality concerns prior to launch. Some 16,000 hours of testing were required before sign off. Sign off / launch was dependent on closure of all product design concerns, assembly facilities were producing engines 'right first time' off hot test, suppliers were capable and ready (APQP process) and R/100 at 12 months in service was projected to be on target.

Figure 4 shows the outline of the activities between preliminary approval in March 1999 to start of production on the 1st November 2004. The first machines fitted with the new engines were delivered from Rocester and Savanna in January 2005.

Summary
The JCB engine has been specifically developed for mid range construction equipment with a low level of noise, high low speed torque and a long and reliable life. The lifetime cost of running the engine compares favourably with alternative units and the design methodologies followed have ensured a simple, robust and cost effective product has been realized. The programme objectives have been met.

5000 machines have been shipped to customers with positive feed back and few problems reported.

Bob Womersley attributed JCB's success in the market place to the setting of clear objectives so that teams could all work in one clear direction and to the rapid decision making process with regards to important key stages in projects. The engine project, a major new under taking, made rapid and sustained progress by involving all relevant staff as soon as possible in planning for future action.

Geoffrey F D Wakeham is Wrekin Branch Press Officer

LABELLING

Food labelling too fussy

Research into the consumers' cognisance on food labelling found that over three quarters – 77% – were totally mystified. And 89% believed that a simpler and more consumer friendly form of labelling needed to be introduced.

The research was undertaken by Gasoline, a marketing company that specialises in food and fast moving consumer goods (fmcg). Managing Director, Mark Joy said: "The general findings from the research were very clear, that the consumer requires clarity and a period of education as to what food labels really mean. There was also a consensus that, armed with the relevant and simplified information, the consumer could then make a more informed choice."

Only 24% of those questioned knew what RDA (Recommended Daily Allowance) stood for and of these 66% were aware that 100% RDA of each vitamin was sufficient for general well-being.

Only 10% knew what roles vitamin A, B, C and D played in general well-being i.e. good for bones, skin, etc.

65% of those researched were unable to answer the suggested guidelines of daily calorific intake for either an adult man or woman. However, women did fare slightly better than men, with 40% being within 500 calories of the average suggested intake.

- Apropos fat, carbohydrate and protein, 85% put fat as the food component that was most unhealthy; followed by carbohydrate at 9%; and protein 6%. However, only 15% could distinguish between saturated and polyunsaturated food.
- 66% of those questioned knew that sugar was a carbohydrate, but only 24% could name three sources of protein, three carbohydrates and three fats.
- The inclusion of sodium on labels stumped most researched; over 90% had no idea why it was included.
- And only 37% could equate energy with calorie intake – both shown on labels.
- 71% were wary of E numbers on labelling, but when questioned as to why, 52% had no reason other than they had heard they were unhealthy.
- The scientific names for additives prompted a large number of respondents to dismiss them as harmful. When asked on a scale of 1 to 6, five being bad for them, and six being ignorant, where they would position various additives, the overwhelming majority could not accurately predict their goodness or harmfulness, preferring the ignorant option.

Mark Joy says: "There was no clarion call for unhealthy foods to be banned, just relevant information to be easily understood and prominently displayed. When asked whether unhealthy food should be banned the majority of those questioned said 'no'."

Around 68% of all those questioned believed freedom of choice was more important than banning perceived unhealthy or unhealthy foods. Yet, 88% wanted to see better and more simplistic labelling; with 54% preferring an industry standard rather than ad hoc measurements.

Mark Joy says: "Whilst there is a huge debate about obesity, lack of exercise and unhealthy eating habits it appears they seem to be taking place away from the mindset of the consumer. The consumer appears not to have been fully engaged in the debate. It is going to be imperative for the food manufacturers and government to ensure that they do not alienate the consumer whilst finding a solution for food labelling."

The research by Gasoline concludes that whilst there have been major steps forward in recent years to ensure better and more accurate labelling of food ingredients, there is still a way to go to satisfy the customer.

Publication Reviews

RISK AVOIDANCE

Avoid an accident waiting to happen…

In 2004/05, 7 million working days were lost due to injury within the workplace. Many of these were machine related. The risks and hazards of machines at work are many, from trapping between rollers or cogs, to entanglement or contact with moving and rotating parts which can cause injuries such as cuts and abrasions.

In the majority of cases, organisations are given the second chance to rectify the cause of machinery related accidents. However, what happens when the accident results in permanent injury or fatality? Surely, in these instances, prevention is better than reaction?

In line with the Machinery Directive (98/37/EC), it is essential that those designing, manufacturing and operating machinery are aware of all the relevant Health & Safety issues surrounding machinery safety. Putting in place practical processes and procedures to reduce and eliminate the risks and hazards involved can help prevent the likelihood of accidents occurring in the future.

There is also an important need for the education of the workforce and management in order to generate a safety-first corporate culture. With an understanding of responsibilities associated with machinery safety, compliance with company policy and statutory obligations can be fulfilled.

Written by leading industry experts and with contributions and support from the Health & Safety Executive, BSI has recently published *PD 5304:2005 Guidance on safe use of machinery*.

This newly revised guide aims to promote a high standard of machinery safety by providing guidance which deals with issues ranging from selection of protective measures and safeguards through to practical examples of guard design and their application. The guidance can also be applied to machinery during its use to assist those persons with duties under the Provision and Use of Work Equipment Regulations 1998.

In a snapshot, the guide:

- describes and illustrates a variety of protective measures;
- explains methods by which it is possible to assess which measure(s) it is reasonable to adopt in particular circumstances;
- helps identify hazards;
- looks at aspects of machine design to eliminate or reduce risks;
- outlines the maintenance and safe working practices; and
- considers what needs to be done for installation of guards and protective devices.

It is intended for those who have responsibility directly or indirectly for use and refurbishment, upgrade or change of use of machinery, machinery guarding or protective devices. It is also intended to be used by those concerned with the development and implementation of safe working practices.

CONTACT

BSI Customer Services (quote reference: 5304-PR). Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. E-mail: orders@bsi-global.com. Website: www.bsonline.ibsi-global.com
Price: £149*, ISBN 0 580 46818 6

VIBRATION EXPOSURE

Employer guidance on whole body vibrations

The Health and Safety Executive (HSE) has published further guidance on Whole Body Vibration (WBV). The guide, *"Whole Body Vibration: The Control of Vibration at Work Regulations 2005"* gives advice to employers of what can be done to reduce and control the risks of WBV under the Control of Vibration Work Act 2005 which came into being earlier this year. The new guidance will be helpful to those who operate off-road machinery and construction vehicles as well as industries where drivers can be exposed to shocks and jolts while travelling over rough ground, such as in mining and quarrying.

The book is a detailed, plain language guide of the regulations as they apply to whole-body vibration together with chapters, giving practical advice on a number of issues like: how to do risk assessments, estimating vibration exposure and arranging health surveillance.

Mike Shepherd, head of HSE's Noise and Vibration Programme said, "HSE has been working closely with industry over the past 4 years to carry out research, which will help identify what the levels of whole-body vibration are in agriculture, mining and construction. The research is to identify the most effective ways of reducing excessive vibration exposures."

"Employers looking for more in-depth explanations of the regulations and how to manage the risks effectively will find the new guidance book very helpful.

MORE INFORMATION

HSE Books, PO Box 1999, Sudbury, Suffolk CO10 2WA. Tel: +44 (0)1787 881165. Fax: +44 (0)1787 313995. Website: www.hsebooks.co.uk/Books/ Public Enquiries: HSE InfoLine. Tel: 0845 345 0055.

STRUCTURES

Use of timber in construction

BS 5268-3 : 2005 Structural use of timber. Code of practice for trussed rafter roofs.
ISBN: 0 580 47340 6
Price: £128*, £64 BSI Subscribing Members

The use of structural timbers in any construction is of vital importance. The correct use of timbers for roofing can help keep buildings free from damp and the elements. BSI Business Information has revised this industry-wide code.

The standard covers the design, fabrication and use of trussed rafters for roofs. For the purposes of the standard, trussed rafters are assumed to be made from timber members of the same thickness fastened together by metal plate fasteners or plywood gussets. Trussed rafters usually span between external load-bearing walls without the need for intermediate supports from internal walls, lintels or purloins.

This standard provides recommendations on the strength grades of timber used in the fabrication of rafters and other critical design issues. Guidance on the handling, storage and installation of fabricated rafters is given. Information to be exchanged between the trussed rafter designer and the building designer is also listed.

Guidance is provided on:
• structural analysis methods;
• design by testing;
• standard bracing arrangements for domestic scale roofs;
• performance requirements for roof bracing;
• engineering design criteria;
• truss handling, storage and erection; and
• production requirements for truss manufacture.

Based on extensive tests, the maximum spans for two common truss configurations for a range of member sizes and roof pitches are given.

More for structural timber
The BS 5268 series covers all the factors that might impact on structural timber throughout its lifetime. It includes preservation, fire resistance, calculations for span tables as well as permissible stress design and workmanship.

MORE INFORMATION

BSI Customer Services (quote reference: 5268-PR). Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. E-mail orders@bsi-global.com. Website: www.bsonline.bsi-global.com/bsonline

WILDLIFE MANAGEMENT

New booklet calls for re-think in river management to benefit British species

A booklet has been produced by Water for Wildlife, a partnership between The Wildlife Trusts, the Environment Agency and Water UK, which calls for a major rethink in the way we manage our rivers and streams, which will benefit British species like otters, white-clawed crayfish, salmon, trout, plus a host of other wetland wildlife.

The booklet *'Managing Woody Debris in Rivers and Streams'* is for farmers, wetland landowners, site managers, anglers, foresters, local authorities and policy makers and aims to promote best practice in rivers and watercourse management by dispelling the myths and summarising the latest key thinking.

Its main advice is that woody debris, such as fallen trees, large branches, twigs and leaves, which has traditionally been seen as a 'nuisance' in watercourses and removed, is actually a vital component of rivers and streams particularly for wildlife. It has many benefits, but is crucial for instance, to migratory fish like salmon and sea trout because it provides a range of micro or 'niche' habitats for feeding, spawning and nursery sites. (Research in America has shown that pools created by logs and branches provide over 50 per cent of salmon breeding areas in small streams and its removal often precedes a decline in salmon populations.) It also helps stabilise the river bank and stores carbon, so can even mitigate the long term effects of climate change. Leaving it in the watercourse can therefore, provide benefits to both people and wildlife.

Nick Mott from the Staffordshire Wildlife Trust who helped produce the booklet says: "Many rivers in the USA, Canada and Australia which were formerly cleared of wood, have been 're-snagged' in recent years with trees and large branches to dramatic effect. The UK now needs to catch up with this thinking and improve its understanding and management of watercourses. A great deal of taxpayers' money is spent removing woody debris unnecessarily. The over-riding principle, should be, that unless there is a very strong and well supported case for its removal or repositioning, woody debris should be left in. It forms the backbone of a healthy wetland eco-system and leaving it is actually a cost effective form of river rehabilitation."

Alastair Driver, the Environment Agency's National Conservation Manager is impressed with the publication. "We have been aware that woody debris is a vital component of healthy river systems for some time now, but the value of leaving quantities of this material in streams and rivers, when we have historically cleared much of it out, is a difficult message to get across to landowners. Fortunately, nowadays we routinely apply a much more sensitive approach to watercourse management by attempting to balance the needs of reducing flood risk to property whilst maintaining and improving wildlife habitats. This attractive and informative leaflet provides a valuable insight into the benefits of this approach for the wide range of wildlife dependent on woody debris."

MORE INFORMATION

Chris Rostron, Water for Wildlife Manager, The Wildlife Trusts. Tel: +44 (0)1773 881176. E-mail: CRostron@derbyshirewt.co.uk

Copies of booklet, partly funded by Biffaward which supports Water for Wildlife in the Midlands, can be downloaded free from The Wildlife Trusts. Website: www.wildlifetrusts.org

PERSONAL PROTECTION

HSE publishes revised personal protective equipment guidance

A revised version of guidance designed to help employers who supply and use personal protective equipment (PPE) at work meet their duties under the law has been published by the Health and Safety Executive (HSE).

The guidance, *Personal Protective Equipment (PPE) at Work Regulations 1992 (L25)*, which was first published in 1992, has now been updated to reflect changes to the Regulations, developments in PPE and to clarify guidance queries commonly received by HSE.

The Regulations require PPE; for example, safety helmets, gloves, eye protection and high-visibility clothing, to be supplied and used at work wherever there are risks to workers' health and safety that cannot be adequately controlled in other ways. The Regulations require PPE to be:
properly assessed before use to ensure its suitability for the work being done;
maintained and stored properly;
provided with adequate instruction on how to use it safely; and
worn correctly by the user.

The first section of the booklet sets out the Regulations, followed by information on how to comply with their requirements. The second part provides details on the different types of PPE available, the types of hazards that may require PPE to be worn, followed by advice on its correct selection, use and maintenance. This section now also features information on the selection and safe use of Personal Fall protection equipment when working at heights.

HSE has also reissued *'A Short Guide to the Personal Protective Equipment at Work Regulations'*, a free leaflet aimed at providing employers with a brief summary of the law's main requirements. In particular, the guide includes a short synopsis of common workplace hazards and types of PPE that can be used to prevent workers' exposure. The leaflet also provides tips on ensuring PPE is adequately maintained and workers are provided with sufficient training so that it is properly used.

MORE INFORMATION

Copies of Personal Protective Equipment at Work Regulations 1992 (as amended), ISBN 0 7176 6139 3, price £8.95, 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.
Copies of A Short Guide to the Personal Protective Equipment at Work Regulations, INDG174, are also available. Alternatively the booklet can be downloaded from the HSE website at: www.hse.gov.uk/pubns/indg174.pdf

WASTE GUIDELINES

How to reuse biogenic solid waste at minimum environmental impact

Guideline: **VDI 3475 Part 2: Emission Control – Composting and anaerobic (co-) digestion facilities for biological solid waste – Plant capacities up to approx. 6000 Mg/a**
Edited by: **VDI Verein Deutscher Ingenieure (The Association of Engineers), Kommission Reinhaltung der Luft im VDI und DIN – Normenausschuss KRdL (Commission on Air Pollution Prevention of VDI and DIN – Standards Committee).**
Price: **138.20**

The guideline VDI 3475 Part 2 describes the state of the art of compost production and anaerobic digestion as well as biogas production of biological solid waste in low-capacity plants, some of which operate as agricultural co-fermentation plants. The focus of the guideline is on air pollution such as odours, hazardous substances, dust and bioaerosols.


Canvas covered, open air compost piles

Criteria for emission control are listed step by step, starting with the selection of the plant site as a function of the input material to be expected. Then detailed descriptions are given on how to organise collection, delivery, acceptance and conditioning of the material prior to and in the course of waste processing, including also effective changes of the treatment method proper. Waste gas cleaning methods count among emission control measures as well.

The provisions of this guideline may also be applied to composting and fermentation of sewage sludge. They do not apply to plants for the treatment of mixed municipal waste and for composting and fermentation plants with subsequent use of the compost or biogas by the plant owner himself. However, the transfer of the methodical knowledge to such plants is generally feasible.

MORE INFORMATION

Beuth Verlag GmbH, 10772 Berlin, Germany. Tel: +49 (0) 30 26 01-27 59. Fax: +49 (0) 30 26 01-12 63 Website: www.beuth.de Released in German and English.

BUILDING DESIGN

Slurry management techniques in dairy cattle housing

This booklet provides an excellent source of information on sound design and stock management in dairy cow housing. Good cow management depends on a clean environment. Cows standing, walking and lying in slurry are more predisposed to disease, softer hooves and digital dermatitis. The 36 page glossy guide is full of photographic examples of what and what not to do. Concise and precise design specifications are provided on building layout in relation to stock lying and standing areas, water trough and feed barrier location and machinery access. The presentation is based on the findings of a project team led by Dr Mike Kelly, Livestock Building Design Consultant, and supported by Dave Howat, Waste Management Specialist, David Webster, retired Farm Manager and SAC veterinary staff.

Example images: steps down giving an injury risk; well-drained herringbone floor

MORE INFORMATION

Milk Development Council, Trent Lodge, Stroud Road, Cirencester G27 6 JN, UK. Tel: +44 (0)1285 646500. Website: www.mdc.org.uk

WASTE MANAGEMENT

£1 million funding for new farm plastics collection and recovery programme

As a result of the new Agricultural Waste Regulations to be introduced in early 2006, 137,000 farms in England will have to find alternative means of disposing of non-natural waste.

At present much of the non-natural waste arising on farms is either buried or burned. When the new regulations come into effect, these practices will be prohibited and farmers will face significant costs to comply with the rules through using off-farm disposal and recovery options.

Looking to lessen this impact, the Agricultural Waste Stakeholders Forum (AWSF) has been successful with an application to the Department of the Environment, Food and Rural Affairs (Defra) regarding the use of the Business Resource Efficiency and Waste (BREW) Programme funds to support the investigation, development and promotion of a producer responsibility Farm Plastics Collection and Recovery Programme in England. The Chartered Institution of Wastes Management Environmental Body CIWM (EB), has been commissioned by the AWSF to manage delivery of the programme.

Packaging wastes arising on farms are already covered by the Producer Responsibility Obligations (Packaging Waste) Regulations. As these regulations are designed to ensure recovery and recycling targets are met through the most cost-effective means possible across all waste streams, little or no agricultural packaging waste is currently collected.

The development of a co-ordinated system of collection and recovery for agricultural waste plastics operating within the framework of Producer Responsibility for non-packaging plastics will result in a considerable number of benefits and opportunities, both for the agricultural and waste sectors.

The objectives of the £1 million programme have been constructed to develop the infrastructure for a sustainable farm plastics collection and recovery network throughout England which might ultimately allow the majority of all farm plastics to be collected and recovered. Project Manager, Ivan Good commented, "I should emphasise that this is not about subsidising loss-making collection schemes. The funding will be used to identify best practice through the commissioning of pilot projects and demonstration activities that aim to maximise the tonnage collected and minimise logistical costs. At the same time, the programme will consider the infrastructure requirements and data systems needed to finance and manage farm plastics collection and recovery under a producer responsibility regime."

CONTACT

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CLIMATE RESEARCH

Effect of climate change on Indian agriculture, health and infrastructure

Results from a three year UK/India climate change research programme were unveiled at the EU-India Summit in Delhi. The £450,000 study, which looked at the impacts of climate change, found that India was likely to face significant adverse effects in a range of sectors, including agriculture, health, forestry and infrastructure.

The study found that temperatures were likely to rise in the next few decades, leading to a reduction in wheat and rice yields in India. While rainfall is predicted to rise in some regions, periods of drought are expected to become longer in others, leading to changes in forestry and vegetation.

Researchers found that the incidence of malaria could increase in areas that are already prone to the disease, and the effects of climate change could introduce malaria into new regions. The study also looked at the impacts of climate change on a coastal railway system in southwest India and showed that rising sea levels could cause severe disruption of services.

The programme involved eight Indian institutes that are working to assess the impacts of climate change on sea level variability, water resources, forests, agriculture, health, energy, industry and transport infrastructure.

Environment Minister Elliot Morley said the programme had enhanced India's understanding of the impacts of climate change across a wide-range of sectors.

"I welcome the fact that the project has helped increase close working relations on climate change as well as enhancing the capacity for climate change research in India. The project has contributed to a rise in awareness of the potential consequences of climate change in India and then importance of taking action.

"Climate change in India represents an additional stress on a country that is already facing tremendous pressures due to rapid development. With its growing population, India is particularly vulnerable to the impacts of climate change. Understanding climate change and its consequences is critical to protect lives and assets upon which India's economy is dependent. Awareness of climate change and its impacts on people, the economy and livelihoods will be important to balance economic growth and development with a changing resource base."

During the project, Indian scientists spent time working with UK research institutes, such as the Hadley Centre for Climate Prediction and Research, Exeter.

FOOD SAFETY

Pesticide Residues Committee – second quarter report 2005

The latest results from the Pesticide Residues Committee's (PRC), programme of pesticide residue testing in food have been published. Tests were carried out on 1101 samples of 19 different foods. This latest quarterly report found that 56% of samples tested had no detectable residues, and 41.6% contained levels below the maximum residues level (MRL) – the legally permitted level. Although 26 samples (2.4%) contained residues above the maximum permitted levels. None of the residues above the limits caused concern for people's health.

Dr Ian Brown, chairman of the Committee, said: "None of the results in this quarter gave me any concern for consumer health. They show that the majority of our food is residue free or contains residues at levels in accordance with guidelines.

"The results show 26 samples (2.4%) contained residues in excess of the maximum permitted levels. This is a slightly higher proportion than we have found recently. We have looked carefully at each of these and in every case the presence of these residues would not have resulted in any adverse health effects for consumers. It is possible that many of these 'exceedances' are technicalities, arising because MRLs have not been set to reflect legitimate use of pesticides in exporting countries.

"The results should reassure consumers that the food they eat continues to be safe. It is important to stress that the positive effects of eating fresh fruit and vegetables as part of a balanced healthy diet far outweigh any concern about pesticide residues.

"Action was taken to inform suppliers and authorities of MRL exceedances where they were found."

The PRC is an independent body which advises Government, the Food Standards Agency and the Pesticides Safety Directorate. These recent findings are part of a £2.2 million food and drink monitoring programme which takes place each year, and cover testing in April to June 2005.

The MRL, or maximum residue level, is the maximum concentration of a pesticide residue – expressed as milligrams per kilogram, or parts per million – legally permitted in or on our food and animal feeds. The levels are not safety limits, but are set at levels which protect the consumer. They are primarily a check that good agricultural practice is being followed, and an MRL exceedance does not automatically imply a hazard to health.

CONTACT

A free leaflet about the monitoring programme is available. PRC, Room 308, Mallard House, Kings Pool, 3 Peasholme Green, York YO1 7PX. Tel: +44 (0)1904 455980.
The full report is available online. Website: www.pesticides.gov.uk/prc.asp?id=1743

FORESTRY

New direction for science of forestry

Ministers in England, Scotland, Wales and Northern Ireland have agreed a new direction for publicly funded science and innovation in forestry. A new joint strategy has been published, following consultation with a wide range of stakeholders. This is the first time that such a strategy has covered all four countries of the United Kingdom.

Among its aims, the strategy sets out to improve the base of scientific evidence for effective policy and practice, with increased emphasis on communications and knowledge transfer. Recent shifts in importance of the social elements of forestry, and of climate change, on the political agenda were reflected in the feedback received from the consultation exercise. This has resulted in a repositioning of major research priorities. The strategy acknowledges that this will require careful planning and detailed reviews of current programmes. Innovation has also increased its position in the list of priorities, with additional expenditure expected to become available to encourage special projects, new partnerships and imaginative research avenues.

In another first, the Forestry Commission has set up a Board to oversee the implementation and revision of the strategy, and to ensure that country interests are properly represented. In line with the strategy's aims to forge tighter links between science and policy, the formation and structure of the new Research Strategy Management Board is expected to promote much closer working between scientists, expert advisers, policy makers and those who deliver on the ground.

The strategy's publication was welcomed by Tim Rollinson, Director-General of the Forestry Commission, who said: "We listened to what our stakeholders said they wanted, and expect to make some major immediate changes as a result. In particular, we need to improve the communication of the knowledge we accumulate; to integrate our research activity better with other land-based activities; to increase our investment in social and economic research; and, crucially, to improve our knowledge of climate change. These are important changes in direction that will mean reducing our current commitments in some areas, and this will require some hard choices and very careful planning."

Malcolm Beatty, Chief Executive Officer of the Northern Ireland Forest Service, added: "This Strategy reflects the common interests of forest users and forest owners throughout the UK. By working together to pool our knowledge and breadth of experience we have increased our ability to make sure that solutions to forestry problems will remain soundly based and stand the test of time. We in Northern Ireland are delighted to be part of this strategy."

One of the outcomes of consultation was clear stakeholder support for Forest Research, the Forestry Commission's world-renowned research agency. It is expected that Forest Research will continue to provide the bulk of the Commission's needs for research and scientific advice, although other sources will also be used, including sponsorship of studentships and bursaries.

CONTACT

'Science and Innovation Strategy for British Forestry', can be downloaded via a link from the following page on the Forestry Commission's website, www.forestry.gov.uk/research

LEGISLATION

Defra publishes advice on the management of byways and rights of way

The Department of the Environment, Food and Rural Affairs (Defra) has published advice for Local Authorities, the Police and Community Safety Partnerships on the maintenance of byways and the illegal use of motor vehicles on rights of way.

Rural Affairs Minister, Jim Knight, said: "It has become clear that many of those involved in enforcement are unaware of the significant range of powers that already exist to tackle the illegal and irresponsible use of motor vehicles on rights of way and in the wider countryside. There are others who have demonstrated, through imaginative and creative use of these powers, that they can be successful if used effectively.

"The aim of the guidance is to share this good practice with local authorities, the Police and Community Safety Partnerships and to encourage the formation of local partnerships to tackle the continuing abuse. We must ensure that our byways and rights of way are protected for the enjoyment of everyone who use these important parts of our countryside, now and in the future."

'Regulating the use of motor vehicles on public rights of way and off road' is the first step in providing information to Local Authorities, the Police and Community Safety Partnerships on getting the most out of existing legislation, and to encourage the formation of local partnerships to tackle the continuing abuse.

'Making the Best of Byways' will provide a practical reference manual for authorities, land owners, contractors, volunteer groups, and others involved in the maintenance of unsurfaced vehicular routes. Among other things, it provides advice on dealing with: conflicts between users; poor surface conditions; and increasing pressure of use.

CONTACT

Defra publications, Admail 6000, London SW1A 2XX. Tel: +44 (0)8459 556000. Website: www.defra.gov.uk/wildlife-countryside/cl/mpv/index.htm

RESEARCH

Scottish Carbon Storage Research Group launched

A research partnership, which will use skills and technology developed to support the oil and gas industry, has been established to investigate the storage of carbon dioxide in underground reservoirs. The Edinburgh-based Scottish Centre for Carbon Storage Research, funded by the Scottish Higher Education Funding Council (SHEFC), Heriot-Watt University and the University of Edinburgh, will support research focused on the global warming problem of carbon dioxide emissions. The four year SHEFC award of £1,399,815 will use the oil related research skill base of The Institute of Petroleum Engineering at Heriot-Watt and the School of Geological Sciences at University of Edinburgh to investigate issues involved in injecting carbon dioxide for long-term storage in subsurface structures like deep saline aquifers, oil and gas reservoirs and deep coal seams.

The Centre will investigate various subsurface storage options that are targeted at contributing to reducing world wide carbon dioxide emissions into the atmosphere, currently at a level of around 25 Gt/yr of CO_2. According to IEA figures, storage of CO_2 in deep saline aquifers could lock away 400 to 10,000 Gt, in oil reservoirs 920 Gt and in coal structures 40 Gt.

The challenge for Centre researchers will be to use oil reservoir simulation software and laboratory methods to model various CO_2 storage scenarios and investigate the behaviour of these processes, which aim to lock the global warming gas away for thousands of years, as compared to oil reservoir behaviour for around 30 years.

Carbon dioxide injection into oil reservoirs is a long established technique for improving oil recovery in on-shore oil fields. However, it is not proven for offshore fields and the expertise and facilities in the Centre's partner laboratories will be used for investigating such techniques to apply in offshore oil sectors like the North Sea.

Monitoring and verification of stored carbon dioxide is an important issue for the general public, government and other stakeholders and the Centre will examine the use and development of techniques such as seismic, geochemical and other techniques to monitor the stored gas behaviour and ensure that the storage structure provides an effective seal to prevent escape of the carbon dioxide.

An important dimension of the Centre in relation to this global issue will be interaction with other groups across the world who are also building up their research effort in this issue, and indeed the British Geological Survey, which has a broad and important national subsurface role and has been active in carbon dioxide storage for a number of years at its centre in Keyworth, is also a partner in the initiative.

The Scottish Centre for Carbon Storage Research members will also be working with colleagues in the Edinburgh Collaborative in Subsurface Science and Engineering (ECOSSE), a Joint Research Institute, providing a strategic opportunity for Scotland to enhance its existing strong subsurface research and education. Heriot-Watt's Professor Adrian Todd, Project Manager for SCCS, said, "The major support of SHEFC to this carbon dioxide emission reduction initiative will enable researchers in Scotland to be significant participants in the international research necessary to contribute to what is probably one of the world's greatest technical and social challenges."

ACCREDITED TRAINING

Driving safety at work

Land Rover has launched a range of 'Lantra Awards' accredited specialist driver training courses designed to improve the safety of 4x4 drivers in the workplace.

The Lantra Awards relationship with Land Rover Experience provides a solution for companies and organisations whose employees use 4x4 vehicles from a range of manufacturers and who therefore have a 'duty of care' to provide appropriate training in how to use them safely under the 1998 Provision and Use of Work Equipment Regulations Act.

Steve Westwood – who manages Land Rover's UK network of Experience centres – said: "By combining 57 years of off-road driving expertise and our unique network of Experience centres with a Lantra Awards accreditation, we are now approved to provide specialist driver training for anyone who uses a 4x4 vehicle at work.

From assessing and negotiating unfamiliar terrain, to understanding environmental issues, Lantra Awards training courses prepare delegates with vital knowledge and hands-on experience to protect both their safety and the safety of those around them. Successful completion of the course is recognised with a Lantra Awards accredited Certificate of Basic Training and a nationally recognised Skills Identity (ID) Card in 4x4 competence.

Steve Westwood added: "These courses recognise that even the most experienced off-road drivers can come up against hazardous situations in unfamiliar terrain. Land Rover Experience centres provide the ideal environment for drivers to learn off-road driving techniques and understand the capabilities of their vehicles. Together we are focused on helping companies drive down the number of vehicle-related accidents at work."

Each of Land Rover's nine UK Experience centres are purpose built and provide drivers with a unique learning environment, comprised of a combination of differing terrains, designed to help drivers develop their knowledge and skills in a safe environment before they apply them in any real life situations that they may encounter.

Wood for watts

A company producing biomass gasifiers has just started running its first full commercial plant in Merseyside.

This advanced technology from Biomass Engineering Limited – winner of the United Utilities Low Carbon award – means a vast range of waste products and energy crops can be turned into money by converting them into energy.

The showcase plant, at Mossborough Hall, Merseyside, is on a mixed use farm with a green waste licence and will be used to gasify chipped logs and clean waste wood.

Farmer Will Heyes says: "It's an excellent, hassle free way to diversify while contributing to a better environment. I estimate I'll save approximately 750 t of carbon dioxide from going into the atmosphere and, what's more, I shall be seeing a return on my investment within three to give years."

He is selling his excess electricity to Green Energy UK plc a renewable energy supplier with which Biomass Engineering has teamed up.

"The EU has just this week announced a biomass action plan for the end of this year, with increased use of this resource and greater market opportunities for farmers," says Ramsay Dunning, finance director of Green Energy UK. "There is an excellent market for this advanced technology which we believe will grow significantly."

The 250 kWe plant is visually unobtrusive and takes up a 10 by 15 m area with a height of 4 m. It is designed to operate unmanned with remote monitoring. The hopper needs to be filled approximately every 6 - 8 hours. This period can be extended to suit individual needs.

EU biomass initiative to bring farmers new opportunities

Whilst running the plant continually maximizes revenues, the plant can be easily shut down and restarted almost immediately.

This is an ideal solution to the waste problem on many environmental counts. The gasifier operates on low pressures so is an inherently safe process. It has very low emissions and has the support of the Environmental Agency. It uses no fossil fuels or water. The process is very quiet with the only noise being that of a low hum of the generator.

Combined heat and power (CHP) is available from the plant which can be used to process heat, wood drying or space heating. Farmers can use the carbon dioxide for other agricultural purposes such as for greenhouses.

The technology can be used for many different wastes including most forms of wood, energy crops, miscanthus/straw/husks, refuse derived bio-fuels, animal by-products, leather, mammalian bone meal (MBM) and food processing wastes.

The gasifiers range from 150 kWe to 2 MWe. The technology works particularly well in modular form and the larger gasifiers are made up from units of 250 kWe. Although not used at the Mossborough Hall site, a fully automated floor system for the gasifier is also available from Biomass Engineering.

Biomass Engineering plans to expand substantially in the UK and hopes to put considerably more business Green Energy UK's way.

Graham Shaw, chief executive of Biomass Engineering, says he selected Green Energy because the fit was good. "When we started looking at this project and researched the energy market we knew the working relationship with the energy company was going to be key. Green Energy UK has the appetite for the partnership and a good reputation in the market."

Green Energy which used wholly British sources of energy, is a young company with a radical business model. It is giving away half of its business in shares – the first 100,000 customers are getting 400 shares each. This not only gives them potential stake in the future but involves them in the business and its successes.

It is also ploughing back 50% of the profits into developing renewable energy technologies, such as tidal generation, solar power, small-scale hydro, biomass facilities and wind farms.

CONTACT

Jim Campion, Biomass Engineering Ltd. Tel: +44 (0)7787 175699 E-mail: info@exell.ltd.uk Website: www.biomass-uk.com

APPOINTMENT

John Deere appoints new managing director

Richard Johnson (left) and Alec McKee - retiring after 37 years of dedicated service - at the John Deere Limited headquarters in Langar, Nottingham

After 37 years of dedicated service to John Deere Limited, Alec McKee has chosen to retire. As of January this year, Richard Johnson replaced him as managing director.
After gaining an NDA from Harper Adams Agricultural College in 1967 and an NDAgrE from Writtle College of Agriculture in 1968, Alec McKee worked for four years with a John Deere distributor in Zambia.
He joined John Deere Limited in 1972 as a trainee territory manager, becoming business management adviser, credit manager and commercial manager. He was subsequently appointed general sales manager in 1991 and managing director in 1993.
At the end of 2000, Alec left the UK & Ireland branch for the position of vice-president, worldwide marketing for Deere & Company in Lenexa, Kansas and in 2002 he was appointed vice-president, Russia Operations. In this capacity, Alec was instrumental in establishing a John Deere office in Moscow, as well as developing and implementing a dealer network and strategic business plan for the company in Russia. Alec then returned to the UK as managing director in 2004.
Richard Johnson will take over responsibility for directing the activities of the UK and Ireland branch, including both the agricultural and commercial & consumer equipment (C&CE) divisions.
Richard joined John Deere Limited in 1988 as a sales trainee after graduating from Harper Adams with an HND in Agricultural Engineering. He then became a C&CE territory manager, firstly for Scotland and Ireland, and then for the east and north west of England. He subsequently worked as home-owner equipment product manager and as business development manager for the UK and Ireland.
In 2001, Richard moved to Deere & Company's European Office in Mannheim, Germany as manager, customer acquisition & marketing support, and subsequently manager, parts & service marketing for Europe, Africa and the Middle East. In 2004, Richard rejoined John Deere Limited in his current position as southern division sales manager.
"Alec's broad business experience in Europe, Russia, and North America and his extensive knowledge of dealer operations will be greatly missed," commented James A. Israel, Deere & Company's vice-president, marketing & product support for Europe, Africa & the Middle East, when the announcements were made.
"While wishing Alec and his wife Maureen a happy and healthy retirement, we also welcome Richard Johnson to his new role. Richard brings strong commercial and leadership skills to this position and we look forward to having him as part of John Deere's European management team."

GUIDANCE SYSTEMS

Automatic steering for all

John Deere's Agricultural Management Solutions (AMS) division has launched Universal AutoTrac, the company's first aftermarket automatic guidance system for tractors and other self-propelled equipment, including combines and foragers.

Universal AutoTrac is designed to be used in combination with either the original GreenStar precision farming system or the new GreenStar 2 and the proven StarFire iTC position receiver, and can also be transferred quickly and easily between different vehicles if required. Accuracy levels to suit all farming applications are available, including the free StarFire 1 signal (30 to 50 cm), StarFire 2 (10 cm) and StarFire RTK (2 cm).

Setting up Universal AutoTrac is a simple process that takes around 30 to 45 minutes. It effectively replaces the existing vehicle steering wheel with a specially designed version, which employs a positive drive system run by an electric motor to operate the steering. This incorporates different steering modes to suit rigid or articulated wheeled machines, as well as tracked models.

Universal AutoTrac - John Deere's first aftermarket automatic guidance system for tractors and self-propelled equipment

Once the new steering wheel is fitted, operation is similar to the integrated AutoTrac system – the driver simply sets an A to B line, activates AutoTrac, and takes their hands off the steering wheel. The system is deactivated and manual steering restored by simply turning the steering wheel, for example at the headland. Operation is possible in both straight and curved modes, as well as parallel tracking.

Available from mid-February 2006, Universal AutoTrac can be retrofitted to John Deere 5020, 6000 to 6020, 7000 to 7020 and 8000 to 8030 Series tractors, as well as Case IH MX Magnum models from the MX180 to the MX285. Further updates during this spring and summer will include additional John Deere and Case IH machines, as well as tractors and self-propelled equipment from New Holland, Claas, Deutz-Fahr, Fendt, Massey Ferguson and Challenger.

CONTACT

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APPOINTMENT

Massey Ferguson Europe's man at the top

Richard Markwell, Vice President and Managing Director for Massey Ferguson operations in Europe, Africa and Middle East (EAME)

AGCO Corporation has appointed Richard Markwell as Vice President and Managing Director for its Massey Ferguson operations in Europe, Africa and Middle East (EAME).

Based in the UK at Coventry, Richard Markwell will be responsible for all Massey Ferguson related operations throughout Europe, Africa, and the Middle East. Prior to his new appointment, he was Vice President Customer Support, EAME with responsibility for Parts and Service across all AGCO brands.

Massey Ferguson's machinery sales approach 50% of AGCO's $5.3 billion global turnover.

British-born Mr Markwell joined Massey Ferguson in 1975. With widespread international experience, he has held a variety of senior European sales and marketing positions with AGCO including a ten year period in France. He speaks both French and German.

Richard Markwell commented, "It's a good time to be part of Massey Ferguson. With all the latest new product introductions, MF has its best model line-up ever. In the last two years, the MF brand has won more awards than any other tractor make and is achieving growing market share in every region of the world. I'm joining a strong team. The depth and breadth of the current MF line-up demonstrates that we are responding strongly to the varying needs of both developed and developing markets."

"Massey Ferguson has and will continue to launch new products across every sector to give farmers the tools they need to meet ever challenging conditions."

He continued, "There is also good news on MF harvesting equipment with increased sales and positive customer feedback. We had a tremendous 2005 harvest in Europe with the Activa, Beta and CEREA combine ranges, while the Brazilian-built models are proving themselves in Africa and Middle East territories. The restructuring at the Randers plant in Denmark has provided a big boost to the CEREA range and production is scheduled to increase significantly in 2006."

"Backed by industry leading after-sales support, and continuing investment in product development we will be seeking to further grow our market share in all sectors," he said.

Richard Markwell replaces Steve Wood, who has decided to retire early to take up other interests. Gary Collar, Senior Vice President General Manager for AGCO EAME said,

"Everybody who has met Steve Wood will know the qualities and commitment he brought to the role and the significant contribution he made to the total re-birth of the MF brand. He has set a strong foundation upon which the MF team can base further growth and development. He will be missed in the AGCO organization worldwide."

He continued, " It says much for the breadth of talent that exists within AGCO that Richard Markwell is taking the lead role in the next stage of developing Massey Ferguson's further growth in EAME. Richard has many years international experience within AGCO and specifically with the Massey Ferguson brand. He is clearly the right man to take the brand forward".

Steve Clarke, currently Director Sales and Marketing for AGCO Parts EAME, has been appointed to Richard Markwell's previous position of Vice President, Customer Support for AGCO EAME.

PERISTALTIC PUMP

Easy tube loading pump

Autoclude, the UK based designers and manufacturers of peristaltic pumps, are pleased to announce an addition to their wide range of original equipment manufacturer (OEM) and cased peristaltic pumps. The new 'Easy' tube loading pump' from Autoclude has been designed specifically for applications where the loading of the tubing into the pump head needs to be effected quickly and simply without the use of any tools. A major feature of the new pump design is its ability to have additional heads stacked onto a single drive unit enabling multi-channel pumping from a single drive.

The pump head will accept 6 tube sizes from 0.8 mm bore through to 8 mm bore and will accept 5 different tube materials to meet the chemical compatibility demands of today. Flow rates up to 1260 ml/min can be achieved dependent upon tube size and motor choice.

Each pump head has as standard a three roller rotor mounted on its own stainless steel drive shaft which is supported by two ball race bearings to minimise the side load on the drive motor so extending the life of that unit.

The pumps can be supplied with ac and dc motors to suit a range of voltages or as pump head only for mounting on customers own drive.

The new Easy tube loading pump head will suit applications in brewing, chemical, food and beverage industries, as well as laboratory, research and analysis applications all of which will benefit from this stylish new design.

CONTACT

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WASTE MANAGEMENT

Seriously effective design

Serious Waste Management, which used design to make a virtue out of what it does, cleaned up at Europe's premier design awards run by the DBA (the trade association for the design industry).

Re-branded 'Serious**' from its original name of Envirotech, the company, based in Burton on Trent in Staffordshire, and its design agency Elmwood, netted the prestigious DBA Design Effectiveness Award for creating a distinctive brand, which led to a 75% increase in turnover.

Rather than disguise the substance of the business, the new brand identity champions it - and does so with a sense of humour. The name, which demonstrates that the company is serious about its role, came out of a conversation about the possible consequences of not complying with environmental law. Suggestions about what the two asterisks stand for, in phrases like "We deal with **it", for example, provide an engaging dialogue with customers. And the green and brown colours? They refer directly to the stuff of the business.

David Birkett said: " We are thrilled to win this award, it just shows how being bold in a design can attract attention. We wanted to be proud and professional about what we do but we also have a sense of humour. The change of design has changed our fortunes and now people remember our name when they see a tanker on the M6 or M1 and that means we stand out from the crowd."

Design Business Association (DBA) award winner – Serious Waste Management for it's 'Serious' rebranding**

From the identity's launch, combined sales of the company's core tanker and maintenance services increased from £1 million per year to nearly £2 million per year. Numbers of customers cited the identity as an influencing factor in awarding contracts. New customers mentioned that the humour in the identity helped develop a strong working relationship, and previous customers were prompted to get in touch by seeing the new livery. With no other marketing support, the re-branding is a testament to the power of effective design.

Raymond Turner, chair of the judges, called Serious** "a bold branding decision, brilliantly executed throughout the organisation and a great door opener which delivered tangible business results."

The Design Effectiveness Awards are a unique initiative from the DBA (Design Business Association). The DBA is the trade association for the UK design industry and acts as a primary intermediary between design and business to promote effective design as an enhancement to business growth and profitability (www.dba.org.uk).

Projects are assessed on commercial performance, rather than the aesthetics of the design itself. They are judged by senior figures from all areas of industry. Raymond Turner, former Group Design Director, BAA, chaired the judging. Senior executives from GlaxoSmithKline, Nissan, O2, Virgin Atlantic, Vodafone and Waitrose were among the judges.

The awards reflect every major design discipline, such as packaging, retail, website and product design.

The re-branding of Serious** has previously won other design awards including the Roses Awards, organised by Adline Magazine, the 2004 'Design Week' Identity Programme Award and the new design was voted the Best Piece of Work in the Carnyx competition for Adline.

CONTACT

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GENERATORS

New Froment generation

UK-based N.J. Froment & Co. Ltd., Europe's leading manufacturer of tractor driven generators, has announced the launch of its new range of Magnate pto generators.

All Froment Magnate units now feature brushless alternators from the internationally well respected British manufacturer, Newage International Ltd.

In addition, Froment has increased the ratings on selected generators, whilst reducing prices by an average of 8% across the range.

Commenting on this latest development, the company's product manager for the Magnate range, Keith Fowler, said: "The new generators are all brushless, which not only provide excellent voltage regulation, but also reduce maintenance and its associated costs over the life of the machine. This is quite simply because there are fewer moving parts. It's altogether a much cleaner, simpler design. "At the same time we have increased ratings. In the single phase Magnate range, the 25 kVA, 34 kVA and 50 kVA units have been replaced by 28 kVA, 35 kVA and 51 kVA machines respectively, whilst the 44 kVA three phase model has been uprated to 45 kVA. With new lower prices, our customers are now getting more capacity and better value for their money than ever before."

Portable Magnate generators have been further upgraded by incorporating two 16 amp sockets with residual current device (RCD) protection to facilitate the safe use of power tools and other equipment, at no extra cost.

All Magnate generators are continuously

Flaming good weed control

Ground care managers at various sites including schools, stately homes and holiday parks are snapping up a new range of hand held weed burners which have major advantages over herbicides.

HOAF's new pedestrian weed burners powered with Calor liquified petroleum gas (LPG) have become established in the ground care sector as an effective solution to weed control, for those organisations unable, unwilling or seeking an alternative to using herbicides and the associated environmental implications caused by their use.

The new Weedmaster and Thermhit equipment is already being used in dozens of locations throughout the country and demand is expected to increase even further this year.

HOAF's UK representative Richard Pearson said that the new range of hand held burners meant that the equipment was suitable for a wide variety of uses.

He said the equipment could be used at smaller grounds such as schools and caravan parks but could also be used in larger areas managed by councils and stately homes.

"We have placed 25 units already this year to customers ranging from stately homes to borough councils and are well placed to reach our target of 100 units in 2005," he said.

"Over recent years we've built up our customer base to the point where LPG powered equipment is in widespread use.

Calor LPG powered pedestrian weed burners are an effective solution to weed control for those seeking an alternative to herbicides

"Environmentally sensitive sites, local authorities, caravan parks and heritage sites are turning to LPG in preference to chemical controls. As that interest has grown, we've expanded the product range and the new hand held equipment is being very well received.

"We've also built up a relationship with Calor, the UK's leading supplier of LPG, to ensure a reliable fuel supply," he added.

The new equipment is available in two ranges - Thermhit and Weedmaster. The Thermhit range operates on propane cylinders in two widths - Thermhit 45 provides 450 mm coverage and Thermhit 75, 750 mm coverage.

Thermhit 75's larger size makes it particularly suitable for weed clearance in public squares, school grounds, hiking routes, cycle paths and other similar larger surfaces. Its double wheelbase allows easy manoeuvrability despite its larger size.

Thermhit 45's smaller size makes it ideal for use around obstacles and can be used to treat areas such as picnic sites, terraces and pathways. Its lower burner head allows use underneath picnic benches.

The Weedmaster range offers two widths of machine - Weedmaster 35 at 350 mm and Weedmaster 65 at 650 mm - and also uses propane as its fuel. Weedmaster is widely used by local authorities.

Weedmaster and Thermhit models feature 12 months' parts warranty and are available from www.thermoweed.com, along with the full HOAF range.

Calor LPG offers clear advantages over herbicide use and is widely used in the ground care sector to power mowers and all-terrain vehicles (ATV's) as well as weed control equipment.

CONTACT

To arrange a demonstration of HOAF's Thermhit and Weedmaster equipment, contact Richard Pearson. Mobile: +44 (0)7769 655564. Website: www.calor.co.uk.

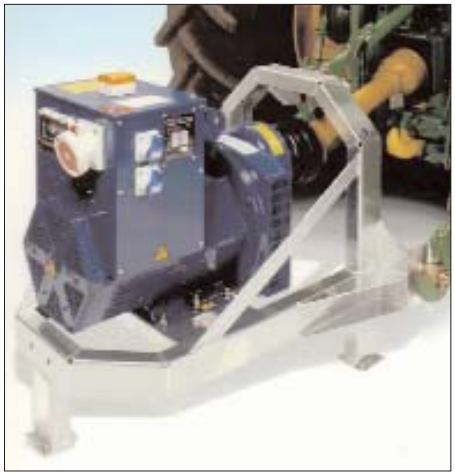
rated at maximum output with a powerful surge for motor starting and precise voltage regulation over a wide range of powers and speeds. Capacities range from 20 kVA to 80 kVA to meet various individual needs.

The renowned Froment gearbox, standard on all Magnate generators, features premium quality hardened and ground helical gears to ensure quiet running, high reliability and extra long life.

"With warnings of harsher winters ahead, the need for farmers to have a reliable back-up supply in the event of power cuts is more essential than ever," explained Keith Fowler.

"The new range of Magnate generators provides peace of mind and the capacity to deliver all the power the farmer needs when he needs it most."

Keith Fowler, N. J. Froment & Company Ltd, Easton-on-the-Hill, Stamford, PE9 3NP. Tel: +44 (0)1780 480033. Fax:knf@froment.co.uk Website: www.froment.co.uk



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