agricultural engineer

Summer 1995

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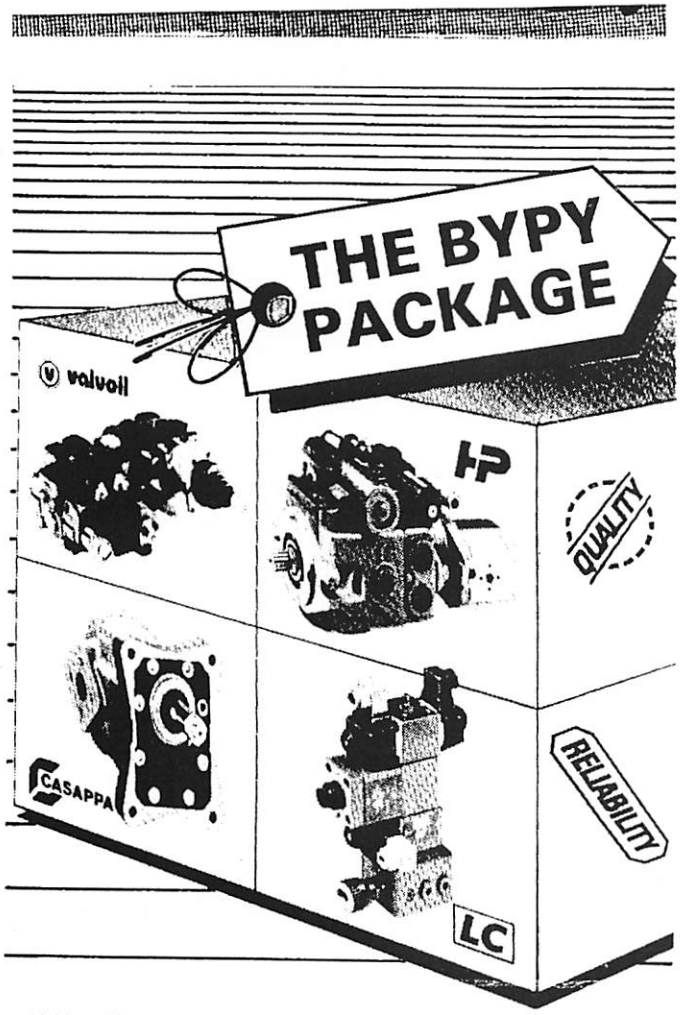

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Further details and an application form, to be returned by Friday 30th June, can be obtained from the Personnel Department, School of Agriculture, Food and Environment, Cranfield University, Silsoe, Bedford MK45 4DT. Tel: 01525 863000, ext. 3603; Fax: 01525 863360.

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Agricultural Engineer

Journal and Proceedings

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The Institution of Agricultural Engineers

NEWS ROUND-UP

THE ENGINEERING COUNCIL - BACKS 'UNITY' PROPOSALS

The Engineering Council, has unanimously supported the proposals for unifying the profession put forward by a steering group composed of representatives of the 40 engineering institutions and the Council itself.

Unanimous support for the proposals also came from all the institutions. All the major institutions have agreed to participate in the establishment of a new governing body.

Sir John Fairclough FEng, Chairman of the Council, said that he was delighted that the Council had fully supported the proposals. "All parties have now signed up to the new plans and we will now be able to start the necessary restructuring of the Council, bringing in the institutions, so that we have at last a cohesive body", said Sir John.

The Council will now join in discussions to plan implementation of the proposals. It will participate in the development of plans to ensure the effective transition of all its present activities and responsibilities of the new Council.

Under the proposals a new Engineering Council will be formed to bring together the views of the institutions, industry and academe and provide a single voice for the profession. The new Engineering Council will consist of a democratically elected senate with 24 member elected by institution councils from their past and present council members, 24 members elected directly by the engineers and technicians registered with The Engineering Council and six members appointed by the Privy Council.

The senate will be the focal point for the engineering profession. It will discharge its responsibilities through two boards; one for the regulation of the profession, the other for the promotion of the profession. Members of the two boards will be selected from the senate.

THE ENGINEERING COUNCIL - THE STANDING CONFERENCE ON SCHOOLS' SCIENCE AND TECHNOLOGY - A CLEARER MESSAGE TO THE YOUNG

A major step has been taken to reduce the complexity and confusion that arises from a wide range of initiatives which are aimed to stimulate and inform the young about science, engineering and technology.

The Engineering Council and the Standing Conference on Schools' Science and Technology recently made an agreement to bring a co-ordinated and coherent programme of initiatives and activities to enhance and enrich the provision of science, engineering and technology in the West Midlands.

The the programme will be managed by the Science and Technology Regional Organisation based in the Engineering Department at Birmingham University.

All the initiatives have a common aim to interest, excite and inform pupils in school. This is achieved through pupils working on real, relevant projects with industrialists. In this way, pupils recognise the importance of science and engineering and how it applies to everyday life. By working, often as a part of a team, on projects requiring problem solving and an innovative and creative approach, pupils gain a sense of purpose and achievement. They also gain the knowledge, understanding and skills that the workforce of the future will need to carry it successfully into the 21st century. The fact that a recognised programme will be managed by a professional network will benefit all users and providers.

The Office of Science and Technology has promised to help set up two new Science and Technology Regional Organisations. This will enable a co-ordinated and effective approach to science, engineering and technology throughout the country and will facilitate the building of successful partnerships between industry and schools.

GREEN GREEN GRASS OF HOME - ALMOST!

With a 250 acre green-field site, finding some grass to enhance its exhibition stand at a national conference event should not have presented a problem for staff at the Great Yorkshire Showground. Not so. Locating a suitable amount of green sward without upsetting the site manager proved a knotty problem! Rather than transporting part of the famous Showground, 22 m² of "turf on a roll" has provided the solution.

Yorkshire Agricultural Enterprises is the trading arm for the Showground which will make its debut at next week's Confex '95 at Earls Court, London. The event is the UK's leading forum for the meetings and events industry with more than 1,000 exhibitors.

The Showground, famous for the annual three day Great Yorkshire Show each July, is currently undergoing a £10 m re-development programme. This summer will see completion of the first phase of the £4 m Pavilion Complex, which houses a range of function rooms. The Flower Hall, the Showground's exhibition centre with 3,420 m² of indoor space, was opened in May last year.

"Harrogate is already one of the top conference venues, but with the extra dimension of the Showground, event organisers have more choice which has got to be good news for the local economy", said Heather Parry, Marketing Manager.

The Showground already has a comprehensive infrastructure - seven miles of concrete roads, two permanent grandstands, an 80-bed hostel and 59,000 sq metres for outside trade stands. The 1994 Great Yorkshire Show attracted 121,752 visitors.

For more information, please contact the Press Officer, Judy Thompson on 01423 561536.

SAUDIAGRICULTURE 95 - UK PAVILION

The DTI is again giving its full support to British Companies exhibiting with the London Chamber of Commerce at Saudi Agriculture 95 the 14th Agriculture, Water and Agri-Industry show - Featuring Saudi Water Tech and Saudi Pro-Pak - Riyadh, Saudi Arabia - 8-12 October 1995. Up to 50% of stand costs will be covered by DTI Grants, and £400 per person will be offered as Travel Grants to each eligible company in the UK Group.

Some 14,500 key industry professionals from Saudi Arabia and neighbouring States visited the exhibition last year, and this number is expected to increased this year as the exhibition will incorporate Saudi Water-Tech and Saudi Pro-Pak

EXHIBITION PROFILE:

* Animal Health
* Apiculture
* Breeding
* Crop Production
* Dairy Cattle
* Feeding Systems
* Fertilisers
* Fish Farming
* Grain Silos
* Horticulture
* Irrigation
* Landscaping
* Livestock
* Maintenance Products
* Management Services
* Packaging Equipment
* Pesticides
* Pipes
* Poultry Equipment
* Pumps
* Seeds
* Semen
* Shade Netting
* Tractors and Machinery
* Veterinary Products

The LCCI will undertake administration for the companies in the UK groups to ensure a smooth and successful exhibition for all concerned. Excellent support from the British Embassy is given, and a farm visit is usually organised during the week.

Saudi Arabia's commitment to further agricultural development, upgrading and expansion of its existing infrastructure and new project investment continues to provide a dynamic market for international manufacturers and suppliers of agriculture technology.

Fresh opportunities are also being created by new government policies aimed at encouraging diversification from wheat to barley, increasing productivity of high value crops, expanding meat and vegetable production and improving quality of output.

Maintaining its position at the forefront of the Kingdom's drive to achieve self-sufficiency in food production, **Saudi Agriculture 95** will feature the latest technology and expertise available to enhance output across the entire agricultural spectrum.

In line with new priorities **Saudi Agriculture 95** will also highlight water technology with the introduction of SaudiWater-Tech. Skilled water management is vital to Saudi Arabia's agricultural future and plans are being introduced to conserve supplies at the same time ensuring that food production targets are met.

Food processing will also be highlighted with the introduction of SaudiPro-Pak. This is the answer to Saudi Arabia's growing output of agricultural produce which farmers are marketing increasingly to the food trade network both at home and overseas.

The SaudiAgriculture series of exhibitions is central to Saudi Arabia's total agricultural programme and is recognised as the established showcase by the Kingdom's farmers, horticulturists, traders, investors and government and municipal officials.

Exporters looking to pursue this vital market and wanting to find out how **SaudiAgriculture 95** can work for them should contact the UK based world-wide agents, Overseas Exhibition Services Ltd of 11 Manchester Square, London, W1M 5AB.

For further information contact:
United Kingdom - Gerry Dobson
Saudi Arabia - Bechara Nacouzi:

<u>World-Wide</u>
Overseas Exhibitions Services Ltd
11 Manchester Square, P O Box 56010,
London, W1M 5AB
Tel: +44 171 486 1951
Fax: +44 171 935 8625

<u>Middle East</u>
Riyadh Exhibitions Company Ltd,
Riyadh 11554, Saudi Arabia
Tel: +966 1 454 1448
Fax: +966 1 454 4846

ENGINEERS' ENERGY MANAGEMENT INITIATIVE

An energy management initiative to encourage engineers to give priority to cutting the UK's energy costs is being launched by The Engineering Council, in partnership with ETSU (Energy Technology Support Unit), for the Energy Efficiency Office.

A challenge facing engineers is that of environmental management, of which energy management forms a major part. It is estimated by the Energy Efficiency Office that 20 per cent of the nation's energy cost is wasted. Successful management can lead to significant cost savings as well as environmental benefits through reduced emissions.

The Engineering Council's code of professional practice on environmental issues highlights the importance of energy management for engineers and recommends action to be taken. The Council's project with ETSU is to establish a continuing professional development training package for energy management. This will assist engineers to analyse their professional development needs in this area, and provide information on available learning resources and guidance on access to NVQ assessment.

The project is sponsored by the Energy Efficiency Office and will build on the national standards for managing energy, being developed and tested jointly by the Management Charter Initiative (MCI) and the Energy Efficiency Office. The project is enthusiastically supported by the Institute of Energy. It is managed by The Engineering Council with the programmed being developed by Pointing Consultancy Services. Material is planned to be available in late summer of 1995.

Involvement from interested employers and individuals is welcomed in developing and testing the programme.

For further information contact:

Chris Senior CEng,
The Engineering Council,
Essex House,
12-13 Essex Street,
London
WC2R 3EG.

NEW ORGANIC ALLIANCE

Organic Farmers & Growers Limited (1) and Soil Association (2) today announced an unprecedented new alliance of organic farming organisations. From this Spring, the two organisations will be joining together for the certification (3) of their organic farming members, who total almost 90% of organic farms in the UK. The alliance marks the end of a 20 year estrangement between the two bodies and is a major step forward in the rationalisation of the UK organic movement. It comes at a time of great opportunity for organic agriculture (4).

Under the new arrangement, certification of O F & G members will be carried out under contract by the Soil Association Symbol Scheme. In addition, OF&G's marketing expertise will be available to Soil Association licensees.

Commenting on this development, Charles Peers, Chairman of OF&G, said "we are absolutely delighted with our new partners. We have been through some sensitive and delicate negotiations and emerged with this highly satisfactory alliance, which will be enormous benefit to our members and to the organic industry as a whole. It is a win-win situation. OF&G and their members will win by getting a more efficient and more economical service; Soil Association licensees will win by having access to OF&G various marketing initiatives; the whole organic movement will win by the co-operation and collaboration between these two major players - both concentrating on what they do best".

Francis Blake, Director of the Soil Association Symbol Scheme, said, "the problems of conventional agriculture continue their devastating upward spiral whereas organic farming increasingly stands out as the coherent solution. This new and exciting collaboration will enable us to be more effective in delivering that solution, in terms of the standards consumer want in farming, the structure of the market, publicity for organic food and the promotion of organic farming as a serious policy option".

NOTES TO EDITORS:

(1) Organic Farmers & Growers Ltd is a co-operative mainly of farmers, but with some processor and overseas members. The company was formed in 1975 and is geared to the needs of farmers, helping with their growing, husbandry and marketing requirements through a network of agencies. OF&G was first to be registered with UKROFS as an approved certification body.

(2) The Soil Association is a registered charity, founded in 1946, working to promote a fuller understanding of the links between farming, the environment, food quality and human health, which are all enhanced by organic agriculture. The Soil Association Symbol Scheme is run by a wholly owned subsidiary of the charity and was established in 1973 as a means of regulating and promoting the organic food market and protecting both producers and consumers. It works both nationally and internationally and currently certifies some 65% of the UK organic market.

(3) All organic operations with the European Union are subject to Regulation (EEC) no 2092/91, which came into force on 1 January 1993. It requires that all food sold as organic must have been properly inspected and certified as conforming to the EU Standards during both its production and preparation. The Regulation is implemented in this country by the United Kingdom Register of Organic Food Standards (UKROF). UKROFS approves and registers the private sector bodies which carry out inspection and certification. Both OF&G and the Soil Association Symbol Scheme are registered with UKROFS.

(4) * The organic market was valued at £105.1 million in 1993 (Mintel survey 1993 - vegetarian and Organic Food). The survey reveals that 2% of housewives always buy organic foods, but more that half would buy them if they were cheaper.

* A survey of farmers by the National Westminster Bank in 1992 found that 38% of farmers would consider converting to organic farming methods, given the right economic climate.

* In August 1994, MAFF launched an Organic Aid Scheme (as part of the EU's Agri-environment Programme) to provide financial assistance during the first five years of a farm's organic conversion, with the intention of increasing the area of land farmed organically by three fold over the next five years. It is the first grant aid to be introduced in the UK that is specifically geared towards organic farming.

* A survey of organic consumers by the Soil Association (1992) indicated that consumers bought organic foods for the following reasons:
healthier for them - (37%);
better for the environment (30%);
better for animal welfare (19%);
taste better (13%).

GREAT YORKSHIRE SHOW - PUTTING FARMERS FIRST

There will be more than ever at the famous showcase - The Great Yorkshire Show - with a greater agricultural focus. The Show, runs from 11- 13 July, is a sell-out with a record breaking 32,450 m² of space let. The number of farming related businesses represented has increased to over 80% of the total with 26000 square metres being devoted to agriculture.

The machinery and livestock areas have been expanded and a Farming Focus Area created, linking the cattle and sheep lines. This will have a Business Advice Centre, including specialists in land management, agricultural finance, law and insurance. Radio 4s 'Farming Today' programme is joining the Show organisers, the Yorkshire Agricultural Society, to run a topical 'Any Farming Questions' Debate on the Wednesday. The latest in farming technology will be presented by scientists from York and Newcastle Universities to help plan for future success.

The Demonstration Area will be found within the new farming location where ostriches will be making their début. Alongside them will be an exhibition by the Yorkshire Dales National Park and close by are the re-located lamb and pig carcase classes. Complementing this new area will be stands from major agricultural companies including the Meat and Livestock Commission, MD Foods, Young's Animal Health, and the National Sheep Association.

NRA URGES FARMERS TO TAKE CARE WITH SILAGE

The National Rivers Authority [NRA] is urging farmers to take special care to prevent pollution during the silage season. Farmers are advised to check the condition of storage structures and to dispose of silage liquor safely.

If silage liquor is discharged into a stream or watercourse the effects can be devastating. Fish and other water life can be killed and the water rendered unfit for use. Silage liquor is a very powerful pollutant, it can be up to 200 times stronger in terms of polluting potential than crude domestic sewage.

Particular care should be taken after rainfall as this increases the amount of liquid which drains from wet grass during its conversion to silage. Farmers should make every effort to contain the liquor for subsequent safe disposal and to prevent it from reaching any stream, watercourse, ditch or drain. Grass additives should be stored safely and securely. By using wilted grass, farmers can reduce the amount of silage liquor and therefore decrease the risk of pollution.
Geoff Bateman, Chairman of the NRAs Rural Land Use Group, commented; Silage is one of the most potent farm pollutants and even small volumes can cause serious damage to rivers and streams. By following the Code of Good Agricultural Practice for the Protection of Water published by MAFF, and taking simple practical steps, pollution from silage can be avoided.

It is good practice to;

1 Cut the crop in dry weather and allow it to wilt as much as possible. This can virtually eliminate silage liquor.

2 Regularly inspect the silage clamp, collection channels and tanks. Carry out maintenance to stop leaks.

3 Make sure there is sufficient storage capacity- empty the tanks regularly to prevent overflows.

4 Dispose of liquor properly, away from streams, boreholes, springs and areas of land with cracked soil or land drains.

5 Refer to Control of Pollution [Silage, Slurry and Agricultural Fuel Oil] Regulations, 1991. The Regulations cover the making and storage of silage.

6 Refer to MAFF's Code of Good Agricultural Practice for the Protection of Water, which gives further advice on good silage practice.

7 Refer to NRAs Farm Pollution and How to Avoid It leaflet for further information. Anyone seeking advice on measures which can be taken to avoid pollution should contact their Regional NRA Office. The NRAs free 24 hour emergency hotline for reporting pollution is 0800 807060.

NATIONAL RIVERS AUTHORITY HELPS INDUSTRY TO AVOID POLLUTION AND SAVE MONEY

Industry can learn simple, cost effective ways of avoiding water pollution and heavy fines, the NRA said. Promoting its free video "Pollution prevention Pays" the NRA said that the total number of water pollution incidents rose by 8% during 1993 to 25229.

Fines totalled over £1 m. There was a total of over 6000 pollution incidents from industrial sources, with industry accounting for the largest number of "major" incidents. All industrial sites pose a potential pollution threat. The NRA video gives practical advice to companies to enable them to minimise the risk of pollution.

The Director of Water Management, Dr. Clive Swinnerton said: "By following a number of simple, low cost steps outlined in the video, companies can cut down the risk of causing pollution from their sites. This reduces the chance of prosecution and a heftyfine, not to mention the cost of cleaning up the pollution and the bad publicity which always follows."

The Magistrates Courts can impose fines of up to £20,000 for pollution offences. If a case goes to the Crown Court, there is no limit to the fine. The "Pollution Prevention Pays" initiative is aimed at helping companies to identify problem areas on their sites, and preventing pollution through co-operation, rather than coercion. Even if a site is not near a river, pollution can enter a watercourse through the drainage system, causing damage to rivers, their fish and wildlife populations and the drinking water supplies which they support.

Dr. Clive Swinnerton said: "Even if an incident does not result in prosecution, the company may still have to meet the costs of repairing the damage, which can run into thousands of pounds. Insurance companies are increasingly unwilling to provide cover for the cost of cleaning up. By showing our free video to their staff, and following our guidance, companies can avoid trouble and expense. They will also be protecting the local environment."

The video pack includes a booklet and poster, and gives tips on site drainage, deliveries, storage of potential pollutants, cleaning waste disposal, de-watering and dealing with emergencies. It is ideal for all types of staff training, including induction and health and safety courses.

Dr. Swinnerton said "Most pollution incidents can be prevented. The NRA is offering the video to companies across the country in the hope that they will help us to look after their local rivers."

DIRECTORY OF EXPERT WITNESSES

The Law Society and FT Law & Tax are publishing the first ever comprehensive listing of expert witnesses whose entries will be subject to satisfactory references. It will be seen by lawyers as the quickest and reliable way to find the right expert. At a time of demand for expert witnesses the Directory, which includes extensive editorial as well as listings, will become essential for all litigation lawyers. It will also be produced on CD-ROM.

The Directory will replace the existing register and will form the basis of an improved Telephone Enquiry Service. Only those who take entries in the Directory will be on the enquiry database. To place an entry you must:

* Complete an application form.
* Sign to the affect that you agree to abide by the Code of Practice.
* Supply two references from solicitors who have instructed you within the last three years (if need be, one reference may be obtained from a barrister or Scottish solicitor).
* Arrange for entry payment - £35 for individuals and £55 for organisations listing several witnesses

Applications forms from the Project Manager, FT Law and Tax, 21-27 Lamb's Conduit Street, London WC1N 3NJ - Tel: 0171 242 2548.

GRAIN EVENT SET FOR '96

The Royal Agricultural Society of England is to hold the next Grain event, Grain '96 on Wednesday 7th and Thursday 8th February 1996 at the Natiuonal Agricultural Centre, Stoneleigh Park, Warwickshire.

Announcing the decision, following consultation through the AEAS Grain and Seed Group, the RASE's Dr Mike Ducker said, "The new format is successful and has produced a very compact, specialist event that appeals to growers. With at least 4800 visitors to the last event this two-day focus on grain management now has a firm place in the calender."

A NEW FOOD SCIENCE & TECHNOLOGY LOCATION ON THE INTERNET IFST LAUNCHES A WEB ON THE WORLD WIDE WEB

The Institute of Food Science & Technology of the UK (IFST), the independent professional qualifying body for food scientists and technologists, is now on the internet and the World Wide Web.

The IFST Home Page is at **http://www.easynet.co.uk/ifst/**. Ifst's e-mail address is **ifst@easynet.co.uk**

IFST's purposes are:

* to serve the public interest by furthering the application of science and technology to all aspects of the supply of safe, wholesome, nutritious and attractive food, nationally and internationally;
* to advance the standing of food science and technology, both as a subject and as a profession;
* to assist members in their career and personal development within the profession;
* to uphold professional standards of competence and integrity.

The IFST Web consists of 40 pages linked to the Home Page, dealing with every aspect of the profession and of food science and technology.

For further information, visit IFST's Home Page and Web.

WE MUST ALL STRIVE TO MANAGE COMPLEXITY AND CHANGE

In his Presidential Address "*Managing Complexity and Change - A View for our Institution*" at the 1995 Annual Conference of the Institution of Plant Engineers at Buxton, newly installed President Eur Ing Francis (Frank) Kelly drew attention to the multitude of chnages now in progress that will have far-reaching effects on individual engineers, the Institution of which he was delighted to become President and on the engineering profession as a whole.

Referring to proposals by The Engineering Council that will require yet greater vigilance from Institutions regarding qualifications and recruitment, Mr Kelly emphasised the need for all concerned to manage successfully the inevitable complexity and change that would result. "Time and again" said Mr Kelly, "it cna be demonstrated that the organisation with the ability to adapt, control and manage a changing scene is the one with the ability to survive."

In outlining the radical change in the educational systeem arising from the work of the National Council for Vocational Qualifications and its Scottish counterpart, Mr Kelly felt that the seeds might be sown fro the eventual formal registration or licensing of engineers to practice their profession. It was his opinion, too, that Continuing Professional Development, a scheme long supported by the Institution of Plant Engineers, should become mandatory for engineers as it is in other professions.

"Where do these changes place our Institution, one of the best in existence?" asked Mr Kelly. "We have the members, organisation, will and multi-discipline ability to manage the complexity and change to come; we must recruit without lowering standards; consider association with other Institutions; embrace new technologies and welcome those qualified in new fields; embrace mandatory Continuing Professional Development and encourage improived qualifications" he concluded.

Further information from Wendy Shell,
The Institution of Plant Engineers,
77 Great Peter Street,
London. SW1P 2EZ
Tel: 0171-233-2855 Fax: 0171-233-2604

TWO DIE IN MOIST GRAIN SILO

In November 1994 two farmers died in a single accident in a moist grain tower silo; one because he was suffocated by the grain, and one because he was asphyxiated due to there being in sufficient oxygen to support life.

The precise details of the deaths are not known; however it seems likely that the first farmer died because he fell through the top access hatch of the silo. He had been leaning through this hatch to rod the blocked or bridged grain within the silo using a length of wooden lath or batten. The lath broke, causing the farmer to over-balance and fall head first into the grain.

The second death occurred when another farmer used a ladder to enter the silo through the top hatch so he could rescue the first person. He was overcome by high levels of carbon dioxide at grain surface level.

All users of tower silos -whether for grain or silage - can learn from these tragic deaths.

* Never go into a tower silo unless it has been thoroughly ventilated (preferably mechanically) first. If natural ventila tion is used, it must continue for at least 24 hours.

* Remember that carbon dioxide is heavier than air; it collects, displacing oxygen. Also, simply opening hatches for a short period is not enough to clear it.

* After ventilating, test the atmosphere within the silo to ensure that it contains sufficient oxygen to maintain life. If testing shows that the oxygen levels are insufficient, then do not enter the silo.

* Ensure that it is impossible to get through the top access hatch of a grain silo, preferable by welding or bolting in a grid or bars. This may, of course, contain sufficient apertures to allow material within the silo to be rodded to clear blockages.

Never underestimate the need to stop and consider carefully the risks involved in the task you are about to do. This will be helped by undertaking good training into recognising the hazards, appreciating risks, and how to deal with them.

PRINCE OF WALES AWARD FOR JCB FASTRAC

JCB Landpower, has been awarded the prestigious 1994 'Prince of Wales Award for Innovation' for the development of its JCB Fastrac, high speed, high draught tractor.

Receiving the trophy from His Royal Highness The Prince of Wales, on the BBC Tomorrow's World programme on Friday 14th April, were JCB's Chairman, Sir Anthony Bamford and JCB Landpower's Managing Director, David Bell.

Announcing the Award, The Prince of Wales said, "JCB particularly impressed the judges with their courage and creativity in applying their traditional, technological expertise to a new market."

The award, organised by Business in the Community, is open to in dividuals, institutions or companies for a product or process in corporating innovative technology that has led to the marketing of that product or process. Sir Mark Weinberg, Executive Chairman of St James's Place Capital chaired the panel that comprised leading experts from a wide range of business and technology dis ciplines.

JCB Landpower's success in the award is the culmination of eight years design, development and manufacture. JCB Fastrac is the world's first genuine high speed tractor. The first machine to overcome the problems of combining a high road speed of up to 80 kmph - twice the speed of a conventional tractor - with excellent ploughing performance, operator comfort and safety. In order to achieve this, JCB engineers designed a fully suspended, hydrop-nuematic self-levelling suspension system and incorporated air hydraulic brakes to full EC Truck Brakes standards. Extensive consultation and testing with farmers has been an element of Fastrac's development.

Sixty percent of the JCB Fastrac production is exported from JCB Landpower's production plant in Cheadle, Staffordshire.

Commenting on his company's success, Sir Anthony Bamford said, "This award is a Royal seal of approval and a great tribute to a dedicated team at JCB Landpower. The innovative Fastrac is achieving considerable success with farmers at home and abroad."

The Prince of Wales Award for Innovation is the latest of an impressive list of achievements for the JCB Fastrac. Others include: The Robert Barrow Award in 1991, a Design Council Award in 1992, a Gold Medal at Fieragricola in Verona in 1992, and a Silver Medal from the Royal Agricultural Society in 1994.

NATIONAL SCIENCE, ENGINEERING AND TECHNOLOGY WEEK - set96

This initiative, coordinated by the British Association with financial assistance from the Office of Science & Technology, is designed to provide a focal point for all those involved in promoting public understanding of science.

The aims of the week are:

* to promote a positive image of science, engineering and technology and to help convince the public of their value to society.

* to raise the public's overall consciousness of science and technology.

* to stimulate the public's insight into and knowledge of, the scientific process.

The target audience is the public at large, including, but not primarly, school children. Like the many arts festivals, the week should present opportunities for the public to be confronted by interesting, relevant and enjoyable science and technology in a non-threatening manner. It is a chance to reach those members of the public not normally part of the scientific and technological community but who are voters, taxpayers, parents and grand parents.

The rationale is that by acting in concert over a short time, practitioners and organisations with an interest in furthering the public appreciation and understanding of these subjects will make a greater impact than they would working alone. We invite you to join in the week, doing activities which you do best, in raising the public awareness and understanding of science, engineering and technology. As coordinators, the British Association can advise participants on other events being held in their area and can help with ideas and suggestions for effective events.

The week attracts considerable cross party political interest. Members of both Houses have expressed a wish to be informed of events in their constituency and Ministers take a personlal interest.

Industry is also encouraged to participate by promoting or staging events for the public at large and young people, demonstrating it's scientific and technological base.

The media, printed, braodcast and televised, national and local, devote time and space to coverage of events. Set7 and its successor set95 were enthusiastically publicised. The media tended to be attracted to titles/events which were "marketed" with snappy and eye-catching wording. The British Assocition can help participants with advice on local publicity and dealing with the media, both prionted and braodcast. We will produce a full national programme of events, coordinate national publicity for the week itself and ensure that the national programme is circulated to all Members of Parliament. Each organisation is, however, responsible for their own local publicity.

The 1996 week will commence on Friday 15 March 1996. Limited funding will, once again, be available to encourage smaller oorganisations and individuals to participate. These funds will be disbursed by way of grant aid from COPUS and details cna be obtained from COPUS, c/o Royal Society, 6 Carlton House Terrace, London. SW1Y 5AG, Tel: 0171 839 5561. Please note that the closing date for grant aplications is 31 October 1995.

Please contact the British Society for further information on 0171 973 3064.

NOTE FROM THE EDITOR

Please note that I have moved to Banbury and my new address, telephone number and fax number are:

30 Crouch Hill Road,
Banbury,
Oxon.
OX16 9RG

Tel and Fax: 01295 255896

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THE WORLD SOLAR SUMMIT PROCESS:
Taking the World into the Era of Renewable Energies

Over the past decades scientists and environmentalists have improved their understanding of the impact of the conventional energy systems and resources on the environment. It formerly been thought that the negative effects of misuse of energy resources and technologies would be felt locally, by distinct populations, and these effects would be manageable.

In recent years it has become clear that environmental pollution caused by releases into the atmosphere of radioactive dust and/or greenhouse gases has no regard for frontiers, and the phenomena of acid rain, ozone depletion and atmospheric warming have begun to undermine our confidence in our ability to control and remedy their effects.

The Conference known also as the Earth Summit, which was held in Rio de Janeiro in 1992, was called to focus on the most fundamental and important challenges to the preservation of the natural human environment. From this it was considered essential to develop environmentally sound technologies and industrial practices.

Impressive technical progress in renewable energy technologies has been made during the past decade. Renewable energy systems have benefited from developments in electronics, bio-technology, and materials science, and in other energy areas. Biomass gasification/ gas turbine power generation, either as stand-alone or in co-generation, is expected to be delivering electricity at a cost comparable to coal-based power output. Wind electricity is rapidly growing and is now cost-competitive with conventional sources of electricity in some areas of the world. Small-scale hydro-power technology is proven and reliable, the recent schemes demonstrate that its use may be economically viable and environmentally acceptable. Photovoltaic has reached the pre-commercialization stage due to a very sharp drop in production costs.

Great strides have been made in global cooperation within the field of renewable energy. This progress has presented stronger cross-cutting international collaboration on renewable technology development and deployment. One must applaud the significant contribution made by the European Union through its Thermie, Joule and Altener programmes, and by the International Energy Agency.

The World Solar Summit Process (WSSP) is a novel collaborative venture based on a close partnership among major inter-governmental organisations, industry, research centres and universities, with special concerns and responsibilities in the field of energy and environment. It is a five-phase process culminating in the launch of the World Solar Programme 1996-2005. The Process is directed towards the promotion of a stronger cross-cutting international collaboration on renewable energy technology development and deployment.

Since the sun has always been universally the symbol of energy and life, the use here and in the **WSSP** of "Solar Energy" actually refers to all forms of renewable energy, including, but not limited to, biomass, geothermal, hydro, ocean thermal, solar electricity and wind. Solar energy is an alternative option of power supply for various energy services mainly in rural areas.

The **WSSP** is being conducted following the recommendations of the High-level Expert meeting "The Sun in the Service of Mankind" - which was held in Paris in July 1993 - and the decision of the 27th Session of the UNESCO General Conference.

This campaign aims to:

* *enhance* understanding of the role that renewable sources of energy play in preservation of the environment, in provision of energy services and in contributing towards a solution to unemployment,

* *urge* non-governmental organisations to enter into partnership with, and make their knowledge and experience available to global and regional inter-governmental bodies,

* *establish* a global information networking system using state-of-the-art communications technology,

* *promote and harmonise* cooperation in training and research, as well as in transfer of research disclosure to industry at the regional, inter-regional and international levels,

* *demonstrate* how wide use of renewable energy is a cost-effective and rapid way for many developing countries to reduce energy cost, save foreign exchange and stretch the energy supply base without heavy investment,

* *identify and define* selected strategic projects of global importance and for inclusion in the World Solar Programme 1996-2005, which will trigger wide use of renewable energy sources and open competitive markets,

* *seek* approval of the World Solar Programme 1996-2005 by a Summit at the highest level of government.

The **World Solar Summit** is now planned to be organised in March 1996 in Harare on the invitation of the President of Zimbabwe the Honourable Robert Mugabe. It is designed as a concrete response to the challenge posed by the Earth Summit that requires all countries to institute appropriate measures for reducing pollution by introducing clean energy technology.

Five leading documents are being prepared for submission to the **World Solar Summit** for approval:

1. **The World Plan of Action**: a selection of high priority renewable energy projects.
2. **Strategic Projects**: a few carefully selected projects of exceptional quality and outstanding universal value.
3. **World Solar Charter**: a document creating the World Solar Programme.
4. **International Solar Treaty**: in order for the underlying objectives of the **WSSP** to be achieved
5. **World Solar Fund**: to solve the need for a special fund to support core activities.

A **World Solar Commission** is being established within the **World Solar Summit Process** whose main function is to organise the World Solar Summit and to direct, evaluate and present to it the 5 leading documents for approval. In addition, the Commission will advise the WSS on the best possible strategies to be pursued for large-scale development and deployment of the renewable energies. The future of the Commission will ultimately be decided by the WSS.

COMPANY AND PRODUCT INFORMATION

FRONT-MOUNTED TANK USES SPRAYER PUMP

A front-mounted sprayer tank with 800 litre capacity has been added to the Amozone range of spraying equipment to boost carrying capacity of mounted machines. The unit, designated FT 802, has a conical shaped stainless steel tank providing its own frame that can include quick-hitch facility where front-linkage is not fitted to the tractor.

A feature of the equipment is that there are no additional and costly pumps, hydraulic motors or electric transfer valves required. This is because of a special venturi in the rear sprayer tank that ensures constant circulation and agitation. In addition, this unique injector system provides completely automatic transfer of liquid from front to rear tank and rear to front tank. This eliminates any need for supervision by the operator although he can override this facility.

When filling, the operator mixes all chemicals through the mixing hopper at the rear tank and the mixture is then fed, and constantly agitated, between the two.

Further details from Amazone Ltd, Doncaster Tel: 01203 751200

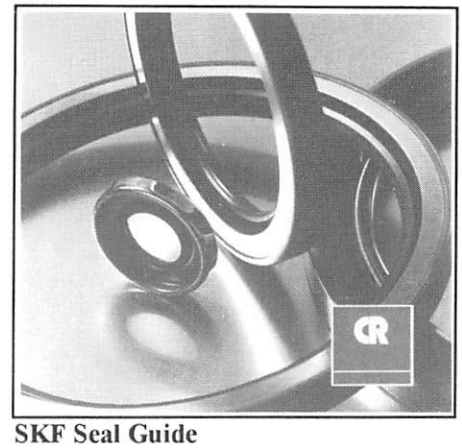
FREE LITERATURE

The choice of seal type, design and material can greatly extend the service life of rolling bearings. That is why SKF has published its "Guide to optimising seal performance for maximum bearing protection". The 24-page publication looks at bearing failure mechanisms, basic seal performance and function, seal selection criteria and shows how the CR range of radial shaft sealing products can optimise bearing life cycles.

This handy reference source includes sections on seal design, lip materials, shaft and bore requirements and the operating conditions seals have to endure. There is also a seal type selection guide and information on seal installation and maintenance. Graphically illustrated in four colours, the publication provides valuable information on how to achieve optimum lubricant retention and contamination exclusion on bearings by using modern seals.

"Guide to optimising seal performance for maximum bearing protection" is freely available, on request, from:

SKF (UK) Ltd., Bradbourne Drive, Tilbrook, Milton Keynes, MK7 8BJ



SKF Seal Guide

CONTROL VALVE FOR ENGINE EFFICIENCY

Until recently, the control of air charge temperature has been mainly applied to large installations using water-cooled intercooler. However, the introduction of these new thermostatic control valves extends the benefits of improved temperature control and therefore greater efficiency, to other applications.

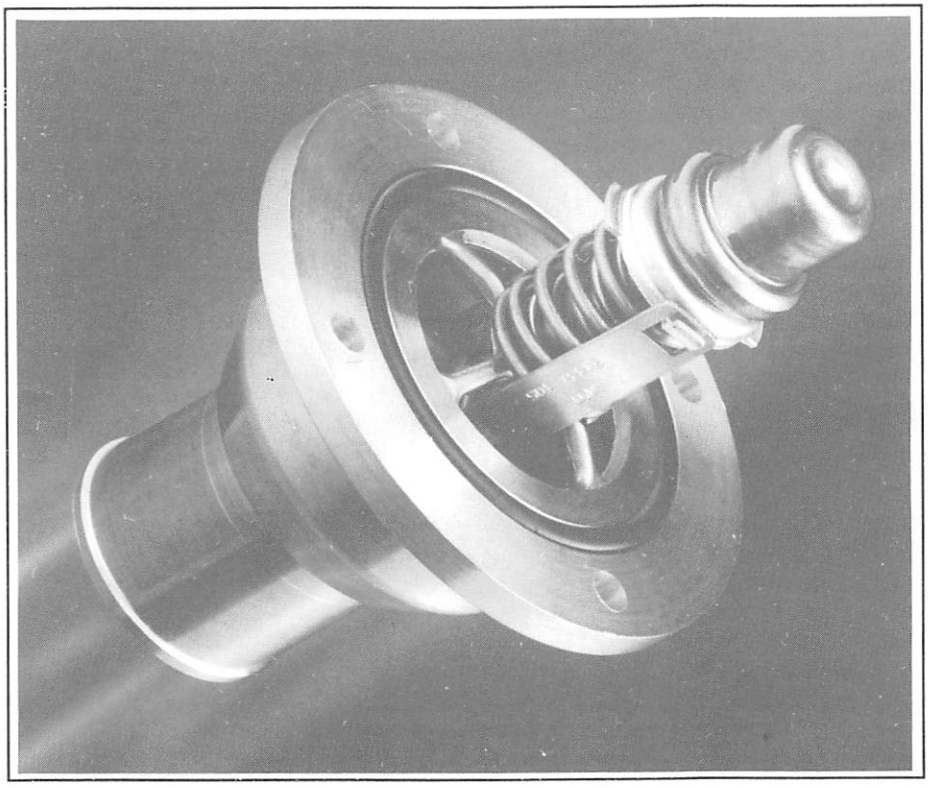
There are two basic systems available for charge air temperature control. The first, aimed at the smaller and lower cost end of the market is a simple internally sensed bypass valve. This allows an amount of uncooled air to mix with either overcooled or unwarmed air. The most important benefit is that it prevents overcooling where the temperature could fall below the dew point and allow moisture in the air to condense out.

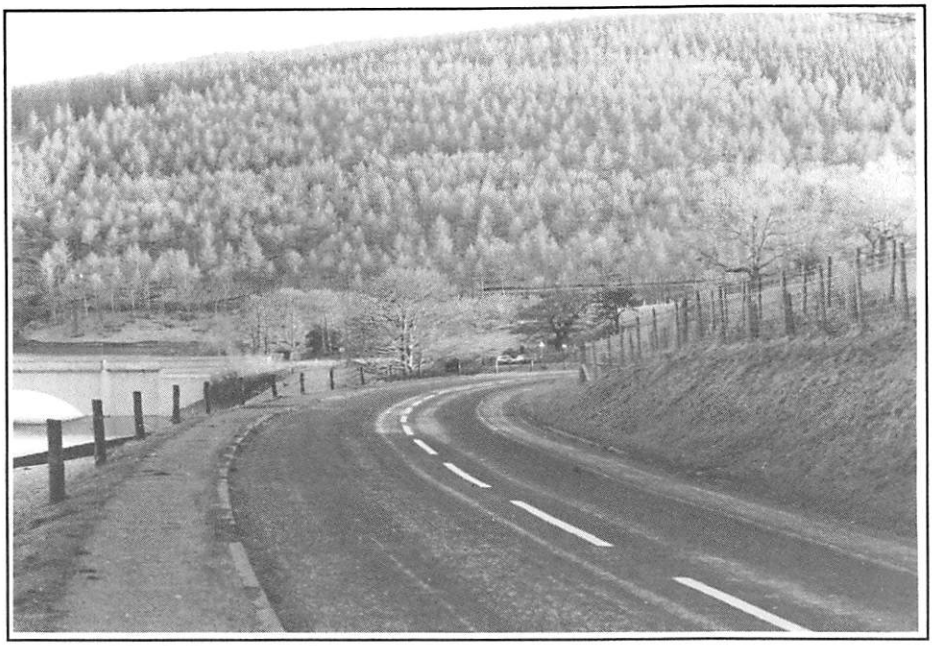
The valve is installed in a bypass line between the hot inlet and the cooled outlet/return to the engine. When the engine is cold, the valve is open allowing approximately 25% of the total flow to bypass the cooler and assist in raising the engine to its working temperature as fast as possible. Once operating temperature has been reached the valve will close allowing full flow through the radiator.

A more sophisticated temperature control unit is available that has a butterfly valve in the bypass line across the charge air radiator. The valve has an electric actuator that, when used with Amot's three term PID controller, provides fully modulated control. This ensures precise monitoring and correction of temperature in all environments.

Further details from Amot Controls Ltd, Bury St Edmunds. Tel: 01284 762222

AMOT Control Valve





'Triple Life' Gripple Fencing

PREMIUM GRADE FENCING PROVIDES 3X LIFE EXPECTANCY

Sheffield based fencing manufacturers Estate Wire have launched a new premium quality fencing range - high tensile 'Triple Life' Gripple Fencing, developed for use on sites where the elements or other corrosive factors would limit the lifespan of a traditional galvanised fence.

Shown in laboratory tests to offer over three times the life expectancy of wire galvanised to BS443, the longevity of the Triple Life fencing is due to its coating of Falfan - an exceptionally durable zinc and aluminium alloy.

The range incorporates all the usual advantages of high tensile fencing including inherently lower maintenance requirements, the need for fewer posts and lightness for easy handling. High Tensile Triple Life is available in all of the most popular patterns including HT8/80/15, and comes in 100 m rolls which means fewer joins are needed.

High Tensile Triple Life's low erection and maintenance costs and substantially extended lifespan give it a 'year on year' cost less than half that of traditional fencing.

Further details from Estate Wire Ltd,
Les Hunter Tel: 01742 392601
Jon Gordon Tel: 01532 370054

WORLD'S FIRST RUGGED NOTEBOOK COMPUTER

Husky Computers has achieved a major breakthrough with the launch of the FC-486. Applying its long-standing expertise in developing rugged handheld computers, the company has addressed the requirements of field staff who need to use a powerful notebook in a range of harsh environments, including timber logging, surveying and field audits.

The result is a unique configuration that overcomes the inherent weaknesses of the traditional 'clam-shell' designed notebook and provides an extremely rugged, portable and very practical computer for all types of organisation.

The fully sealed magnesium alloy case of the FC-486 incorporates both screen and keyboard in a single hingeless unit that weighs approximately 2 kg. Its unique curved profile is ergonomically designed to fit snugly in the crook of the arm so the user can work comfortably standing up and on the move.

The FC-486 has a QWERTY keyboard and an optional high performance pen, utilising Microsoft Windows for Pen software. The use of a built-in digitiser and cordless electromagnetic pen ensures field users of high levels of accuracy and ruggedness compared to typical pen interfaces.

The FC-486 is the first ever notebook to have a fully ruggedised screen. For example, it is tested to withstand direct impact from 1" steel ball dropped from a height of two metres.

Further details from Husky Computers, Coventry. Tel: 01203 604040

Husky FC-486

NEW ROTARY TELEMETRY EQUIPMENT BEATS EMC

Those in research, development and testing in the agricultural machinery field can now measure torque, strain, temperature and other measurement data from rotating shafts or components by using a new rotary telemetry system, which has been launched (February 1995) by Astech Electronics Limited.

The system's transmitter, which is mounted on the shaft or moving component, uses infra-red to transfer the data to a static pickup. This avoids the problem of transmission corruption caused by EMC emission from ignition systems, motor controllers, bearing static, that is a major difficulty with capacitive, inductive or radio based systems.

Further details from Astech Electronics Limited, Hampshire. Tel: 01420 22689

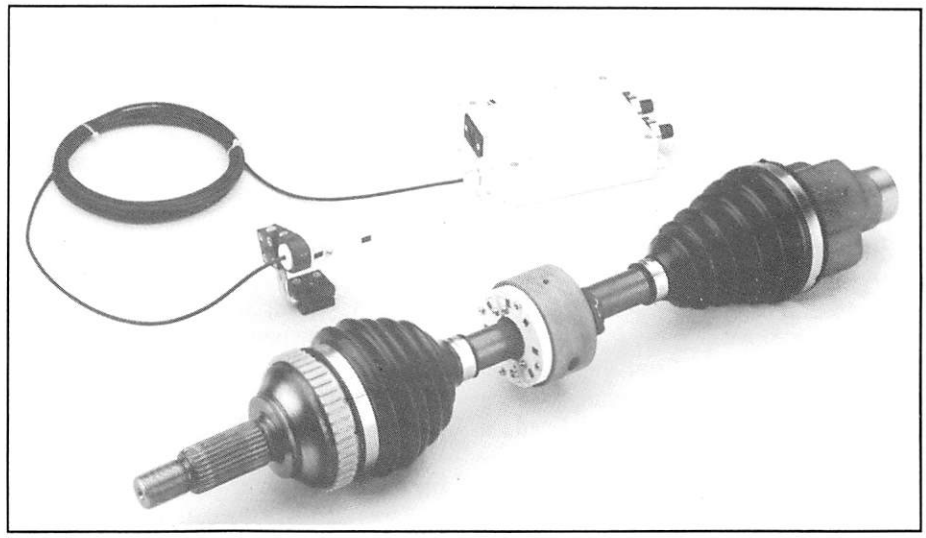
NEW MODEL SFC DRYER FROM CARIER

Carier have introduced a new generation of high capacity dryers. The series 2 SFC 'Low Height' Dryer has been designed and developed by Carier specifically to provide high volume drying within a compact unit and may be installed within lower height restrictions than any other mixed flow dryer of equal output.

The new SFC uses the proven mixed flow principle, which allows the use of higher drying temperatures without damaging the crop. As the grain descends through the dryer, staggered and tapered laterals ensure constant mixing of the product and minimise the time the product is exposed to the full 'air-on' temperature. Cariers own design of tapered laterals, with half laterals at the end of the grain beds ensure equal flow of air over the full area of the drying column.

Control is by a panel incorporating a PLC specifically designed for simple operation. Digital indication of 'air on' and 'air off' temperatures, with accurate control of 'air-on'. 'Air off' temperature can be used to control discharge for constant moisture content.

Further details from Carier Bulk Materials Handling Limited, Braintree. Tel: 01376 321102



Rotary Telemetry Equipment

MACHINERY DIRECTIVE COMPLIANCE

A new, low-cost remote stop system will help machinery manufacturers comply with the EC Machinery Directive. The compact, easy-to-fit unit requires no physical link with the panic button to provide instant emergency shut-off from a range of 200 metres.

The Remote Stop works by transmitting a coded radio signal from a belt-mounted or handheld control unit to a small receiver attached to the machine's existing emergency stop system. The control unit is in a robust box no larger than a pack of cards and the receiver requires only four wired connections. When the panic button is pressed, the control unit changes the signal to an emergency code that instructs the receiver to operate the emergency stop.

The standard version includes a 'dead man's handle' that automatically stops the machine if the person monitoring it moves out of radio range. Alternatively, the system can be specified with a system that sounds an alarm when radio contact is broken instead of activating the emergency shutdown.

The standard system is available for under £200 and is suitable for line-fit, dealer fit and retrofit applications. Radio transmissions comply with MPT 1340 and several remote units can be used on the same machine.

Further details from Zeta Control Limited, Oxford.
Tel:01865 784500

Remote Stop

RULES, REGULATIONS AND CODES

TREE WORK IS IN HIGH RISK INJURY CATEGORY

The Health and Safety Executive (HSE) issued an urgent warning to tree felling operators and tree surgeons that their work is in the "high risk of injury" category at a Tree Work Safety Day organised in Kent.

The warning came from John Oliver, HSE's South East Area Director, speaking at the National Trust's Scotney Castle in Lamberhurst, where the event took place.

Said Mr Oliver: " The HSE is becoming concerned at the number of serious accidents in the forestry and allied industry sector. In the past three years 21 persons have died because of this activity. The main risks are from falling trees, operators falling from trees and severe injuries from machines such as chainsaws. Other industrial activities are showing an improvement in accident rates but forestry type work remains resistant to an improvement in its overall health and safety performance."

Organised jointly by HSE, the National Trust and Lamberhurst Equipment Ltd, the safety day combined 20 live work demonstrations including felling trees, tree surgery, the use of chainsaws and logging for firewood.

Mr Oliver said that the actual number of persons earning a living in tree work was unknown. "But what is known is that some of these people have to work alone deep and out of sight in woodland and in all weathers. The main dangers they face are being crushed by trees during felling work; severe injury resulting from chainsaw cuts and vehicles overturning trapping drivers," he commented.

He spoke about the work of tree surgeons. 'There are too many cowboys in the South East pretending to be tree surgeons. Nearly all these take no precautions at all. They are a risk not only to themselves but also to others helping them and to their customers. The HSE recommends that only qualified tree surgeons are engaged as contractors'.

He added: 'The HSE is concerned about the welfare of people who earn their living in forests or woodland. Our surveys reveal that some operators are going nearly deaf because of high noise level from machines. Some operators have the condition known as vibration white finger caused by over vibrating components of machinery, particularly chainsaws. Inspections often reveal the use of dangerous machines such as circular saws with safety guards missing.

Tractors are often used with the safety cab or frame missing and the driver is at high risk if the tractor should overturn. During this winter I have instructed agricultural inspectors working in Kent, Surrey and Sussex to crackdown on 'cowboys' and on employers who fail to meet basic health and safety requirements for their employees.'

Mr Mark Daniels, Health and Safety Officer with the National Trust, said: "the National Trust is keen to work with the HSE in promoting the highest safety standards for those carrying out forestry and arboricultural work. The Tree Work Safety Day will help the Trust by raising standards among the local contractors who may undertake work on Trust properties, and by reminding our own staff of safety working practices."

CARBON MONOXIDE POISONING

The Health and Safety Executive (HSE) have warned farmers of the potential hazard from carbon monoxide (CO) poisoning during silage making. This can arise during end of season maintenance if forage harvesters contaminated with acid based silage preservatives are washed with water and detergents containing sodium hydroxide or other alkalis.

In 1994 a worker was poisoned by CO while power washing a forage harvester contaminated with grass and a silage preservative containing formic and acetic acids. The harvester was cleaned with water at around 100°C, and a detergent containing sodium hydroxide. Although cleaning took place in the open air two to three days after the harvester had been used, with a slight breeze blowing, the reaction between the additive and the detergent produced CO in such quantities that the operator nearly died.

Mike Sebastion, Agricultural Inspector at HSE's Livestock National Interest Group (NIG) at Stoneleigh said: "Tests with the silage preservative and the detergent, carried out by HSE, showed that the two will react together to produce CO. This reaction is extremely rapid at above 66°C and very large quantities of CO were produced - thousands of parts per million (ppm) - and measured during the test. This compares the occupational exposure standard of 50 ppm. The test suggests that the gas will be produced if contaminated machinery is washed with water at 100° C.

Although the volume of CO liberated will depend on the amount of silage additive/grass contamination present, being exposed to even small amounts of CO poses an immediate risk to health"

HSE have contacted the manufacturers of both products involved in the incident, and will be contacting other suppliers, to ensure that their safety data sheets warn of the hazard and that their technical representatives are able to advise their customers of the risk.

Farmers should consider carefull whether they need to clean forage harvesters with powerful detergents or very hot water if there is no heavy contamination with oil or grease. If they decide that they must use such detergents or water at or around 100°C, and they use a silage additive containing formic and acetic acids, thay should assess the risk of CO production in line with the principles of the Control of Substances Hazardous to Health Regulations 1994 (COSHH) and take steps to reduce the risk.

The following steps should minimise the risk of dangerous levels being produced:

* carry out an initial wash-down with cold water alone;
* do not use water at a temperature of more than 60°C;
* if there is no oil, grease or similar contamination, do not use a degreasing detergent.

Further advice from the Livestock and Stationary Machinery National Interest Group, HSE, NAC, Stoneleigh, Warwickshire, CV8 2LZ.
Tel: 01203 696518 Fax: 01203 696542

PROPOSALS FOR REFORM OF HEALTH AND SAFETY POSTER AND NOTICE

CONSULTATION DOCUMENT

This document is the first step in the Commission's programme of work to simplify health and safety legislation, following the Review of Regulations.

During its Review of Regulations, the Health and Safety Commission identified 78 statutory requirments on employers to display posters and notices. This document puts forward proposals for the removal without replacment of 51 requirements, which predate the Health and Safety at Work, etc. Act 1974 and whose purpose has clearly been overtaken by more modern legislation.

There are a number of pre-1974 requirments for the display of health of safety information which relate to significant risks. Examples include requirements to post notices of safe working loads on cranes and to mark tanks of highly flammable liquids.

The main requirement for display of health and safety information introduced since 1974 is the poster approved by the Health and Safety Executive (HSE) under the Health and Safety Information for Employees Regulations 1989 (HSIE Regulations). This replaced earlier requirments for one of four notices to be posted, and was a major simplification of the existing provisions. This would enable HSE to approve posters specific to particular classes of employer.

REPEAL AND REVOCATION

The key elements on provision of information in the present framework are:

- Section 2 (2) (c) of the Health and Safety at Work Act requires employers to provide information to employees;
- Regulation 8 of the Management of Health and Safety at Work Regulations 1992, requires employers to provide employees with comprehensible and relevent information on risks to their health and safety and preventative and protective measures.
- The HSIE Regs require employers to display an approved poster, or provide employees with an approved leaflet.

PROPOSAL TO AMEND HSIE REGS

The requirement for employers to display a poster or to hand out an equivalent leaflet under the HSIE Regulations serves a number of purposes. The poster:

* alerts employees to the existence of health and safety law and the duties that employers have under that law;
* gives details of the local enforcing authority and the Employment Medical Advisory Service;
* enables employers to discharge the most basic parts of their general duty to provide information to employees on health and safety;
* informs employees of their own responsibilities for health and safety.

The poster and leaflet provide a convenient means of conveying information about health and safety and the Commission is not proposing that this obligation should be removed.

The Government's Deregulation Task Force and the Commission's own Sector Task Groups, have suggested that the introduction of sector-specific or industry-specific information might make the poster and leaflet more user-friendly. This suggestion needs to be examined careful. The proposed amendment would enable posters and leaflets to be prepared for different classes of employer, if consultation show that these would be useful.

Comments are invited on:

- would posters targeted towards sector or industry risks be useful for some sectors;
- if so, which sectors or industries should be covered and what form should these posters take.

Views are needed on 'would it be helpful if the poster and leaflet were designed in a way that enabled employers to record the significant findings of their risk assessment?' This might be a means of meeting the requirment, in Regulation 8 of the Management of Health and Safety at Work Regulations.

PRECAUTIONS WITH SHEEP DIP

The Lancet has published a paper by the Institute of Occupational Health (IOH) about the findings of research into the long term health effects of exposure to organophosphorous (OP) sheep dips.

The research, commissioned by Health and Safety Executive (HSE), looked at concerns over possible chronic neuropsychological and neurological effects in sheep farmers from exposure to OP dips. The study population consisted of some 150 sheep farmers and workers in three areas North Wales, Devon and Cumbria. The control group was drawn from workers employed at quarries in the same geographical areas matched for age, sex and educational level.

The research showed that:

* there were no differences in short or long term memory or learning capacity between the dippers and a control group of quarry workers;
* dippers took slightly longer than the control group to perform tasks requiring sustained attention and mental processing of information;
* only one of these tests suggested any dose response relationship
* personal protective clothing was not used by many dippers.

Welcoming publication of the research, Dr Peter Graham, Director of HSE's Health Policy Division said: "Many people will have been waiting for the results of this independent research into the actual effects of OP sheep dips. It does carry our knowledge further. OP dips are well known to cause acute ill health effects if no proper precautions are taken. The question explored is whether they are the cause of long term or chronic effects as is often claimed.

What the research shows is that long term users of OP dips do not perform quite so well on some well recognised tests of reasoning and attention span.

We shall have to consider the implications of the results very carefully. They do not confirm the worst predictions of some people but they do obviously underline the strong need for precautions. Dippers must follow the Control of Substances Hazardous to Health (COSHH) Regulations 1994 and if they wish to purchase OP dips must obtain a certificate of competence. I strongly advise users to read our free leaflet "Sheep dipping", which was sent to all farmers, and follow its step by step guide to protect health."

The Lancet is available in main public libraries. For those who wish to read the IOH paper the reference is Lancet 1995, Vol. 345, P. 1135-1139, 6 May issue.

THE MACHINERY DIRECTIVE (89/932, 91/368 AND 93/44)

BACKGROUND

My starting point is the political decision by all Member States of the EEC in 1995 to create the Single Market. It was seen that there would be the need to remove existing barriers to trade, many of them being national regulations - some deliberately created for that purpose. The way chosen to remove many of these barriers was to draw-up Directives requiring Member States to 'approximate their laws' so that there is a level playing field.

However, there was one snag to this concept. Historically, Directives had taken a long time to produce - up to 12 years - because they were a complex mixture of legal and technical requirements. They were also agreed on the basis of unanimity. It was therefore easy for a Member State to veto or filibuster. As there was only six years to get everything ready and some 300 areas had been identified as requiring action, something needed to be done.

The solution was the 'New Approach' in which weighted majority voting was to be used for many Directives and the structure of the Directives was modified. This new structure was deliberately intended to remove the worst characteristics of the old approach. The Directives were to state the legal requirement to be achieved in the form of Essential (Safety) Requirements (ESRs) and the technical requirements were removed. It was clearly seen that many organisations would have difficulty in interpreting these Essential Requirements - particularly small firms, which means most firms on the 'Market'.

The solution was to ask the European standards bodies to prepare standards in support of these Directives - known as 'Harmonised Standards'. These standards - produced under a mandate from the Commission - would give the technical measures to meet the ESRs. There was never any intention to make these standards mandatory. The whole concept of the New Approach was to open-up the markets for suppliers with the minimum of restrictions on the basis of self declaration of conformity.

MACHINERY DIRECTIVE

Directive 89/392/EEC was one of the first of the new approach Directives and was passed on the 1st June 1989. It was intended to cover a wide range of machinery defined as:-

> **Machinery** - an assembly of linked parts or components, at least one of which moves, with appropriate actuators, control and power circuits etc, joined together for a specific application, in particular for the processing, treatment, moving or packaging of a material with certain exceptions.

Although the Directive covered a wide range of machinery, its application was restricted to largely static and handheld machines. The amending Directives 91/368 and 93/44EEC cover the risks arising from mobility and lifting both loads and people (with certain exceptions) and extends the scope to include:-

> An assembly of machines which in order to achieve the same end, are arranged and controlled so that they function as a whole; and inter-changeable equipment modifying the function of the machine, which is placed on the market for the purpose of being assembled with a machine (or a series of different machines or with a tractor) by the operator himself in so far as this equipment is not a spare part or a tool; and safety components.

The Directives became total on 1st January 1995 (with come exceptions for ROPS and FOPS). Thereafter a manufacturer (any other supplier) putting machinery on the market anywhere in the EU for the first time must comply with the following requirements:-

- Comply with the technical requirements of Annex 1.
- Compile and keep available a technical file (documentation).
- Provide information on use, maintenance, training, supervision and personal protective equipment.
- Make a declaration of conformity - there are special requirements for certain machines.
- Put certain information, such as makers name, on the machine.
- Put on the **CE mark**.

Having complied with these requirements the manufacturer can freely put the machine anywhere within the Single Market. Should a manufacturer fail to comply with these requirements there may well be a breach of the criminal law in both the country of origin and the country of supply.

Putting on the market for the first time means on the Single Market for the first time after 1st January 1995. This would exclude second-hand machines already in use in Member States before 1st January from the Directive, but would include second-hand machines originating from outside the Community. The Directive also covers machines made or assembled within an organisation for its own use.

ESSENTIAL HEALTH AND SAFETY REQUIREMENTS (ESRS)

The ESRs are given in Annex 1 of the Directive and must be considered for all machines. Annex 1 is divided into the following parts:-

Part 1- Preliminary observations, principles of safety integration, and general safety aspects.

Part 2- Additional requirements for agrifoodstuffs machinery portable handheld machinery and machinery for woodworking and similar materials.

Part 3- Particular requirements for the hazards arising from mobility.

Part 4- Particular requirements for hazards associated with lifting - but not lifting people (to be the subject of a second amendment).

Part 5- Requirements for underground working.

Part 6- Requirements for lifting and moving persons.

NB. It is important to realise that when assessing a machine all of these Parts should be considered.

PRELIMINARY OBSERVATIONS

The starting point is Part 1 **Preliminary Observations - which determine how the rest of the ESRs should be interpreted.** These give two directions that control the way the rest of the ESRs should be dealt with.

> The first is that the ESRs only apply when the corresponding hazards exist but that requirements 1.1.2 (the

Principles of Safety Integration), 1.7.3 (Marking) and 1.7.4 (Instructions) apply to every machine.

The second is that every effort should be made to comply with the absolute nature of the Essential Safety Requirements. However, if it is not possible to meet the objectives set by them (the ESRs) the machines should be designed with the purpose of approaching these objectives, **taking into account the state of the art.**

MANDATORY ESRs

As stated in the Preliminary Observations the following ESRs apply to every machine and as such under the Directive have equal precedence. However, in terms of producing a safe machine, the Principles of Safety Integration are the core of the Directive and should be fully understood before any work is started on a machine or a Harmonised Standard:

1.1.2. Called the **Principles of Safety Integration** gives the basic approach to be used in the assessment of all risks to health and safety for any machine during all stages of the machines use, from assembly to scrapping, under conditions of foreseeable use and misuse.

The strategy gives the following approach:-

Identify all hazards to health and safety then,

Carry out a risk assessment and on the basis of the risk assessment eliminate or minimise the risks by:-

Design measures
Provision of protective devices
Provision of information on residual risks and precautions needed to deal with them.

1.7.3. Marking - requires that all machines should be marked so that the manufacturer and the machine type can be identified. That any special operating limits are given and that the **EC** mark is fixed (see Annex 3).

1.7.4. Instructions - requires the supplier to provide operating instructions and sales literature containing a wide range of information dealing with the safe use of the machine including transporting, installation, operating and maintenance through to scrapping. There is a particular requirement for information on noise and vibration depending on the level emitted by the machine under stated test conditions.

NB. The 'Principles of Safety Integration' form the basis for the entire approach to meeting both the requirements and the spirit of the Directive, enabling the 'State of the Art' to be achieved for any combination of risks for any machine. The logical step by step system is intended to be a hierarchy to be followed 'in the order given'.

CONFORMING WITH THE ESRs

The manufacturer can choose one of two ways of conforming with the technical measures requires by the Directive:-

Interpret the technical measures directly from the ESRs.

or

Use a Harmonised European Standard produced by CEN/CENELEC under mandate from the Commission and placed in the Official Journal of the CEC.

DECLARATION OF CONFORMITY

Before putting the EC mark on a machine and for safety components the manufacturer must draw up a **Declaration of Conformity** as detailed in Annex II and Annex V. For most machines the attestation will be carried out by the manufacturer alone but for certain machines that are considered to have particular risks and some safety components there are extra requirements. These machines are list in Annex IV and for these machines there are special procedures:-

For machines and safety components made to a **Harmonised Standard** there is a choice of:-

1. Sending the technical file to a **Notified Body** (see Annex VII).

   or

2. Sending the technical file to a **Notified Body** to verify that the standards have been complied with and to draw up a certificate of adequacy.

   or

3. Submit the machine to the **Notified body** for an **EC-Type Examination (see Annex VI).**

For machines not made to a Harmonised Standard the machine and safety component must be submitted to a **Notified Body** for an **EC-Type Examination.**

NB

Notified Bodies are bodies set up under Article 9 of the Directive that are responsible for carrying out the certification procedure under Article 8. Member States shall apply the criteria given in Annex VII to approve such Bodies and the CEC shall publish details of them in the Official Journal. Once approved, a Notified Body can carry out its work for any supplier within the Single Market.

HARMONISED STANDARD EUROPEAN STANDARDS

So what was/is so special about these Harmonised Standards. The starting point is to look at what knowledge a supplier needs to have to comply with the Machinery Directive (MD) (NB - the Supply of Machinery Regulations

1992 is the UK's approximation of the (MD), namely:-

Interpretation of the Directive
Design of the machine
Use of the machine
Accident History

It is clear that many organisations would have difficulty in assembling this array of information and having the confidence to act on them. It was anticipated that within a CEN/CLC technical committee it would be possible to assemble Europe's best experts to write a standards that would be the definitive state of the art. On this basis is was agreed that any machine made to such a standard would be deemed to have a presumption of conformity with the ESRs covered. In addition machines coming within Annex IV of the Directive would not need type testing for those ESRs covered by the relevant standard.

CEN/CENELEC have a programme supporting the Directive involving some 40 Technical Committees with over 560 standards in preparation. EN 292 Safety of Machinery sets out the basic philosophy for the entire programme, EN414 Rules for the Drafting and presentation of **Safety**

Standards gives the format for the overall approach. There will be standards dealing with Risk Assessment, safety devices and information on a wide range of safety topics such as noise ergonomics, control systems and control of dust and fumes, together with many standards dealing with the safety of specific machines.

To date there are some 30 standard published with another 180 at the public enquiry stage.

The first priority for CEN was to develop a strategy that avoided re-inventing the wheel in each subsequent standard and making the best use of the experts available to do the work. This evolved into a hierarchy of standards:-

A Type: Giving the basic approach (EN 292 etc)

B Type: Giving information a common safety topics and devices (controls, guards, etc)

C Type: Giving specific safety requirements for machines

CEN TC/144 was set up to produce standards for the Agricultural and Forestry sector. This TC has an ambitious programme of 31 standards covering a wide range of machines. Other TCs are producing standards for materials handling machines and equipment that are used across the various sectors including agriculture and forestry.

Footnote

I am often asked the question what has been the purpose of producing the standards and have manufacturers been wasting their time and resources over the last seven years? Well I can't answer for manufacturers but I hope that there are several good reasons for both producing the standards and using them that will remain for the foreseeable future, namely:-

* Common approach to safety by competitors across the Market

* Presumption of conformity - hence acceptance by enforcement authorities

* Legal defence of due diligence

* No need for type testing for annex IV machines

* Levelling up of safety standards - the best state of the art

* High confidence factor when committing technical resources

* The collective experience of working in the TC - keeping ahead of the game

These seem to me to be good reasons for taking part and are why so many manufacturers continue to support CEN and CLC. Although of course it is very disappointing to have missed the 1st January implementation date - however good the reasons for doing so.

This paper was given by Paul Makin, February 1995, at Institution of Agricultural Engineers, Scottish Branch, Annual Conference 1995

Paul Makin is Consultant to CEN for machinery safety

LETTERS TO THE EDITOR

Dear Sir

Engineers for the Year 2000 - 2005

Students entering A level this year who intend taking a degree in engineering will not complete their studies until the next century.

Colleges have to review their courses on a regular basis if they are to stay relevant. These reviews need to take into consideration what students and industry will be requiring four to six years in the future.

Current engineering knowledge and skill are said to have a half life in the order of five years.

If industry is to have recruits who will meet their needs both they and the educators need to look well into the future. Higher education does not need to respond to the needs of today but those of tomorrow multiplied by 2,000.

This letter is a request to those in industry who will shape our engineering future. The writer seeks guidance from these forward thinkers. The core 50% of courses for the future are likely to be those based on the bed rocks of science and technology unchanged over the years. It is known that engineers need to understand the fundamental engineering principles, they require the ability to work with others and be able to communicate their ideas in a coherent and persuasive manner. The ability to solve problems is an obvious requirement but is only possible if they understand the problem and can communicate with others.

If industrialists have views on this matter the writer would be pleased to hear from them. As we develop our courses we can then adjust their content and style to meet the needs of the future.

Yours faithfully

G.F.D. Wakeham, BEng Course Manager, Harper Adams Agricultural College, Newport, Shropshire. TF10 8NB Tel: 01952 820280

Letter from BBC Midlands and East

Dear Sir/Madam

I am writing to let you know about summer transmissions for Leisure & Countryside Programmes. BBC1's CountryFile - network television's weekly rural affairs magazine, presented by John Craven - continues its run on Sundays at noon, covering the key issues affecting farming and the countryside. And TRACKS, BBC2's sharp sideways look at the country, returns this coming Tuesday at 8 pm for a new series.

As always, we are keen to hear of people, places, events and issues that merit our attention. Please feel free to contact Caroline Jones on 0121-414-8994, or by fax on 0121-414-8181, by post at CountryFile at the address below, or e-mail me tim.manning@bbc.co.uk. We'd appreciate it if you could keep our records up to date - so if our contact's book need to be amended, please let us know.

We're keen to know your comments in general about our programmes - whether praise or otherwise - and I would much appreciate hearing from you. Similarly, if there is a particular point you wish to raise at any time, please don't hesitate to get in touch.

Kind regards,

Yours faithfully

Tim Manning
Executive Producer and Assistant to Managing Editor
Leisure & Countryside Programmes
BBC Midlands and East, Pebble Mill Road, Birmingham. B5 7QQ

Membership matters....

THE NEWSLETTER OF THE INSTITUTION OF AGRICULTURAL ENGINEERS

PERSONAL CAREER DEVELOPMENT

This is the third in our series of articles which describe important aspects of the **Personal Career Development** initiative. It is hoped that, by now, every member of the Institution is fully aware of PCD and what it can do for individuals in their current jobs and in helping to develop their careers in agricultural engineering. If you can find the time, read through the first two articles again and ask yourself whether you are making full personal use of the opportunities that the initiative presents - your future may depend on it!

For many members, one of the most important aspects of PCD is the recently launched Continuing Professional Development programme. Yes - we have noticed that the initials PCD and CPD are very similar and could lead to confusion. We decided to retain them because the words are just right for each activity and the similarity in initials emphasises the close connection between each activity. CPD is a key component of PCD. CPD is the personalised career planning and events diary for each member. It formalises what many of us have been doing mentally for years as our careers have progressed. In recent times, however, professional life and work has become more competitive and increasingly complex. As the President points out in his letter to Members in January 1995, "Working in a discipline where knowledge is developing at an ever increasing rate, the need to keep up to date is no longer a luxury; it is a necessity".

The case for CPD is therefore very strong. Every member of our Institution is urged to take full advantage of the opportunities that CPD presents. Again quoting from the President's letter:

> "CPD is described as the systematic maintenance, improvement and broadening of knowledge and skill, and the development of personal qualities necessary for the execution of professional and technical duties throughout the individual's working life. Put more simply, it is a system which will contribute to ensuring the individual's continued employability throughout his or her working life. It is not something that any of us can simply ignore. It will become an important and recognised part of the whole process of Personal Career Development".

The message and advice to members of this Institution is clear, but what are other organisations doing and saying? In taking this initiative, our Institution is in good company. The Institute of Personnel and Development has 50,000 members and sees "four overwhelming reasons for requiring CPD of its members". These are:

> "ensuring that professionals remain up-to-date in a changing world;
> ensuring that the reputation of the qualified in the profession is enhanced;
> encouraging professionals to aspire to improved performance;
> facilitating committed learning as an integrated part of work and to manage learning methods that are appropriate to the needs of the members' circumstances".

Most of the engineering institutions are in the process of introducing CPD schemes which are being well received by members. The Engineering Council has brought together a CPD Forum which has produced a Code of Practice. Our Institution's programme is in accordance with this Code.

As you may now be aware, the Institution's CPD scheme is in operation on a pilot basis. The Education and Training Committee is working actively on developing the final version of the scheme and its necessary documentation. It is anticipated that the scheme will be fully operational by the Autumn of this year. In line with the other Engineering Institutions, the Scheme will not be mandatory. It would not be easy to enforce a mandatory scheme as it would require a significant input of financial and personnel resources, and in certain circumstances, it could cause difficulty for some individual members. A voluntary scheme will rely, almost entirely, on the integrity of members. Its success will enhance the standing of the Institution by demonstrating commitment to improving professional standards.

Unlike some other professional institutions, there will be no 'approved' CPD events and a points system will not be used. Participants in the CPD scheme will be required to set their own targets of attainment based upon individual professional aspirations and on their assessment of their ability and potential. They will be expected to attain at least 30 hours of CPD in each year and to record it, and they will be encouraged to submit their records to the Secretariat each year for monitoring and validation. Those who satisfactorily achieve the target of 30 hours per year over five consecutive years will be awarded a certificate of attainment. It is anticipated that there will be three types of qualifying CPD. These will be recorded under the following separate headings:

a. developing technical expertise and knowledge in agricultural engineering or closely related disciplines,
b. extending technical and managerial skills beyond the participant's normal field, and
c. developing professional life skills and knowledge, such as languages, finance and law, etc.

It is expected that a typical CPD programme will not concentrate on only one of these headings, but on a combination of them all. The balance will vary from person to person, but it must be suited to the needs of individuals and their future aspirations. There are many activities which can be counted towards CPD. These include:-

a. Courses, conferences and seminars
b. Institution technical meetings
c. Organised visits
d. Secondments and exchanges
e. Professional updating by private study and reading
f. Writing articles and papers
g. Further education
h. Institution committee work
i. Distance or open learning

JOHN MALET CHAMBERS 1909 - 1995

John Chambers, brilliant engineer, much loved father, and husband of Daphne, died early i May after a distinguished career which saw his other child, the 'little grey Fergie', burst upon the Post-War agricultural scene and become the world standard for tractor design.

A shy and retiring man by nature John nevertheless became CHief Engineer of Harry Ferguson Limited, President of the Institution of Agricultural Engioneers (1957-1959), a founder Governor of the National College of Agricultural Engineering (now Silsoe College of Cranfield University) and for forty years a pillar of the West Midlands Branch of the Institution. In recognition of his many outstanding achievements he was awarded the Institutions highest honour , that of Honoury Fellow, in 1969.

John's career began in 1932 when he left the family farm in Downpatrick and went to sea as a junior engineer aboard the *Atholl Princess*, a tanker of the United Molasses Company Line, but later that same year he decided seafaring was not for him and joined Harry Ferguson in Belfast, where Harry was working on the prototype 'Black Tractor'. John's first small triumph came in 1933 when his own father purchased the the very first Black Tractor to be offered for public sale and put it to work at Downpatrick, and it was soon followe by many other and greater sucesses.

There followed a brief association between Harry Ferguson and David Brown, when John was involved with the production of the short-lived David Brown Ferguson Tractor at Meltham and then, in the mid 1930's, John and Daphne accompanied Harry Ferguson to Dtroit, wher two of his sons and 306,000 Ford Ferguson tractors were born.

Moving to Banner Lane, Coventry, afterthe war he became Chief Engineer of Harry Ferguson Limited, and was resposible for introducing the American range of Ferguson implements into production in the UK. This involved many problems, particularly with the Trailer and Mower, both of which needed extensive redesign to meet the requirements of the British market.
There followed years during which many changes took place; the Company was sold to Massey Harris to become Massey-Harris-Ferguson and later Massey-Farguson, and John finally left inthe early 1960s to found NeIdea UK with Trevor Knox and others.

It is as an outstanding engineer, innovator and devoted family man that we remeber John, as well as for his magnificent Delauney-Belleville motorcar, for many years his other pride and joy. Typically, he kept a drawing board beside his bed, claiming that many of his best ideas came while he was asleep; he would leap out of bed and record them before they slipped away with the dawn. One such was the brilliantly simple spring-lop lich-pin for implement hitches - today as indispensible and as much a part of everyday farming life as a ball-point pen.

John was indeed one of the great agricultural engineers of our time - his contribution to tractor development was immense and enduring, but the profound changes which have overtaken the industry in recent years mean that almost certainly we shall

Congratulations go to **P K Afful** on being granted an MBE in Queens New Years Honours List

Mr P K Afful, MBE IEng MIAgrE is employed by the **ODA** Overseas Development Administration (British Government) as a field engineer and is at present locatated in Central Bosnia (Former Yogoslavia)

He was contract by **ODA** and seconded to the European Community Task Force (ECHO), as part of an emergency team of engineers, to repair basic public utilities in areas of Central Bosnia. His role was to identify and appraise un-met infrastructural needs, to draw up proposed work plans, procure the necessary materials and plant through a procurement service and to oversee the successful completion of repair work. This involved technical assessments of district heating, water, sewerage and power network systems. He provides technical advice for other International organisations such as **UNCHR** and **NGO's**. Much of the work was done in co-operation with local municipality and government officials.

BELLS RQUESTED

This is not a request for a whisky but one for church bells. Malcolm Simpson has written requesting help to locate the manufacturer of large church type bells, preferably 12 to 18 inches in diamemter. If any member can help can you please contact Malcolm at Lisdoart Post Office, Ballygawley, Co Tyrone, N. Ireland.

James Ramsey who has been an independent environmental consultant since 1988 has recently moved from Cambridge to Canada. Most of his work is in developing countries and recent missions include acting as Field Team Leader of a World Bank environmental impact assessment of a road linking Georgetown in Guyana to Roriama State in Brazil, checking on environmental compliance for a road under construction with ODA assistance in St. Lucia and being the green conscience on a Panel of Experts advising the Ministry of Public Works and Water Resources in Cairo on the effects of rebuilding one of the old British barrages across the Nile. His next project will be in Vietnam, where he will be looking at environmental institutional strengthening in the transport sector.

Hugh Turral says that since 1982 he has mostly worked on irrigation and agricultural development projects, as an engineer and agronomist. From 1990-93 he went back to do a doctorate at the University of Melbourne. He is now working for the overseas Development Institute in Regents Park. He is a Research Fellow on the new Water Resources Network (WRN), which has replaced ODI's Irrigation Management Network. WRN a research based network, attempts to link organisations involved in water resource management, policy, planning and regulation in developing countries. It also provides open access to research papers via INTERNET. The principle areas of interest are:

1. Competition between different uses for increasingly limited resources: specifically agricultures (irrigation) response to urban/industrial demand.
2. Performance and development of reforms in rational water resources management particularly decentralisation, corporatisation, franchising and privatisation and development of regulatory codes and legislation.
3. Use of economic insentives, cost recovery and self financing in the use of water services.

He says they also carry out consultancy work for UN agencies and the ODA.

INSTITUTION MEMBERSHIP CHANGES

Admissions - A warm welcome to the following new members:

Fellow: G S Povey (Hereford)

Companion: J A B Castell (Cambs)

Member: K Gardiner (N Ireland), J C Salisbury (Wales), A.K. Singoro (Nimibia)

Associate Member: M T Creswell (Worcs), O A Fajemisin (W Midlands), L. Kailondo (London), E T Nfor (Bucks), A.I. Olorunfemi (Nigeria), S.C. Price (Worcs)

Associate: R.L Grantham (Shrops)

Student: K N Baguant (Beds), J C Carr (Lincs), P.R. Earl (Suffolk)

Re-admission: S P Imonigie (Nigeria), M.J. Wattam (Hants), R.W. Whittall (Zimbabwe)

Transfers - Congratulations on achieving a further phase of their professional development

to **Hon Fellow:** J Neville (Beds)

to **Fellow:** H. Catling (Gloucs)

to **Member:** A.G. Boateng (Ghana), W.J.Bradfield (Norfolk), C.S. Cornish (Devon), S.R.B. Done (Beds), G.H. Fletcher (Kent), D.N. Hinchcliffe (Worcs), H.M. Lockwood (Pakistan), H.N. Turral (London)

to **Associate Member:** K. Devine (Scotland), R.L. Grantham (Shrops), W.W. Kinnaird (Scotland), E. Hindmarsh (Tyne & Wear)

to **Student:** J.E Brown (Cambs)

Deaths - with great sadness we report the death of:
J.M. Chambers (Warks)

ENGINEERING COUNCIL - Registration - Congratulations on this achievement

CEng: C.S. Cornish (Devon), G.H. Fletcher (Kent), K. Gardiner (N. Ireland)

IEng: D.F. Giles (Staffs)

EngTech: M.T. Cresswell (Worcs), E. Hindmarsh (Tyne & Wear)

Movements - members who have changed their addresses except where they remain in the same English county or, elsewhere, in the same country. We hope the move has proved beneficial.

Member No	Name	From	To
6363	E.F. Asante	London	Bucks
6395	N V Askew	Yorks	Shrops
5468	P M Blakely	Belgium	Ukraine [via Middx for mail]
5208	J.F. Browning	Philippines	Oxon
5868	D Dowler	Warwicks	Oxon
5726	D S Elsworth	Netherlands	Yorks
6338	T.D. Eyre	Worcs	Salop
6359	N A L Gunn	Suffolk	Essex
6145	T A Ijir	London	Nigeria
2406	F. McLean	Warwicks	Worcs
6420	E.B.H. Martyn	Hants	Oxon
1887	G.J. Meikle	S Arica	Zimbabwe
5766	G.B. Moir	E. Sussex	Herts
6388	P. Mushove	Dublin	Zimbabwe **
4274	J G S Norman	London	Devon
3929	W.D. Parnell	Cornwall	Mexico
1292	S.A.G. Perera	Nigeria	Sri Lanka
6356	N.J. Pigott	Ireland	N. Humberside
5901	K. Rhodes	Jamaica	Belize
5686	A B Richardson	Bucks	Dyfed
6229	T.P. Roddy	Tyne & Wear	Essex
4687	D.A. Scothmer	Gloucs	Hereford
4856	T.J. Sharples	Wilts	Wales
6131	J R Sivil	Lincs	Devon
6139	D.A. Steven	Scotland	Lincs
2132	R Streatfield	Lancs	USA
0029	L. West	W. Yorks	Somerset

** P. Mushove was shown as "gone away" in the previous issue: he has now made contact.

Gone Away

Name	Last Known Address	Date
D J Baldwin	4 Ashburnham Road, Ampthill, Bedford, MK45 2RH	21.04.95
H J Bellis	2 Bracken Court Calthwaite, Penrith, Cumbria CA11 9QU	03.04.95

The front-line team in action

The conference this year entitled 'Engineering Crops for Industry', was held on 16th may 1995 at Silsoe College. It focussed on the engineering aspects of non-agriclutural crops. The conference was run because there is currently much interest in producing new crops for industrial use and in finding new non-food uses for existing crops. This interest has been stimulated by the food surpluses in the developed world which has led to set-aside, and to increased consumer demand for 'green' products and processes.

CAPTION COMPETITION

The picture captures John Neville our new Honourary Fellow with his buffet lunch and it would appear that he may have been a little early. We would like some suggestions as to a suitable caption for this photograph.

The judges, who are the Editor, the Secretary and the Chairman of the Editorial Panel, will not accept entries referring to certain farm animals at the trough and their decision will be final.

The winner will receive an Institution tie and his caption will be published in the next newsletter. All entries to the Secretariat

The president welcoming delegates

The conference provided a platform for experts in the production and processing of crops for fuels or industrial feedstocks to illustrate the latest technology developed for these areas, and it also encouraged discussion on the way forward.

Nine speakers from a wide range of disciplines gave impressive presentations, and the conference was summed up by Brian Legg of Silsoe Research Institute.

Later in the day the AGM and Council meetings were followed by the annual dinner and awards ceremony. Ben Gill, deputy president of the NFU spoke as guest of honour giving us his views as a farmer.

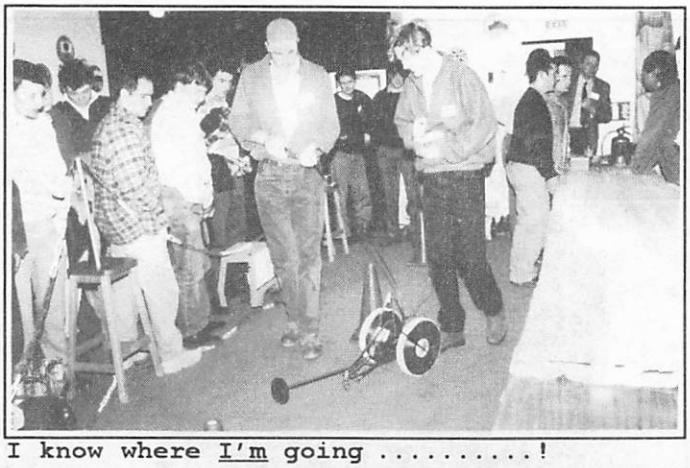
Dick Godwin as president made the following awards:

Honorary Fellow	- John Neville for his long service to the Institution.
Branch Meritorious award	- Jim Pritchard of the South Western Branch.
Award of Merit	- Jim Brown of RDS Technology Ltd.
Branch Recruitment award	- Ian Yule of the Northern Branch

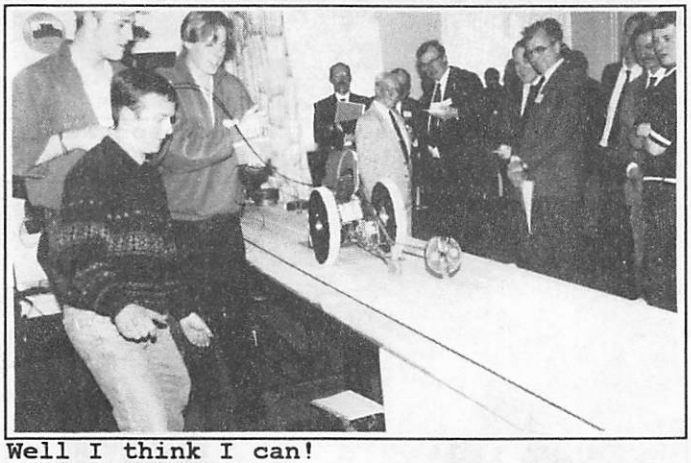
Finally Bob Humphrey of New Holland Ltd presented the Johnson New Holland Award to Timothy Roddy for his final year project at Newcastle University.

The whole day was highly successful, largely due to the Convenor, Laurie Osborne and the Conference Organisor, Yvonne Miles. Our thanks go to them both.

THE SECOND MASSEY FERGUSON PARTS COMPANY MODEL TRACTOR

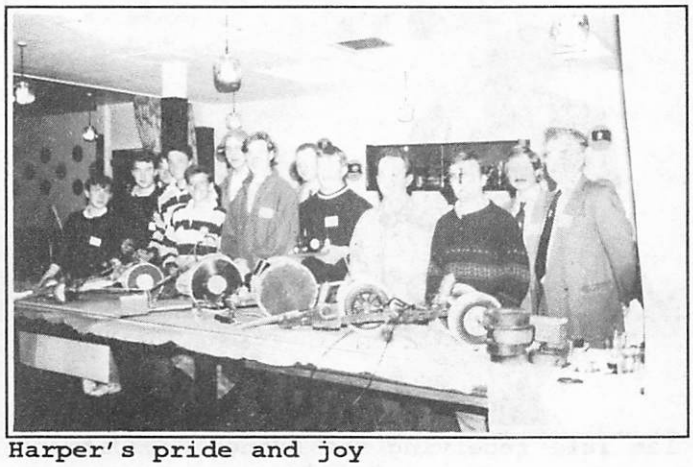


I know where I'm going .....!



Well I think I can!

It was in there when we started!



Harper's pride and joy

The delegates to the conference held at Silsoe on the 16th May were entertained and informed during their lunch by the efforts of students from many of the centres of agricultural engineering across the country.

Nine teams or individuals had entered a range of interpretations of the rules for a model largely devised by John Kilgour.

These engineering masterpieces were put through their paces over courses designed to test their steering and tractive efficiencies.

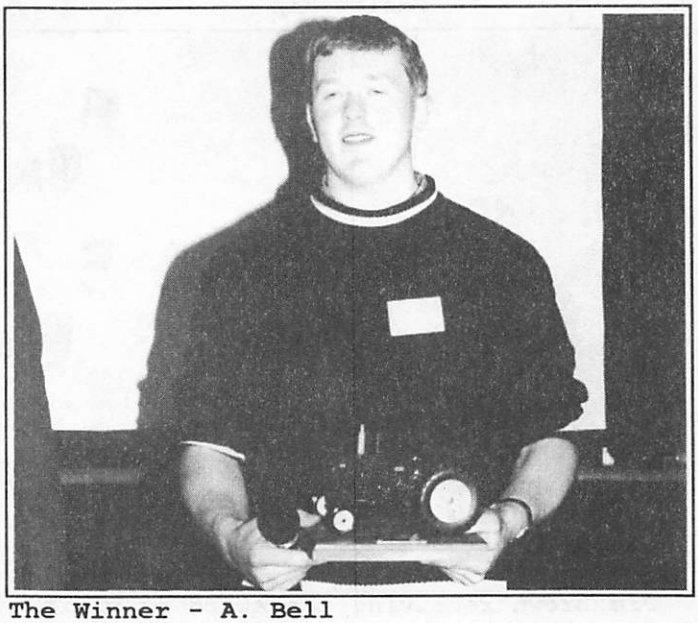
The calculation of power to weight ratio (units specified) led to a close result with little between the top three. Working at the cutting edge of model tractor technology (gas axe) produced the sort of problems more often associated with those encountered by the top designers of racing cars. Two entrants were forced to withdraw part way through the competition for unspecified reasons.

The final result for the top three places were:

1. A. Bell (Student) Harper Adams HND III
2. J. Bratley Harper Adams HND III
3. BEng I team Harper Adams

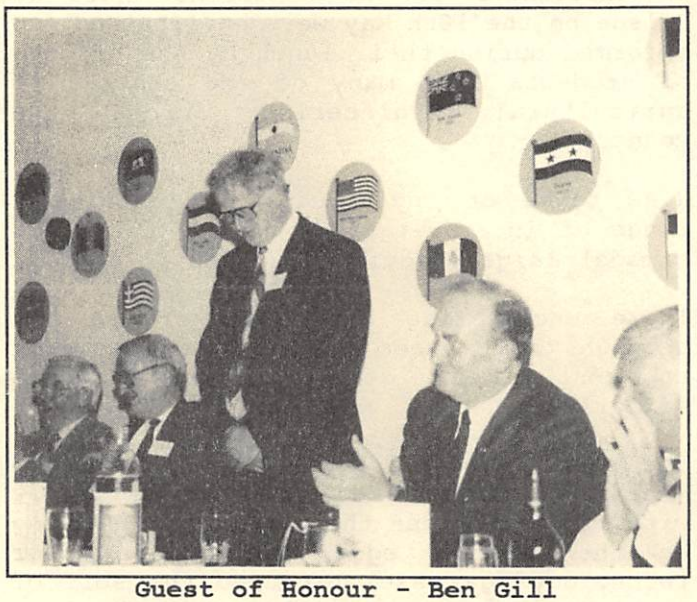
Teams from Writtle, Rycotewood, Silsoe and Harper Adams filled the remaining places.

The Trophy was presented by G.F.D. Wakeham on behalf of Massey Ferguson Parts Company. On receipt of this trophy Alister Bell put out a challenge to older members to enter the competition in future years.

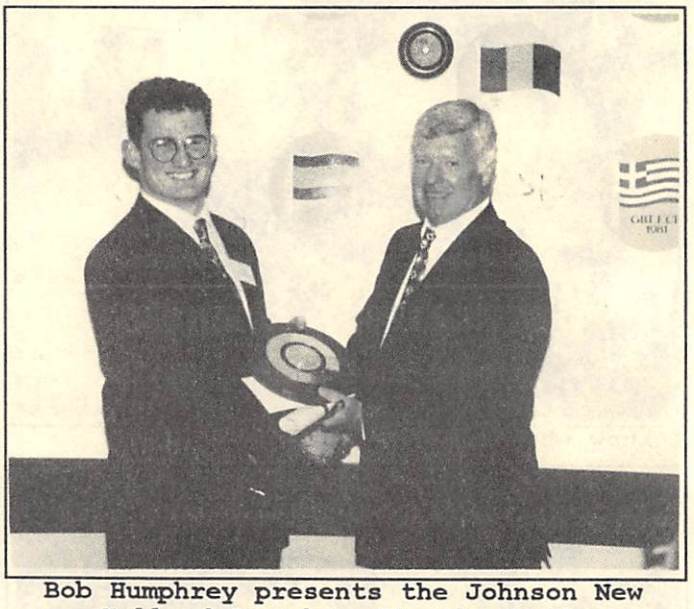


The Winner - A. Bell

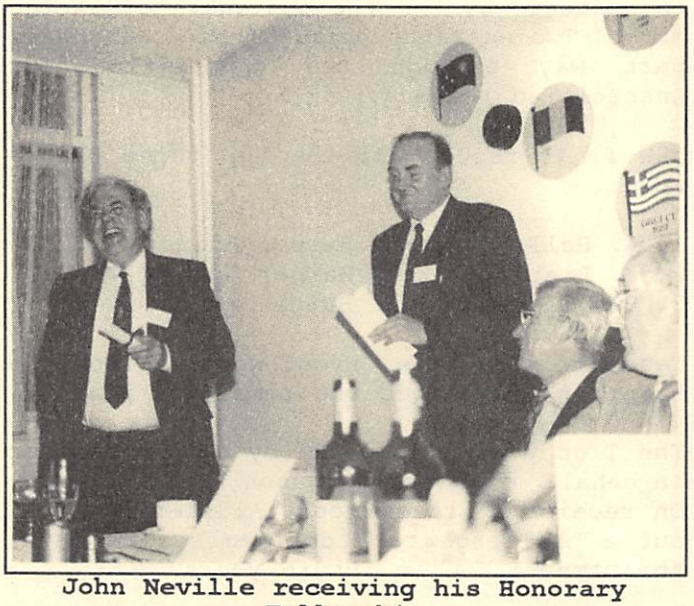
ANNUAL DINNER AND PRESENTATION OF AWARDS



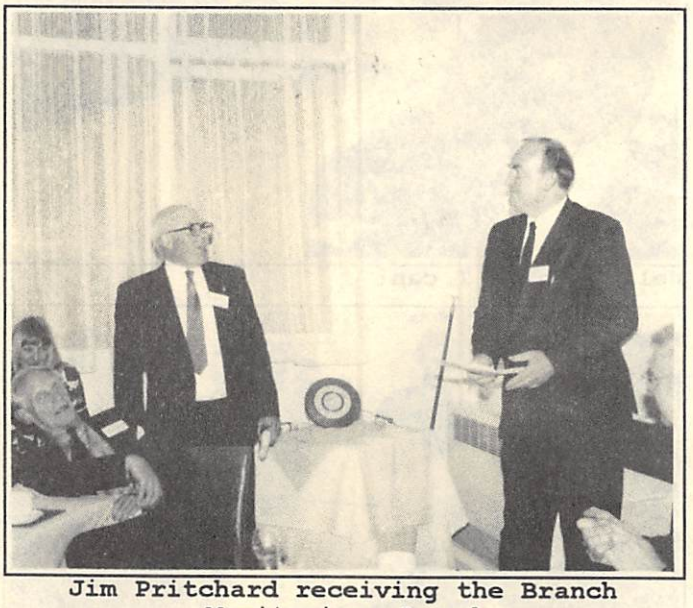
Guest of Honour - Ben Gill



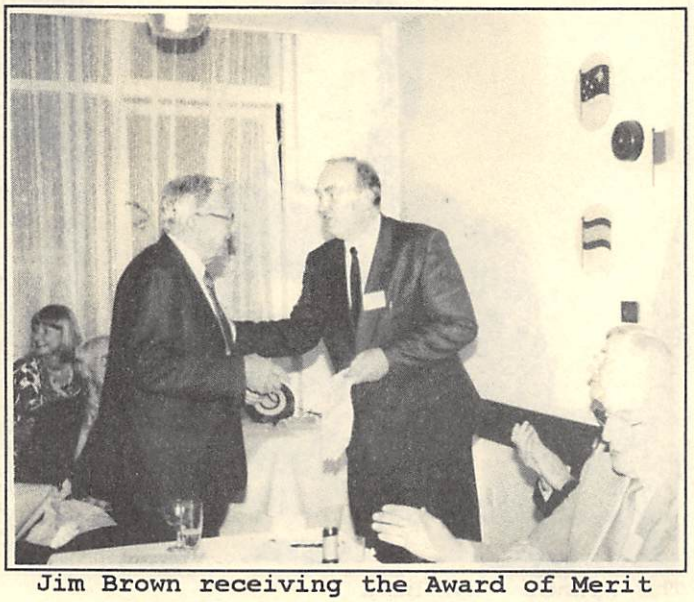
Bob Humphrey presents the Johnson New Holland Award to Timothy Roddy



John Neville receiving his Honorary Fellowship



Jim Pritchard receiving the Branch Meritorious Award



Jim Brown receiving the Award of Merit

Ian Yule receiving the Branch Recruitment Award

MEMBERS OF COUNCIL 1995 - 1996

President	R.J. Godwin	F	CEng
President-Elect	M.J. Dwyer	F	CEng
Immediate Past-President	J.B. Finney	F	-
One Other Past-President	D.M. Walker	F	IEng
Vice Presidents (3)	J.C. Sartain	M	IEng
	B.J. Legg	F	FEng
	S.D. Cartmel	M	-
Honorary Treasurer	D.B. Tinker	M	IEng
Chairman, Editorial Panel	B.C. Stenning	F	-
Chairman, Membership Committee	M.J. Dwyer	F	CEng
Chairman, Education and Training Committee	J.C. Sartain	M	IEng
Chairman, Examination Board	J.H. Neville	HonF	CEng
Fellows (3)	A.J. Landers	F	IEng
	D.J. Greig	F	CEng
	B.C. Stenning	F	-
Members (3)	W. Waddilove	M	IEng
	J.P.Metcalfe	M	CEng
	M.St.J. Carr-West	M	-
Companions (2)	B. Hurtley	C	-
	A. Hall	C	-
Associate Members (3)	R. Lockhart	AM	-
	A.J. Scarlett	AM	-
	P.N. Wheeler	AM	-
Associates (2)	P. Leech	A	-
	W.G. Warr	A	-
Special Representative for Scotland	G.J.H. Freedman	F	CEng
Special Representative for EurAgEng	B.D.Witney	F	CEng
Co-opted to Council			
Chairman, Recruitment Panel	B.A. May	F	FEng
Chairman, Awards Panel	J.C. Jeffery	F	CEng
Specialist Group Co-ordinator	P.L. Redman	F	-
Editor of Journal	E.B.H. Martyn	C	-

SPECIALIST GROUP FOR INDUSTRIAL CROPS

In recent years there has been great interest in the possibilities of growing crops for non-food uses. This has been driven both by demand for products from renewable resources and the opportunities presented by the availability of land that is no longer required for food production.

There is a demand for fuels that will reduce CO_2 emissions, for more natural products seen to be more environmentally friendly, and raw materials for industry derived from renewable resources.

The economic production of crops for energy and industry and the processing required provide industry with raw materials of the correct quality and consistency will require considerable engineering input. Although crops for energy and industry will share many characteristics of food crops, there will be differences and there is scope for developing new crop establishment, harvesting and post-harvest processing techniques. There is a need for a multi-disciplinary approach to these problems.

There is some overlap with the activities of existing Specialist Groups, but it is suggested that the special requirement of crops for energy and industry and the high level of interest currently indicate the need for a focal point that could be provided by an Institution of Agricultural Engineers Specialist Group. It is hoped that it would attract both existing members of the Institution and potential new members.

At the end of the Annual Conference on Engineering Crops for Industry on 16th May 1995 a short meeting was held to assess support for the formation of a new Specialist Group in this area. About 35 members attended the meeting and all were in favour of the formation of such a Group. In a brief discussion of the scope of the proposed Group it was suggested that it should include all non-food crops, be international in outlook, bring in disciplines other than engineering and encourage communications with farmers and the industrial end users. Seven members volunteered to join a steering Group, under the Chairmanship of Mike Dwyer, to bring the new Specialist Group into being.

EROSION PLUGS LANDROVER GAP

The AGM of the Essex and Herts. Branch, which took place on the 16th March was to be followed by a talk entitled 'Is Landrover still the best?' was to be given by Nr Bob Dillon of Landrover. However due to the pressure of work this talk was cancelled with less than 12 hours notice. It was replaced by a talk on soil erosion.

Brian Keeble and Steve Willis of Writtle College spoke about erosion both in the UK and Africa. Using their experience of consultancy work both at home and abroad they described the problems that modern farming practice and urban fevelopment were causing in terms of increased runoff. They described the cost to the nation of these problems not only in the conventionally recognised soil losses but also in terms of silt deposition and increased flooding. They said that these problems had been studied abroad, often by the British, and detailed the solutions that had been well established.

XII CIGR WORLD CONGRESS AND AGENG CONFERENCE - AUG 94

The Secretary informs me that he is underwhelmed by the queue of people waiting to purchase the books of the proceedings from this conference. He still has a small number of the abstracts from the conference in Milano held last August.

They comprise two books and are available for £ 15.00 including postage in UK (overseas extra at cost). Please send your order with a cheque made out to EurAgEng to the Secretariat at Silsoe.

CPD WORKSHOPS

Engineers and technicians based in the Thames Valley and Chilterns are being invited to attend a CPD workshop. The workshop will be held at the Padworth Court Hotel, Bath Road, Padworth near Reading on Tuesday 4th July 1995.

PRESS RELEASE

CASH IN ON CATTLE GALLSTONES

If you have access to cattle carcasses, don't miss out on the gold mine that you are sitting on. Almost the price of gold is offered by **Alice Import Export** for Cattle Gallstones.

Gallstones are rare and are found inside the cattle's gall bladder. They are usually golden brown in colour and clay-like in appearance. In size, they vary from a peanut to a pigeon egg. It is very important to handle the stones gently as they are fragile. The broken stones are not worth as much as whole stones.

When you have extracted the stones from the bladder, dry them in natural breeze until thoroughly fried. When ready, put the stones into a plastic bag then wrap them carefully with plenty of cotton wool as cushioning and put them in a strong container. Then send them to Hong Kong by registered airmail or insured air parcel post.

As soon as your parcel reaches us, I will personally evaluate and grade them. If you prefer, you may put a note instructing me to send you the details and the amount due for confirmation. If you are not fully happy with my offer, I will be responsible for returning the parcel to you. Otherwise, payment by bankdraft or cable transfer will be sent to you on the next day. **Your satisfaction is guaranteed**. There is good money in this business, of course, it requires patience and constant effort.

Did you know that cattle gallstones are used for medical purposes in China? They help in controlling fever and cleansing the blood circulation system. They are effective after being mixed with other herbal ingredients and are recommended with a herbalist's prescription.

Alice Import Export has been buying cattle gallstones for over 45 years and are proud to have over 3000 satisfied suppliers throughout the world supplying us with over 100 kilos of gallstones a year. Our objective is to build a long term business relationship with you.

If you want the current price and more information, please write to Ms. Josephine Poon at ALICE IMPORT EXPORT, 2A Tung Wui Bldg., 48 Kimberley Road, Kowloon, Hong Kong. Fax (852) 2311-0693

EUROPEAN EXPERTS MEETING

Chris Evans, Economist of the AEA and Chairman of the CEMA Economic Experts comments on the European experts' meeting in Brussels in late April.

One of the fascinations of meetings with one's European colleagues is to hear of the varying concerns of the moment. Often these are very different as so many factors may be unique to a country or area.

The climate can be a major influence, especially if severe frosts, flooding or drought has been experienced - it can be hard for a Brit to understand that parts of Spain have not seen rain for three years, and harder still to think of that as a problem!

Many other factors can affect markets for farm machinery. Tax can play a role in purchasing decisions and any fiscal changes can distort a market as they did for the Netherlands in 1993. Currency fluctuations impact on both farmer incomes and the competitiveness of companies in international trade.

However, not withstanding the above facts, a degree of commonality on two points emerged from the Spring meeting. Firstly, all the countries represented had seen a distinct improvement in demand for farm equipment over the last year or two. Secondly, all agreed that component shortages and input price increases threaten the ability of companies to profit despite apparent buoyant conditions.

Demand for farm machinery has always been volatile - not only is the requirement seasonal but also easily postponed. This is a problem that suppliers have had to overcome but in the past national markets have to a large extent behaved independently. The present evidence seems to point to the EU markets moving to a co-incidental cycle and this could be of some concern.

By 1992/93 many markets had halved from the levels of the late 1980s but over the last 12-18 months have made a recovery. To take an extreme example: tractor sales in Denmark peaked at over 7000 units but fell to below 1500 in 1993. Since then a recovery has taken place that is dramatic in percentage terms but will still leave the market below 3000 units.

The industry is enjoying a pan-European resurgence but this is likely to be short lived as farm cash flows dwindle under tighter agricultural policy. The European industry must manage the downturn to ensure a constant development of products in its traditional markets and by innovative action in emerging activities. Many of these will not relate to production of food, but to crops for special purposes and to land management with environmental and amenity targets.

As the European forum for 14 countries CEMA forms the focal point for the development of an industry strategy and the UK has a great opportunity to play a central role as it takes the Presidency this year.

GO DOWN UNDER

The AEA Trade Mission to New Zealand and Australia leaves in early June. With support from the Department of Trade and Industry and MAFF 15 British Companies will travel to Auckland to visit the Field Days at Hamilton. The largest event of its type in the Southern Hemisphere will feature a British stand displaying literature supplied by UK manufacturers. Key New Zealnd contacts will be invited to meet our delegation during the course of the show.

The Mission will then go to Melbourne and visit the Institute of Horticultural Development before travelling to Ballarat to participate in a joint seminar with the Victoria Horticultural Growers Council.

Members of the group will then visit other areas of Australia to develop their business opportunities.

NEW PRESIDENT

Mr. Peter Baker was elected AEA President for 1995/6 at the Association AGM held on 25 April at the Savoy Hotel, London. Peter is Managing Director of Andreas Stihl Ltd.

NEW HYGIENE REGULATIONS FOR MILK AND MILK PRODUCTS

New Dairy Products (Hygiene) Regulations were laid before Parliament on 18th April 1995, which implement EC requirements and revoke most existing milk and dairies' legislation. The regulations came into force on 9th May this year.

Commenting on these Regulations, Angela Browning, Parliamentary Secretary at the Ministry of Agriculture said:

"The Dairy Products (Hygiene) Regulations are an important development both for the protection of the customer and for the future of the dairy industry. As they also revoke and consolidate most existing milk and dairies' legislation, they represent an important additional contribution to the Governments deregulation initiative.

In implementing the milk hygiene directive the Government has tried to make maximum use of flexibility and derogations to keep to a minimum any additional burdens on the dairy industry. Many of the provisions are similar to those in existing national legislation so for most milk producers and processors the cost implications should be minimal.

Indeed it may be that the directive will have more potential implications for the dairy industry in other Member States that do not already have such extensive controls in this area than for their British counterparts.

We will also be advising enforcement officers that they should take a common sense and risk based approach to enforcement. A Code of Practice made under Section 40 of the Food Safety Act will be published as soon as possible which will explain the local duties of local authorities in enforcement of the Regulations."

TECHNICAL ARTICLE

THE NEXT TEN YEARS IN AGRICULTURE AND THE ROLE OF THE AGRICULTURAL ENGINEER

I am not an Engineer and therefore do not have the skills or technical knowledge required for such a profession. However I believe that I possess some insight into the likely shape of things to come, which may act as a catalyst to your thinking in relation to your role in the 21st century.

Like it or not agriculture is a relatively peripheral player in the English economy, contributing about 1.4% of GDP each year. Agricultural engineering is a relatively peripheral player in agriculture. Whilst peripheral, agriculture is still of sufficient importance to warrant the undivided attention of Governments, a Minister of Agriculture, a number of Under Secretaries and also the commitment of thousands of farmers, advisors, marketeers, engineers, farmer representatives and many colleges and universities that offer a range of land-based courses. It is also very important to the Agricultural Engineers Association and like bodies.

What will be the changes in agriculture over the next ten years? Agriculture in the UK will be influenced by:

1. Government and EC policy
2. A changing attitude towards things environmental
3. Advances in technology
4. The ability of the education system to prepare participants for the new order.

1. GOVERNMENT AND EC POLICY

In ten years the UK will still be a member state of the EC. The community will incorporate the Eastern block countries of Poland, Czech and Slovac Republics, Hungary, Bulgaria and Rumania and may also include Estonia, Latvia and Lithuania. UK will continue as a member because it cannot afford not to be.

At present most decisions affecting UK farming are focused on what subsidy is available. Before the entry of the Eastern European countries the CAP will be reformed. Not to do so would put a very considerable strain on the EC budget and the patience of the EC populous would reach breaking point. There will also be problems with the next GATT round.

The UK (or more accurately the NFU and the Ministry of Agriculture) has been active in exploring a better, more efficient and lower cost alternative to the current CAP. (Refer to the NFU's 'Taking Real Choices Forward' document and Minister William Waldegrave's CAP Reform Committee). I note with interest that not many farmers have the same enthusiasm for changing the CAP especially if it is likely to result in a cut in payments.

Until recently, the EC partners have shown little enthusiasm for change. They think the CAP is fine and supports their social and agricultural objectives well. However, the imminent movement of France from being a net recipient to a net contributor to the EC budget and the looming entry of the new six into the EC has resulted in a desire to investigate change amongst a greater number of member states.

What will the changes be?

It is very likely that the payments to farmers will be completely or partially decoupled from production. This will remove the insanity of set-a-side, and the payment to farmers of an elevated price for cereals. Much of this cannot be sold within the EC resulting in it being sold with an export subsidy. This payment is being made simultaneously with payments to farmers to not produce by way of set-a-side. It will eventually do away with intervention stocks and quotas.

Almost equally certain is the tagging of payments to environmental goals (cross compliance). A very desirable result of these changes will be farmers, for the first time in many years, making farming and equipment purchasing decisions based on market information rather than on the anticipated handouts from the EC. Some thoughts on the ramifications for engineering later.

2. ENVIRONMENTAL IMPERATIVE

In a world context concern for the environment is a rich country's passion. If you live in an impoverished community whether in Eastern Europe, Africa or drought affected Queensland the question "What as a farmer are you doing to protect the environment?" is answered by, "How do I fend off the bank?" or "Where is my next meal coming from?"

The UK is very environmentally conscious and this is a very desirable state of affairs. If one puts aside the silly excesses of some over zealous planners, we can be proud of the way we in this country, which endures constant population and farming pressure, have enhanced the environment. Rivers are cleaner, air is more breathable and much more care is taken with dangerous chemicals. There are also problems but the portrayal of nothing but gloom and doom by some environmentalists is an unfair representation. Inevitably and perhaps desirably we will be asked to do more.

The organic farming movement will remain a fringe activity and in ten years time will still constitute less than 1% of production.

The environmental pressure will be effected by both carrot and stick - the most influential being the pressure to "do the right thing" and the binding of EC payments to the achievement of environmental priorities. Only when or if population pressure demands more food from less land will the environmental pressure decline. The other impetus for a reduced emphasis on environmental protection will come from the backlash against unreasoned environmental imposts - the classic pendulum effect.

3. ADVANCES IN TECHNOLOGY

This topic could fill a 1,000-page tome and therefore I cannot do justice to it here. Suffice to say that the following are likely to be affecting your businesses in ten years.

a) Genetic manipulation of plants will result in greatly reduced fertiliser and chemical requirements - unless of course the genetically manipulated material is own by the chemical companies.

b) Cultivation technology that achieves the development of a micro-seedbed around the precision sown genetically tagged hybrid seed with the remainder of the soil being undisturbed will become commonplace.

c) Unsubsidised biofuels will start to become economic, unlike today, and wind and solar energy will become more commonplace with the

development of new cheap photvoltiac cells and improved battery capacity.

d) Satellite monitoring of crops for disease and water stress along with instant identification of disease prevalence by sensors in front of the tractor will allow precision spraying of those crops for which genetic manipulation for disease control has been less than perfect.

e) Progress with the de-nitrification of slurry will loosen the NVZ straightjacket that affects many farms.

f) The worldwide supply of processed food from Britain will be supported by new technology and these companies will require twelve months even supply of exact specification produce.

g) As a result of superior returns from production that meets exacting standards, British farmers will at last gear their production to the demands of multinational food processors.

h) As food processors become more dominant, they may dictate the design and function of machinery, and if vertical integration becomes more prevalent they may own the land, transport, machinery, the processing plant and the marketing e.g. tea/sugar cane dictating machinery design.

i) There will be a continued decrease in the number of farmers and the number of farm workers. There will be more management of land by management companies and more small farms will be leased. This will result in more sophisticated machinery that will achieve a number of functions in one pass. Because of cost, these machines will be owned by contractors, large farmers or by syndicates. The timeliness of the operation factor will be partly addressed by the speed and capacity of machinery to do the job.

4. THE ROLE OF EDUCATION

Both secondary and tertiary education will have an increasingly important role in the preparation of farmers and engineers for the new order. Because agriculture in the UK will be more international, or at least more oriented towards Europe, farmers will have joint businesses with foreign partners and most leading farmers will be multilingual.

Apart from having an understanding of cultural practices that is already of a high order, farmers will be au-fiat with the benefits of genetically manipulated plants and animals. They will also be much more attuned to sophisticated decision making based on risk, international market prices and forward selling opportunities. These skills will have been freshly learned as the insulating effect of the CAP production subsidies will have only been recently removed.

All these skills and attitudes will need to be provided by the post secondary education system, whether by full-time study, part-time study or interactive satellite TV tutoring. The rate of changes in agriculture will continue to increase and education will have the task of enabling farmers and engineers to prosper in this environment.

Not only will they be required to have a mature understanding of these principles that are currently taught in agricultural engineering degrees and HNDs but the additional elements that include microelectronic crop sensing, satellite technology, precision cultivation and spraying techniques will be added. Because of the greater specialisation in agricultural engineering, especially on the manufacturing side, there will be more specialist electronic engineers employed compared with engineers who have come via the agricultural engineering path. The agricultural engineer will be employed more in the practical application and trialling side of the business. Education, therefore, has a major role to play. It must be at the forefront of research and development if for no other reason than to ensure that its teaching is relevant for the careers its graduates aspire to take up.

The modes of delivery will change - there will be more emphasis on off campus tuition and continuing professional development will be the norm. Not to participate in continuing professional development will result in colleagues being left behind professionally and probably removed from their professional bodies that require continuing education.

WHAT WILL AN AGRICULTURAL ENGINEER'S LIFE BE LIKE?

The profitability of farming in the UK will be more uncertain because payments for production will be discontinued. The fluctuations in income will, however, be less than in free market countries such as New Zealand and Australia as UK farmers will have the underpinning of a very large area payment or similar. Farmers will, however, be responding to real market signals and will therefore require more specialist equipment when the signals indicate a change in farming policy. As subsidies for equipment purchases and building erection are likely to be reduced, farmers will stop buying these products when real financial analysis indicates they should not buy. As a result the buying patterns of farmers will be more stop/start and will reflect the profitability of their enterprises, the products of which are sold in the real market. There will be an increased demand for spare parts from smaller farmers who are adversely affected by the market, and for spare parts and secondhand equipment from the emerging Eastern European states.

Environmental engineering matters will increase in importance. Effluent disposal, soil erosion, hedgerow maintenance, woodland development, spraying and fertilising techniques will become more central to a farmer's activities due principally to the tying of EC money to their development. The broad area of environmental engineering will be an expanding and exciting field for engineers.

The greatly increased sophistication of cultivating, spraying and fertilising techniques will be exciting fields of endeavour for the agricultural engineer in 2205. The sophistication of much of the plant will result in it being developed by international firms that will sell it internationally. There will still be a role for the small local development engineer but he will probably be working in collaboration with a large multinational.

CONCLUSION

One can depict farming and agricultural engineering in 2005 as a fearful unknown or an exciting challenge. I see it as the latter. While farming will change and become more worldly and sophisticated so will engineering change in order to service the new look rural industry. I look forward to being a major player in the educational sector of that industry and I believe you should also look forward to an increasingly important and challenging role in the field of agricultural engineering.

A paper presented by Graham McConnell, Principal and Chief Executive, Harper Adams Agricultural College, Shropshire to the Agricultural Engineers Association Annual Conference and Luncheon on Tuesday, 25th April 1995

Appreciation and acknowledgement to Geoffrey Wakeham, Senior Lecturer in Agricultural Engineering at Harper Adams Agricultural College, for his help in preparing this paper

TECHNICAL ARTICLE

MANUFACTURING CAPACITY PROBLEMS?

Over the past few years many UK based companies have found it necessary to reduce their production facilities because of the difficult trading conditions.

Once upon a time they accepted contraction of their size in an open manner. It then became fashionable to say they were downsizing and of late companies have right-sized, re-engineered or "adjusted capacity to match customer demand".

This sounds good commercial sense, but it is used in company reports to hide the fact that sales have fallen dramatically. It could, however, mean that productivity has risen and excess capacity has been released. That is the hope but not often the reality in the recent past.

Whatever the words used, a commercial company is presented with a real problem and the solution is not easy or obvious. How does one reduce capacity with the least damage to long term viability?

Companies that have bought or created subsidiary production facilities at a remote site often close these and bring the work into the parent company's factory.

The value of the facility is lost, the loyalty of the workforce is destroyed and the product fits badly into the core production programme. Often there are no product champions available and before long the product itself is lost. This leads to a total loss of the initial investment alongside all the costs involved in closing the subsidiary.

An alternative that seems to feature in the news is a 10% or 20% cut in workforce - this smacks at the influence of the company's financial advisors and may have little logic on the shop floor. This leads to "last in first out policies" or early retirement.

Both have their drawbacks. The first leads to the loss of the new young recruits and the enthusiasm they had to offer. The second means that the best of the experienced staff leave as they can find work elsewhere.

Either way leads to a reduction in the capacity of the concern, costs money in the short term and leads to a loss in confidence in the workforce. Company reports always praise the staff as the greatest asset of the organisation but a fearful and defensive workforce is unlikely to be expansive or imaginative in its operation.

Evidence from a survey of 1204 American companies shows downsizing is an uncertain way of stemming the haemorrhage (ref: Anon. 1992). Three quarters of these companies said they had not seen an improvement in economic performance.

The biggest snag with downsizing that the survey identified was that most of the companies had little clear idea about why they were carrying out the process. It was suggested that a downsized company results in a smaller company with all the problems it has when it was bigger.

A study by CSC Index confirms these findings. In spite of long standing evidence companies are still taking the road to reduced capacity "without regard to the strategic context" (ref: Anon. 1995).

Alternatives have been suggested (ref: Plummer, S 1992). The idea of using excess staff to seek cost reductions equal to their salary leads to a more efficient operation ready to respond to future upturns in the market. Capacity and skills are retained and a more competitive product will result.

This in itself should result in a halt in the slide, at the very least and may result in a turn around even in difficult trading conditions. To follow this path requires confidence in the future.

If we go back to the beginning and look at the problem again, this may offer another alternative. The problem is not that there is too much capacity but too few customers. Not many companies in the UK can claim to be the world leaders in their field. There is a market out there but someone else has it.

What is required is a range of products and services that better meets the demands of the customer than is currently available.

Greater effort is needed in adjusting to what the customer demands. Effort must be put into designed better products that generate greater margins. The time taken to introduce a new product must be reduced and that product must enter production with the minimum of change.

Production must strive to get it right first time and deliver on time. Combines delivered in October with "its well worth waiting for" signs on the back only mock the customer.

The customer's cost of owning the product must be seen as low as possible and the availability of service and spares must not be in question.

Having achieved all the above goals and seen the sales expand and investment in new capacity undertaken, next time there is a downturn in trade then you will return yet again to the problem of over-capacity in a reduced market.

This means that a single leap forward is not enough. The process is continuous. The company needs to become flexible and responsive. Change will take place and must be built into the system.

There is only one sure fire way of matching capacity to sales and that is to let sales reduce to zero and close the plant. Some companies seem to adopt this option.

REFERENCES

Anon. 1992 Pink slip productivity; Sacking workers is not enough. The Economist 28 march (From CD Rom. distributed by healed Ltd.)

Anon. 1995 ....Deming initiatives faltering through poor application? Automotive Engineer February/March. p.10.

Plummer, S 1992 Cutting costs without cutting staff. Professional Engineering February 29-30, 37.

Authror: Geoffrey Wakeham, Senior Lecturer in Agricultural Engineering at Harper Adams Agricultural College.

SURFACE COATINGS TO PROTECT CONCRETE AGAINST SILAGE EFFLUENT

1. INTRODUCTION

The durability of concrete depends on the mix, workmanship and use. However, concrete when exposed to silage effluent (which is acidic and has a pH of about 4.0) causes concrete to deteriorate more quickly than normal. Many researchers have studied this vexing problem and this is well documented.

To prevent pollution arising from farm structures, the Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991 (HMSO,1991) were enacted, and these regulations require that silo walls, bases and any drains should be able to resist corrosion by silage effluent for 20 years with maintenance. A CIRIA report (Report 126, 1992), however, recommends that concrete silo walls and bases should have a protective surface coating applied to them before use.

ADAS has been working on the problem of the durability of bunker forage silos for some time (Albutt, 1988). A test rig, for the rapid evaluation of concrete protective coatings has been developed. This is described in Section 2 and in detail elsewhere (Sangarapillai et al, 1993).

2. METHOD

The ADAS test rig is illustrated in Fig. 1. Using this test rig, the test procedure is as follows:

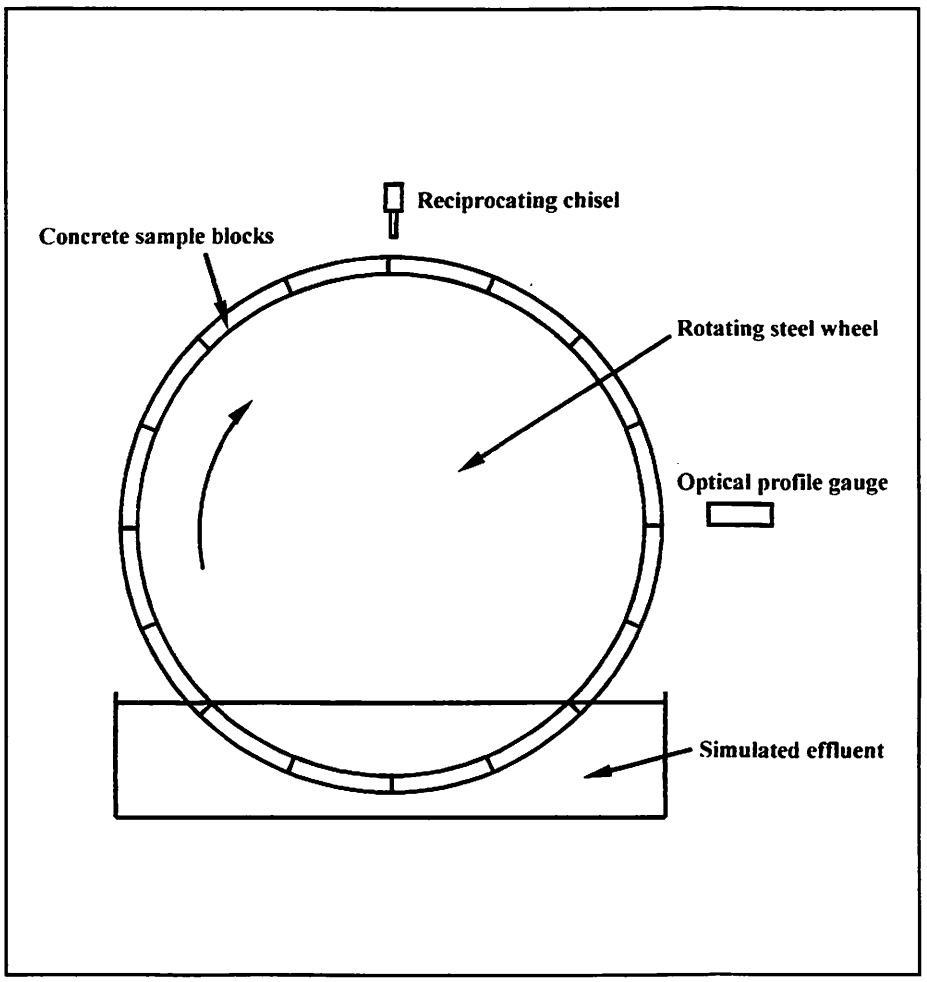
* sixteen curved concrete sample blocks are attached to the perimeter of a steel wheel.

* the wheel rotates continuously at a speed of 0.5 rpm and is partially immersed in a simulated effluent bath at a constant temperature of 23°C and a pH of 3.5. The blocks are thus cyclically immersed and exposed to the atmosphere.

* a reciprocating chisel (which is activated for four revolutions of the wheel once every six hours) automatically drops onto, drags along and lifts off the surface of each block to simulate the damage caused by farm machinery.

* the mean surface profile depth and surface roughnes (BS 1134, 1972) of each block are measured using an optical profile gauge at hourly intervals until the failure of the surface of the samples takes place, which is usually between 10 and 21 days.

Figure 1 - Diagram of the Test Rig



It should be noted that when concrete samples are tested, the swelling of concrete results in an increase in their depth. The wearing of concrete due to the dissolving of cement paste at the surface of the samples or due to impact and abrasion results in a decrease in their depth. Also, a steady increase in surface roughness of the samples show that their surfaces had become rougher due to the wearing of concrete. From this test, the relative performance of protective coatings can be assessed in a matter of weeks rather than years.

3. MATERIALS TESTED

3.1 Previous tests

Individual tests were also conducted previously on epoxy (of formulation Type A of pre-1993 period), polyurethane and acrylic coatings and unprotected concrete using C35A (characteristic strength of 35 N/mm^2 at 28 days) concrete sample blocks. In each of those tests, eight of the sixteen blocks were protected with the chosen coating and the other eight were unprotected control samples, giving "two surface treatments", namely, protected and unprotected concrete surfaces. Results of the earlier tests have been published elsewhere (Sangarapillai et al, 1993) (Albutt et al, 1993).

3.2 Current test

Three generic types of coatings; epoxy resin coatings (of two formulations: Type A of pre-1993 period and Type B of post-1993 period), polyurethane and acrylic coatings and unprotected concrete were tested to evaluate their performance, in offering protection to concrete exposed to silage effluent. These were tested simultaneously. Therefore five

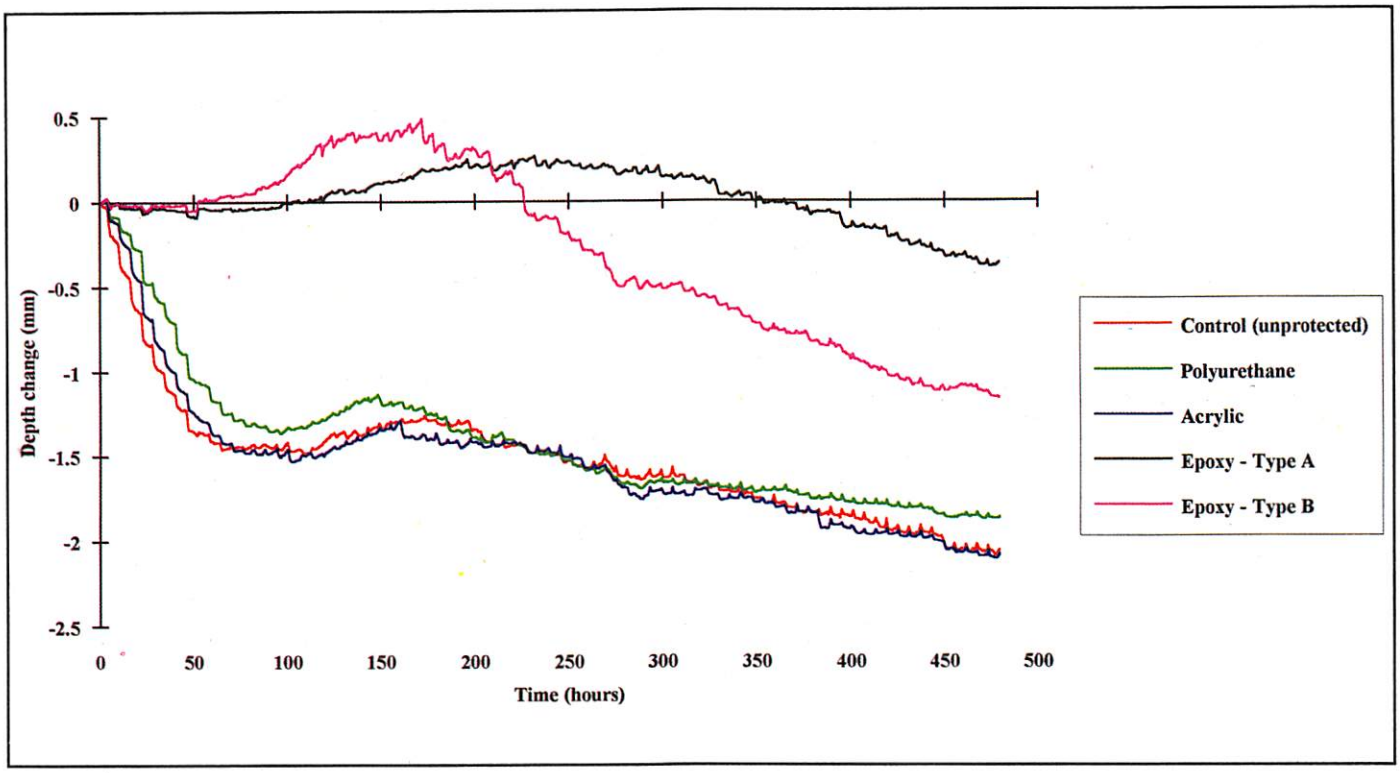


Figure 2 - Change of surface profile depth eith time for various surface treatements (C40 concrete sample blocks)

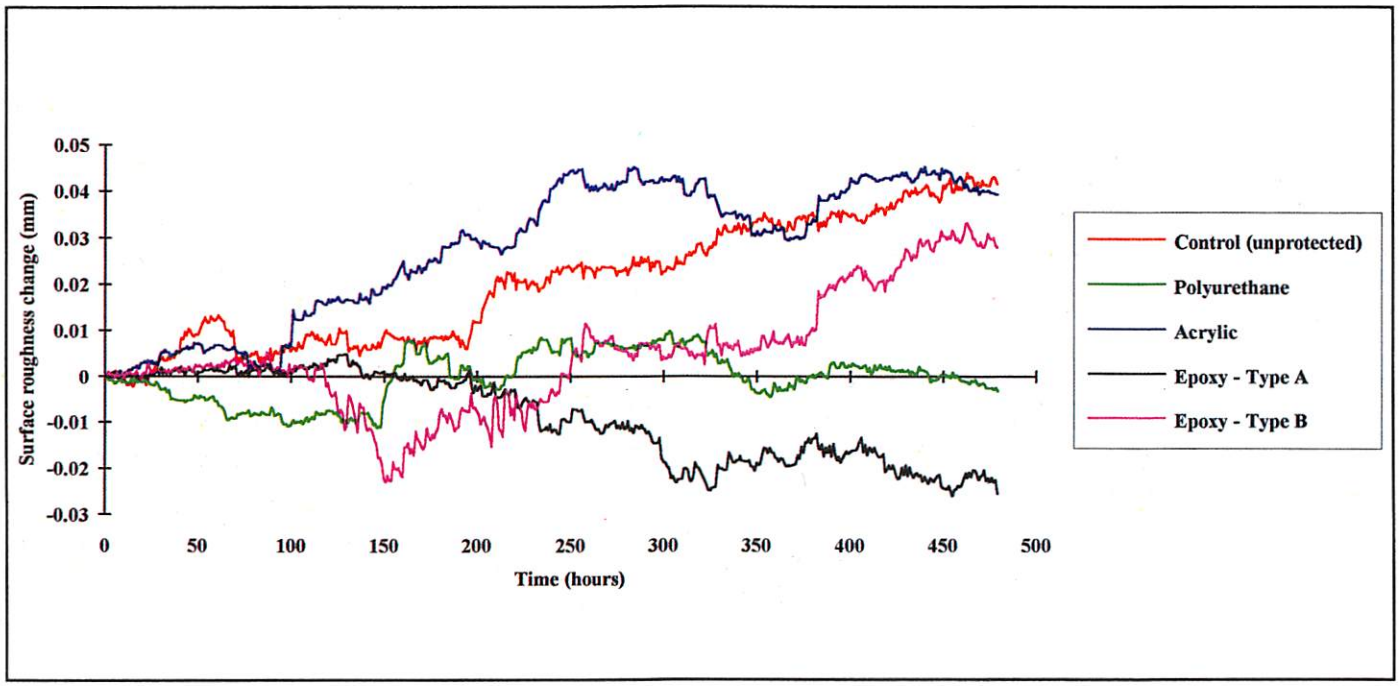
treatments were used in this test and the concrete samples were allocated as follows.

1. 4 untreated C40 (characteristic strength of 40 N/mm² at 28 days) concrete blocks;
2. 3 C40 blocks treated with two coats of epoxy Type A coating;
3. 3 C40 blocks treated with two coats of epoxy Type B coating;
4. 3 C40 blocks treated with two coats of polyurethane sealer; and
5. 3 C40 blocks treated with two coats of acrylic sealer.

The blocks were randomly placed on the steel wheel and the test was carried out as described above.

With reference to the epoxy coatings, according to themanufacturer's data, there is no significant difference between the properties of the pre-1993 Type A and post-1993 Type B formulations. Their tensile and flexile strengths, adhesion to good quality concrete and like for like chemical resistance to individual acids tested are similar. However, Type A gives a thicker protective film of 150-200 µm per coat compared to the Type B of 100 µm per coat. Consequently, the latter are cheaper and are targeted for the manufacturer's main market, which is the building industry.

Figure 3 - Change of surface roughness with time for various surface treatments (C40 concrete sample blocks)



4. RESULTS

Fig. 2 plots the change in surface profile depth versus time for epoxy (Types A and B), polyurethane, acrylic and untreated concrete samples (five surface treatments in total). Polyurethane, acrylic and unprotected concrete treatments showed a rapid reduction in profile depth for the first 100 hours and then a slower change until surface failure occurred.

The epoxy treatments did not show any marked change in depth during the first 100 hours, however, over the duration of the test, the epoxy Type A treatment performed better than the epoxy Type B treatment. Both showed an initial swelling of the surface before wearing of the surface occurred.

Fig. 3 shows graphs of the change in surface roughness versus time for all five treatments. The two epoxy treatments showed virtually no change during the first 100 hours. After this time, for epoxy Type A treatment, the surface roughness decreased, for epoxy Type B treatment, the surface roughness fluctuated, decreasing first and then increasing after that.

For the polyurethane treatment, the surface roughness fluctuated throughout the test. For the acrylic treatment and unprotected concrete, the surface roughness increased throughout.

5. DISCUSSION

5.1 Relative performance of the three generic coatings

The epoxy type A coating gave the best protection followed by the epoxy Type B, polyurethane coating, acrylic coating and unprotected concrete in that order. The polyurethane coating was only marginally better than the acrylic coating. The present test results agree with the findings of the earlier tests (Sangarapillai et al, 1993) (Albutt et al, 1993).

Although the manufacturer's data indicated that epoxy Type B has similar properties to epoxy Type A, the results show that under this testing procedures there is a marked difference between the two formulations. However, despite the effective protection against silage effluent offered by epoxy Type A, the manufacturer no longer promotes it because this agricultural application is a small and niche market. It is reasonable to assume that if three to four coats of epoxy Type B coating is applied then the protection offered could be similar to that offered by two coats of epoxy Type A coating of, say, 350 µm. Similarly, the number of coats required for epoxy coatings supplied by other manufacturers could then be specified with reference to the thickness criterion of the protective film required.

The polyurethane and acrylic treatments became ineffective very quickly and the underlying concrete was attacked in a similar way to, but marginally less than, unprotected concrete. Hence it is necessary to renew polyurethane and acrylic coatings more frequently than epoxy coatings.

5.2 Cost implications

It can be seen that both epoxy treatments protected concrete but epoxy Type A treatment was better than the, less expensive, epoxy Type B treatment. However, as a generic type, epoxy is more expensive than the other two materials. It is necessary to consider the life cycle cost of each coating to arrive at the most cost-effective solution. Proprietary coatings vary in formulation and cost. Therefore it is difficult to say which is most cost effective.

However, if the cost is of less importance, then epoxy surface coating is the type most suitable for protecting concrete against attack by silage effluent.

5.3 Other factors affecting the durability concrete in bunker silos

The durability of silo floors and walls will depend on concrete mix, the protective coating used, workmanship, maintenance and care taken in use. Also, a roof covering, a good drainage system such as an internal as well as an external drain and the airtightness of clamps would also provide protection to concrete. These factors have to be considered before evaluating the life cycle costing or correlating the test results to estimate the service life of silo floors. Any such evaluation or correlation has to be qualified to some extent.

5.4 The ADAS rapid assessment technique

Concrete blocks in this rapid assessment technique are exposed to a liquid that has the highest acidity likely to be found in a real effluent. If a protective surface coating can withstand this test, then it should perform satisfactorily under field conditions.

The authors propose that a duration of 1 day is approximately equivalent to 1 year of field use under an aggressive environment, but in a professionally designed, constructed and maintained roofed silo 1 day in the test rig may be equivalent to 3 years of field use.

6. Acknowledgements

This work was funded by the Environmental Protection Policy Division of the Ministry of Agriculture, Fisheries and Food, UK.

7. References

1. HM Government. The Control of Pollution (Silage, Slurry and Agricultural Fuel Oil) Regulations 1991. Statutory Instruments 1991 No. 324, HMSO, 1991.

2. CIRIA. Farm Waste Storage: guidelines for construction. Construction Research Information Association, Report 126, 1992.

3. ALBUTT R.W., (1988). Durable floors for bunker forage silos. Farm Buildings & Engineering (5), 2, 18-20.

4. SANGARAPILLAI V.G, and DUMELOW J., (1993) Rapid assessment of the durability of concrete exposed to silage effluent. Farm Building Progress No 114 October 1993 pp 15-17.

5. BS 1134: Part 2 (1972). Assessment of surface texture: Part 2. General information and guidance. British Standards Institute, London, 1992.

6. ALBUTT R. W. et al., Durability of concrete in bunker silos. Symposium on 'Concrete for sustainable agriculture', Bologna, Italy, 21-23 April 1993.

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TECHNICAL ARTICLE

LOW RATE IRRIGATION OF DIRTY WATER AND ITS EFFECT ON DRAINAGE WATER QUALITY

INTRODUCTION

Dirty water is the polluted runoff from livestock yards and housing, after rainfall or periods of washing down and from the use and cleaning of milking parlours. It can be contaminated with faeces, urine, silage effluent, milk, disinfectants or runoff from stored manures.

An increasingly common component of dirty water is surplus liquid from slurry stores that can substantially increase its Biochemical oxygen demand (BOD).

Dirty water typically has a dry matter content of between 0.2-2% and a BOD ranging from 500-500 mg/l and so it must not be discharged directly into watercourses. The pollutant strength and volumes produced vary considerably between sites and according to season (Brewer and Cumby 1992).

Factors influencing the quantity of dirty water produced include the area of uncovered yard and the amount of the local rainfall. Nicholson (1994) calculated that on many dairy farms the annual production of dirty water could be 50% greater than the amount of excreta handled as slurry.

Methods of reducing the quantity of dirty water produced, such as roofing of open yards to divert rainwater away from contaminated areas, and large scale storage systems so that applications can be made when soil conditions allow, may be too costly or impractical. Farmers are advised to divert clear roof water away from the slurry and dirty water collection systems to minimise the volume of contaminated water produced.

Low rate irrigation has been encouraged as a method of dirty water disposal where suitable land is available (MAFF 1991). Low rate irrigation systems (Figure 1) commonly consist of a 3-chambered settlement tank in which the dirty water is collected. The contents of the third chamber are pumped through small bore pipeline on to the fields via suitable manually moved sprinklers or self travelling irrigator.

The Code of Good Agricultural Practice for the Protection of Water (MAFF 1991)

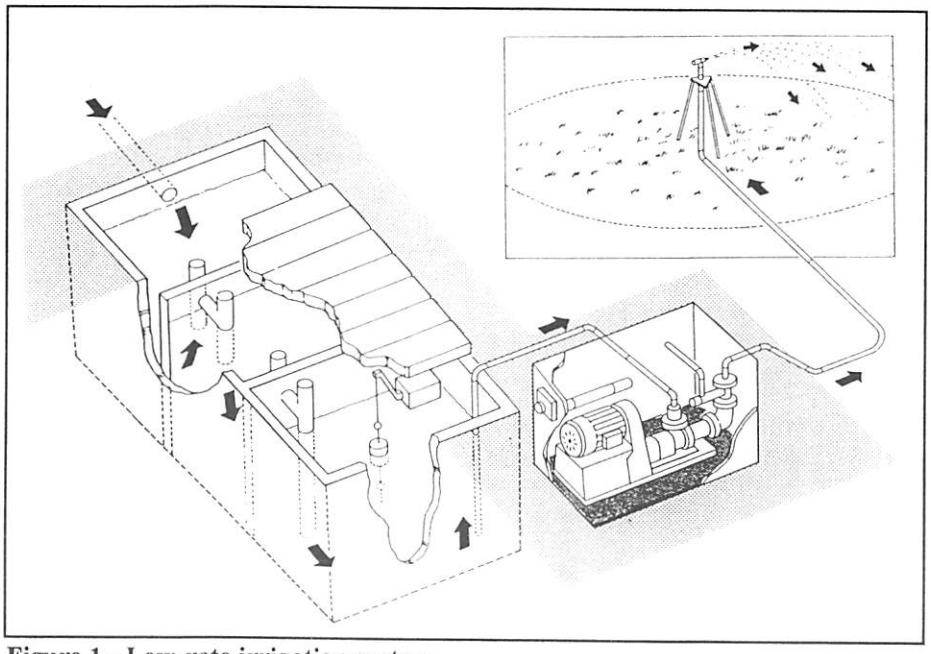


Figure 1 - Low-rate irrigation system

encourages application rates of less than 50 m³/ha to reduce the risk of direct contamination by surface runoff in high risk situations.

In addition the Code suggests applications should not be made to recently subsoiled and mole drained soils or where a drainage system is less than 12 months old. Applications to dry soils that are cracked to drain or backfill depth are also not recommended.

Management of low rate irrigation systems is known to be particularly difficult in winter, when soils are saturated and surface runoff or drainflow contamination can occur following applications. In 1992, 325 out 1810 substantiated farm pollution incidents (NRA, 1993) from dairy farms occurred following contamination runoff after applications of slurry manure or dirty water.

While it is not recorded how many of these were from dirty water applications, experience suggests that a significant proportion were caused by inappropriate applications of dirty water initiating contamination surface runoff or drainflow.

Some work has been done to investigate the degree of contamination of surface runoff following applications of farm manures to grassland.

Kiely (1981) found that phosphorus and potassium contamination could be significant for up to 20 days following applications of cattle slurry. Edwards and Daniel (1993) demonstrated considerably increased organic matter and nutrient con-centrations in runoff from plots treated with pig slurry than from untreated plots. In addition, Uhlen (1981) showed that manure applications to frozen soils represented a substantial pollution risk.

This paper reports results from a 3 year study set up in 1990 to investigate the effect that low rate irrigation of dirty water had on drainage water quality from 2 soil types. Dirty water was applied at a range of moisture contents.

METHODOLOGY

a. **Sites**

Two sites were used in the experiment

(i) IGER Trawsgoed, gently sloping long-term grassland on silty clay loam soils of the Cegin Series (Rudeforth, 1970), drained in 1980 with 75 mm diameter tile drains at 20 m spacing and 75 cm depth with permeable fill to within 30 cm of the surface.

Table 1 BOD, Nitrate, Ammonium and Phosphorus concentrations in cpplied dirty water

DATE	BOD (mg/l)	NH_4N (mg/l)	NO_3N (mg/l)	total P (mg/l)
Trawsgoed				
July 1990	551	450	4	52
November 1990	2900	190	5	50
June 1991	790	359	<1	126
March 1992	40	179	4	48
October 1992	1809	240	1	61
Terrington				
April 1991	1290	333	<1	69
October 1991	N.D.	350	5	132
April 1992	3155	641	6	106
September 1992	346	536	2	52
January 1993	N.D.	1330	14	60

N.D. = No data

(ii) ADAS Terrington, level arable land, on clay loam soils of the Wallasea Series (Hodge et al., 1984) drained in 1983 with 80 mm diameter plastic pipe at 20 m spacing and 150 cm depth with no permeable backfill. There were no moling or subsoiling treatments at either sites.

At Trawsgoed, dirty water was collected from approximately 1 ha of concrete yard on a 300 cow dairy unit whilst at Terrington the effluent was from a 0.3 ha yard on a 300 sow unit.

b. Applications

At both sites the dirty water was applied using a Briggs Roto Rainer Model 10 MKII travelling irrigator at right angles to the drainlines.

At Trawsgoed the effluent was pumped from a storage lagoon through lay flat hose using an Alcon centrifugal pump belt driven by a Lister Petter twin cylinder diesel engine.

At Terrington the dirty water was transported to the experimental site in a 7500 litre tanker and pumped to the irrigator from a small portable tank through lay-flat hose using a Briggs and Stratton engine driven centrifugal pump.

Applications were made at different times of the year to cover a range of soil and moisture conditions. Calculated soil moisture deficit figures at the time of application were obtained from MORECS (Thompson et al. 1981).

Application rates were varied by changing the nozzle size and altering the forward speed of the irrigator by adjusting the throw of the pull and ratchet mechanism that drives the winch from the rotary boom.

The irrigator was calibrated before each application by collecting and weighing the output from the irrigator for a particular nozzle size over a given time period. The evenness of spread of application was assessed by placing catch drays each with a surface area of 0.25 m^2 across the path of the irrigator, measuring the volume of effluent collected in each tray and calculating the coefficient of variation (C.V.).

c. Monitoring

Three drains in each existing drainage scheme were monitored. At Trawsgoed the drains were intercepted mid drain run and instrumentation was installed in 2 m deep x 2 m diameter concrete chambers. At Terrington the monitoring equipment was installed in an open ditch adjacent to the application area.

Drainflow was measured before, during and after applications of dirty water with ½ 90° v-notch mini-weirs (Talman 1979). Epic automatic waste water samplers were used to take 300 ml samples of drainage water every 5 minutes during drainflow initiated by the applications.

The samples were bulked in fours to have sufficient volume for analysis. Samples of the dirty water applied were taken at the beginning of each run from the irrigator. All the water samples were analysed for BOD, nitrate-N, ammonium-N and total phosphorus.

RESULTS

(i) Applications

The quality of dirty water varied during the study period. Table 1 shows the analysis of the effluent used for each experimental run.

At both sites, the irrigator spread the dirty water over a 20 m width with transverse coefficients of variation of between 17% and 28% when calibrated under relatively still air conditions.

The forward speed of the irrigator was proportional to the water pressure that was influenced by the nozzle size and the size of the pump used. The irrigator was slowed by the "drag" associated with the pulling long lengths of lay flat hose across wet vegetation.

When applications were made to a dry seed bed at Terrington soil adhered to the low ground pressure tyres of the irrigator. This made movement very difficult and affected the forwardspeed and evenness

Table 2. Application rates and forward speed of the irrigators during application

	Ratchet setting	Nozzle Size (mm)	Pressure (bar)	Average forward speed (m/minute)	Application	Application rate (m^3/ha)
Trawsgoed						
	4	11	1.3	1.5	110	11.0
	5	5	2.5	2.0	63	6.3
	5	3	N.D.	2.0	40	4.0
Terrington						
	1	9	N.D.	0.36	250	25.0
	3	9	2.3	0.59	64	6.4
	5	9	2.3	0.94	40	4.0

of spread. Table 2 shows the measured speed and application rates achieved.

(ii) Water Quality

a. Trawsgoed

In July 1990, two applications of 11 mm (110 m³/ha) to soils with a calculated soil moisture deficit of 120 mm initiated drainflow within 30 minutes of the irrigator crossing the drainline.

The water was discoloured and foul smelling with concentrations of between 32-200 mg/l NH_4N and 5-12 mg/l total P (Figure 2). Total applications of 22 mm initiated 1 mm of drainflow - approximately 5% of the applied liquid.

In November 1990, applications of between 6-11 mm (60-110 m³/ha) to saturated soil with water ponding on the soil surface and the drains carrying water, caused flows to increase and become contaminated within 30 minutes of the irrigator crossing the drainlines.

Drain flows had concentrations of between 44-90 mg/l BOD, 7-81 mg/l NH_4N and 9-25 mg/l total P (Figure 3). However, applications of 4 mm (40 m³/ha) did not contaminate drainflow.

b. Terrington

In April 1991, two 13 mm (130 m³/ha) applications to soil with a moisture deficit of 20 mm initiated drainflow that was contaminated with concentrations of between 72-292 mg/l BOD, 8-13 mg/l NH_4N and 25-33 mg/l total P (Figure 4).

The volume of drainflow collected was approximately 15% of the volume of water applied in excess of the moisture deficit. This suggests that some of the applied water moved laterally into drier soil either side of the application area.

In October 1991, applications totalling 24 mm (240 m³/ha) to soil with a calculated moisture deficit of 100 mm did not initiate drainflow.

In September 1992, one application of 25 mm (250 m³/ha) to soil with a moisture deficit of 20 mm initiated contaminated flow with concentrations of 118-310 mg/l BOD, 149-179 mg/l NH_4N and 24-29 mg/l total P (Figure 5).

However, 5 consecutive applications of 5 mm (50 m³/ha), under similar moisture conditions did not initiate drainflow. In January 1993, when soils were at field

Figure 2. - Drainflow quality following two 11 mm applications of dirty water to soils with 120 mm moisture deficit

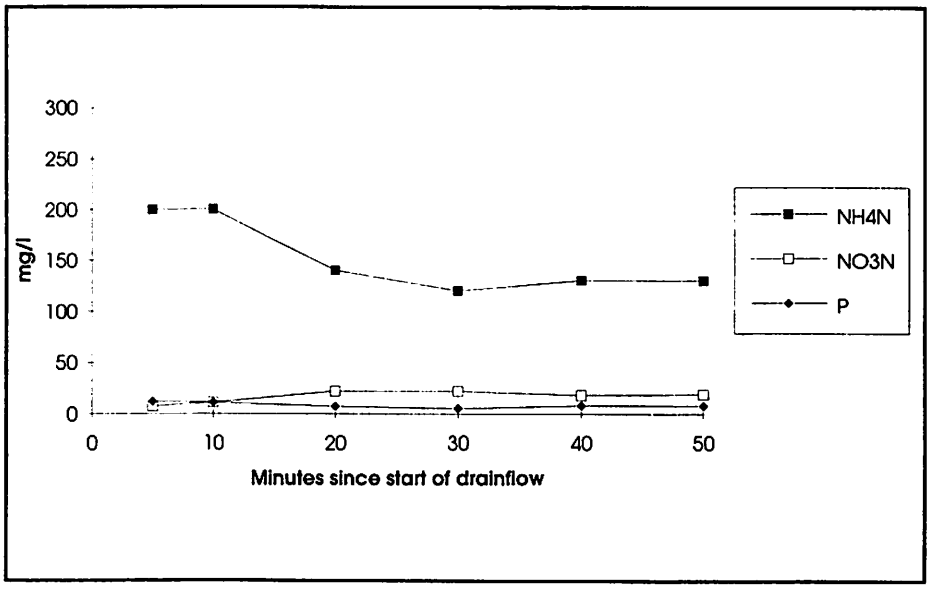


Figure 3 - Drainflow quality at Trawsgoed after 11mm application of dirty water to soils with moisture content greater than field capacity

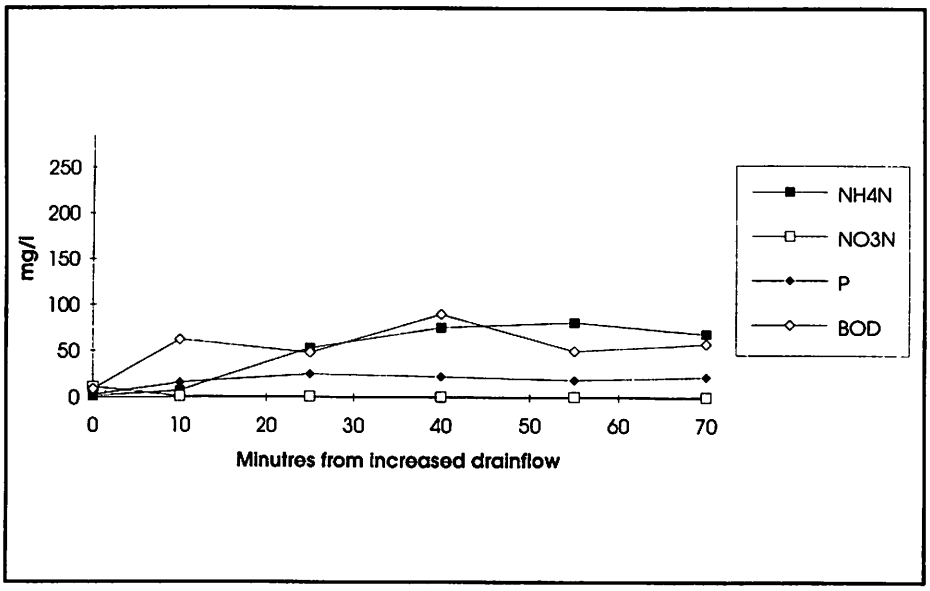
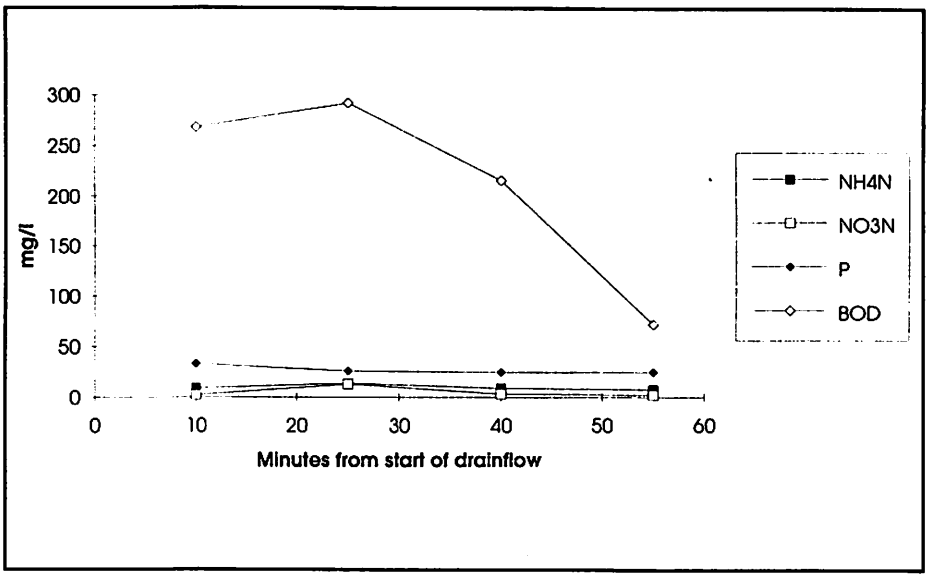


Figure 4 - Quality of drainflow initiated at Terrington after applications totalling 26 mm to soil with 20 mm moisture deficit



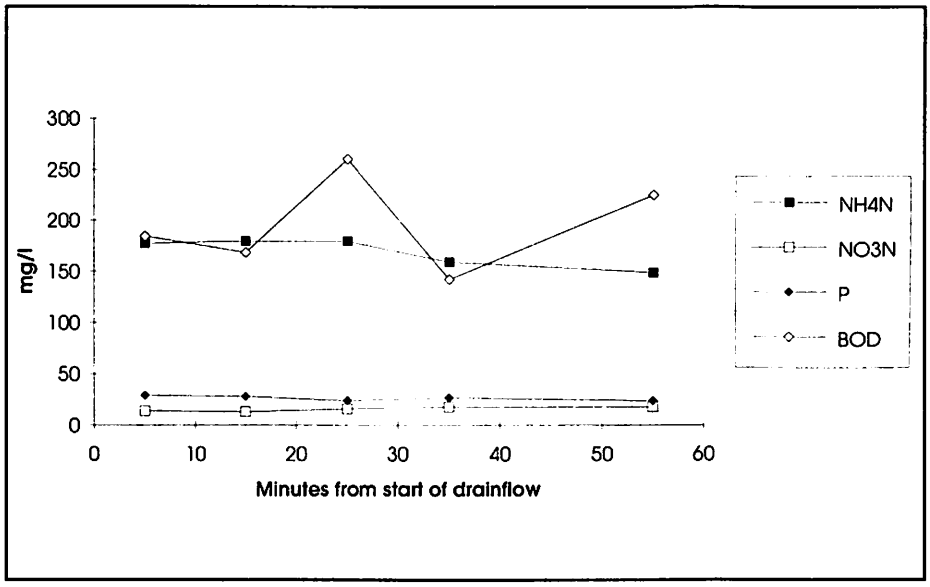


Figure 5 - Quality of drainflow at Terrington following single application of 25 mm to soil with a moisture deficit of 20 mm

capacity one application of 4 mm (40 m³/ha) initiated a trace of contaminated flow.

At both sites concentrations of contaminants in the drainage water were lower than in the dirty water applied. The most substantial reduction in BOD was after applications to saturated soils at Trawsgoed when concentrations were reduced by approximately 97%.

DISCUSSION

The results in this paper confirm that applications of dirty water to drained soils needs to be carefully managed if drainage water pollution is to be avoided. The recorded levels of contamination exceed typical NRA maximum levels for discharge consent of 50 mg/l BOD and 10 mg/l NH_4N.

It should however, be pointed out that polluted water was collected from individual drains, in most situations further dilution could occur from untreated areas of the field. However, these levels of contamination do give cause for concern.

Robinson et al., (1987), investigated the pathways of water movement on drained and undrained grassland clay soils. They found that on undrained land a third of the total flow occurred in the top 10 cm of the soil. However, on drained land this inter-layer flow was almost eliminated.

This suggests that, after applications greater than 6 mm (60 m³/ha) were made to soils at field capacity on the gently sloping land at Trawsgoed, dirty water moved rapidly to the drains as inter-layer flow, which was then intercepted by the permeable backfill in the drain trench. Applications of 3 mm (30 m³/ha) were insufficient to penetrate the saturated soil but remained on the soil surface.

Goss et al., (1983), showed that on clay soils, the principal route of water from the soil surface to the drains is through fissures in the soil profile.

This explains why at Trawsgoed, under very dry conditions when the soils were cracked, applications of approximately one-fifth the soil moisture deficit initiated contaminated drainflow. The dirty water percolated rapidly through the cracks to the drains.

Under these conditions it is likely that contaminated flow would occur following applications to similar soils drained without permeable backfill. The risk of polluting watercourses is most severe in such dry situations because of the lack of background flow to dilute any contamination.

At Terrington, contaminated drainflow only occurred when total applications exceeded the soil moisture deficit. The depth of the drains and lack of permeable backfill meant that there were fewer direct pathways for the movement from the surface to the drains. The drainage system was designed for ground water control and drain flow would only occur when the soil around the drains was saturated (Smedema and Ryecroft 1983).

Low rate irrigation systems can require considerable management time if drainage water pollution is to be avoided. For example, in this study a 40 m³/ha (4 mm) application was only achieved when the irrigator travelled at 0.9 m/minute. This means that a 200 m run would be completed in 3 hours 40 minutes. The irrigator should be moved to fresh ground for each run to reduce the risk of saturating the soil with contaminated water. In a situation with limited dirty water storage, the irrigator would have to be moved every 4 hours during long periods of continuous rain to prevent tank overflow.

CONCLUSIONS

This study suggested that low rate irrigation can be used to dispose of dirty water without causing drainage water pollution. Applications need to be carefully managed especially on heavy soils that have drainage systems with permeable backfill. On drained soils without permeable fill the risks of drainflow contamination are less.

The following detailed conclusions can be drawn from this study:

1. Applications to drained soils that are at or above field capacity should be limited to less than 50 m³/ha.

2. On soils where the drainage system includes permeable backfill, limiting applications to 50 m³/ha at all times will substantially reduce the risks of polluting drainflow.

3. On dry soil without permeable backfill total applications should not exceed the soil moisture deficit. Under very dry conditions, where soils are cracked to drain depth, applications should not exceed 50 m³/ha.

4. Application rates of less than 50 m³/ha will require frequent irrigator or sprinkler moves to reduce the risks of drainflow contamination. In many situations, it may be necessary to consider the provision of additional dirty water storage to avoid applications when soil conditions are unsuitable.

ACKNOWLEDGEMENTS

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REFERENCES

Brewer, A.J. and Cumby, T.C., 1992. The treatment of dirty water from dairy farms. Report MMB Research and Development Contract Report 8843.

Edwards, D.R. and Daniel, T.C.., 1993. Runoff quality impacts of swine manure applied to fescue plots. Transaction of the ASAE, 36(1), 81-86

Goss, M.J., Harris, G.L. and Howse, K.R., 1983. Functioning of mole drains in a clay soil. Agric Water Manage., 6: 27-30

Hodge, C.A.H., Burton, R.G.O., Corbett, W.M., Evans, R. and Seale, R.S., 1984. Soils and their use in England and Wales, Bulletin No 13. 336-341. Harpenden

Kiely, P.V., 1981. Catchment pollution. In: Nitrogen losses and surface runoff from land spreading of manures (Brogan, J.C. ed) 87-91. Martinus Nijhoff/W. Junk, The Hague.

NRA, 1993. Water pollution incidents in England and Wales - 1992. Water Quality series 13, National Rivers Authority, Rivers House, Waterside Drive, Aztec West, Almondsbury, Bristol. BS12 4UD.

Nicholson, R.J., 1994. System of storage and disposal of livestock wastes. In Pollution in livestock production systems (ap. Dewi I. ed) 385-402. CAB International, Wallingford, UK.

MAFF, 1991. Code of good agricultural practice for the protection of water. Ministry of Agriculture, Fisheries and Food, London.

Robinson, M., Mulqueen, J. and Burke, W., 1987. On flows from a clay soil - Seasonal changes and the effect of mole drainage. J. Hydrol., 91: 339-350.

Rudeforth, C.C., 1970. Soils of North Cardiganshire. Memiors of the Soil Survey of Great Britain England and Wales 74-75. Harpenden.

Smedema, L.K. and Ryecroft, D.W., 1983. Land Drainage: planning and design of agricultural drainage systems. Chapter 7 129-160. Batsford Academic.

Talman, A.J., 1979. Simple flowmeters and watertable meters for field experiments. Technical Report 1979/1. ADAS Soil & Water Research Centre, Anstey Hall, Maris Lane, Trumpington, Cambridge. CB2 2LF.

Thompson, N., Barrie, I.A. and Ayles, M. (1981) The Meteorological Office Rainfall and Evaporation Calculation (MORECS). Hydrological Memorandum 45. London: The Meteorological Office.

Uhlen, G., 1981. Surface runoff and the use of manure. In : Nitrogen losses and surface runoff from land spreading of manures (Brogan, J.C. ed) 87-91. Martinus Nijhoff/W. Junk, The Hague.

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BIOLOGICAL ENGINEERING : INTO A NEW ERA FOR THE PROFESSION

This article represents the personal view of the author, John Gowing, who is actively involved within the IAgrE in promoting expansion into amenity engineering and who has spent the last 10 years at the University of Newcastle teaching agricultural engineering. It is presented at this time to stimulate discussion of the future role of the institution and the profession.

The IAgrE Annual Convention, which is to be held this year in Newcastle, will address these issues. It will be preceded by a two-day conference which provides an opportunity to find out more about new developments in biological engineering and their relevance to agricultural engineers.

The origins of the profession of agricultural engineering in the UK (and of the IAgrE) lie in the drive to increase food production through intensification and mechanisation. Its accomplishments should not be underestimated: unproductive lands have been transformed and farmworkers have been emancipated from the drudgery of manual labour. Nevertheless, the profession has been dogged by an image problem. Its stature as a legitimate engineering discipline has long been questioned - perhaps more so in this country than in any other - and now we are facing a full-blown identity crisis.

It is tempting in an article such as this to present a forest of statistics in an effort to show how bad things are. That is not my intention, but I will present some evidence, if only to strengthen my case for change. The first dataset consists of IAgrE membership totals (Table 1), which show a steady post-war increase to the early 1980's followed by an inexorable decline. The second dataset consists of UK tractor registrations (Table 2). Again the trend is more-or-less steadily upwards to the late 1970's, followed by general decline.

It is my contention that these two datasets reflect the decline of the traditional base of agricultural engineering. Clearly, the data on tractor registrations do not provide a complete picture of the status of agricultural mechanisation, but it is important to note that 75% of the UK agricultural machinery market is tractors (Cracknell, 1994).

Also, to reinforce the argument, I have included data on import penetration, which reveal a steady rise from 16% to 54% imports over a periodof 20 years. It is small consolation to note that the UK is not alone within Europe in facing this decline (see Figure 1).

Table 1: IAgrE Membership Total (all grades)

Year	1948	1955	1965	1975	1985	1990	1994
Total	542	1491	1846	2012	2361	2270	1974

Figure 1. The European dimension

Fred Meier (President, EurAgEng) reports in Land Technology (Spring 1995) on the state of the European farm machinery industry. He notes that employment has dropped from 200,000 in 1980 to 125,000 now. Turnover in 1993 at 10 million Ecu was 25% down from 1990. The tractor market has shrunk by 35% from the late 1980's and the combine-harvester market is down by 50% over

In his inaugural address in 1994, IAgrE President Dick Godwin calls for expansion of the institution into new areas within the domain of the land-basedindustries. The success of the Forestry Engineering group is invoked as evidence for the potential of a strategy of lateral expansion. However, the struggle faced by the Amenity Engineering group raises doubts about its general applicability.

While it cannot be denied that the role of the professional agricultural engineer has evolved to embrace new areas (e.g. post-harvest technology), the profession (or at least the public perception of it) is still dominated by "the application of mechanical engineering principles to equipment design, manufacture and product support" (Godwin, 1994).

This is too narrow a definition. What is needed, rather than lateral expansion alone, is a redefinition of the profession in order to embrace the wider field of *biological engineering*. We must face up to the fundamental question: is agricultural engineering a discipline or is it rather the specialised adaptation of other engineering disciplines to the problems of agriculture?

Within the ASAE this debate started as long ago as 1990 and since then the momentum for change has steadily grown. The impetus for this change has

Table 2: UK Tractor Market Data

	Total Registrations	% Imports
1965	31849	-
1966	34497	-
1967	36808	-
1968	39703	-
1969	33749	-
1970	33835	-
1971	23425	-
1972	30784	-
1973	30462	16.0
1974	28111	17.0
1975	34487	19.0
1976	37904	20.0
1977	35175	21.0
1978	32125	23.0
1979	29006	27.0
1980	21243	31.0
1981	20773	37.0
1982	26125	39.1
1983	28306	45.3
1984	25312	47.1
1985	24912	46.9
1986	18831	53.4
1987	19689	52.1
1988	22521	52.2
1989	19948	55.9
1990	18148	56.0
1991	15280	58.4
1992	14296	55.5
1993	19101	54.4
1994	19349	56.7

come largely from the academic community, who were faced with declining student numbers and declining job opportunities for their graduates.

In a recent survey of universities in USA and Canada (Cuello, 1995), 52 departments offering degrees in Agricultural and/or Biological Engineering were investigated. It was found that 48% could still be described as 'traditional' in that they adhered to the established domains of machinery, structures, soil & water and post-harvest technology. A small majority (52%) could be described as 'expansive' or 'revisory'. The former category promoted formal areas of degree specialisation in domains beyond the above, such as aquaculture engineering. The latter category had completelyrevised and reworked their curricula to embrace Biological Engineering and generally offered Agricultural Engineering as a formal specialisation area.

To proceed further with this discussion, we need a working definition of *Biological Engineering*. In order to arrive at such a definition we must first recognise that all well-established engineering disciplines have a characteristic science base.

The proposal is therefore that biology is the logical science base for our profession. It cannot be said that this is the case for *Agricultural Engineering* even in its current state of evolution. Perhaps the explanation for this lies in the observation that biology has in the past been seen as a 'soft science' while physics and chemistry are considered hard sciences. But biology has undergone a metamorphosis in recent years and is rapidly becoming a quantitative science.

New knowledge of the behaviour of biological materials and biological processes provides a far greater opportunity for their control and manipulation. This is the domain of the biological engineer.

It is generally agreed that at the core of all engineering is design of artefacts, systems and processes. Therefore, we can conceive that Biological Engineering is that area of engineering concerned with biological materials and biological processes. In other words, biological engineers should be to biology what chemical engineers are to chemistry and mechanical engineers are to mechanics.

The discipline therefore embraces bio-

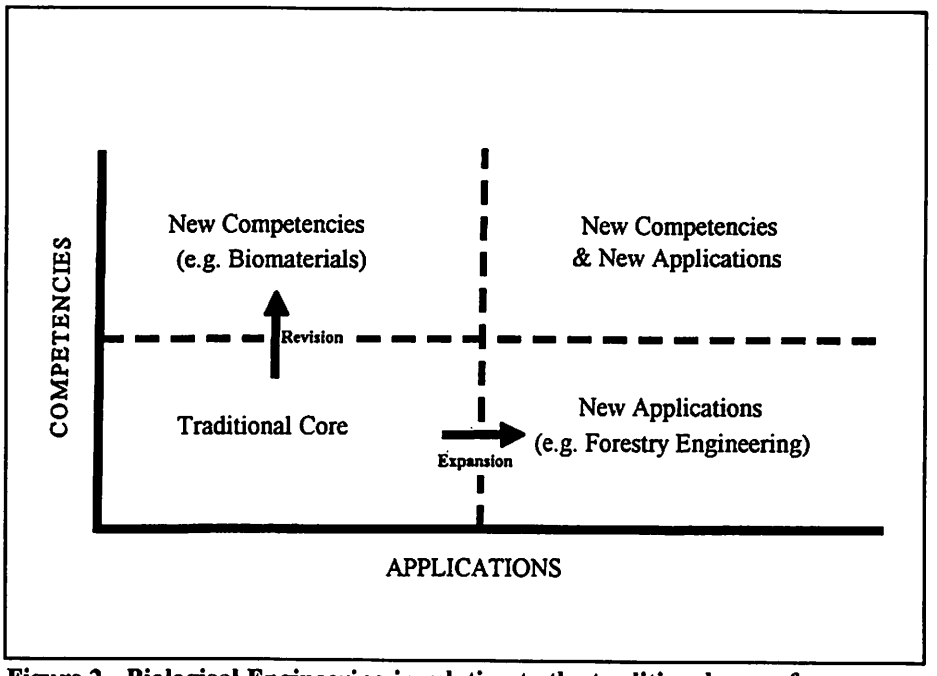


Figure 2 - Biological Engineering in relation to the traditional core of Agriclutural Engineering

mechanics, bioinstrumentation, bio-materials, bioprocessing, food engineering, aquaculture engineering, ecological engineering and bioremediation.

The proposal to adopt a strategy of reformation rather than expansion is undeniably controversial. Some may feel that embracing biological science means placing undue emphasis on a peripheral issue. Others may feel that the myopic adherence to the traditional definition of the profession will ultimately lead to its demise. Perhaps a compromise position can be identified which will accommodate both points of view.

Whatever the outcome of the debate, we can no longer avoid confronting the issue. The combined conference/convention in Newcastle provides an opportunity for all members to participate in the debate. Don't miss it!

ACKNOWLEDGEMENT

This article draws upon the debate within ASAE and in particular on the writings of Prof. Roger Garrett and Dr. Joel Cuello.

REFERENCES

Cracknell, J. (1994) Factors Influencing the Mechanisation of UK Agriculture since 1972. *Agricultural Engineer* **49**(3): 81-85.

Cuello, J.L. (1995) Faces of Change. *Resource* **2**(3): 14-16.

Godwin, R.J. (1994) President's Inaugural Address: Expanding Horizons. *Agricultural Engineer* **49**(2): 38-39.

Footnote: John Gowing is a lecturer in Agricultural Engineering at the University of Newcastle upon Tyne.

BRUXELLES EST PLUS AU LOIN D'ICI!

"Brussels is long way away" said a Breton pig farmer during the Rural Design and Building Association's annual overseas study tour. The tour, that attracted some 20 delegates, spent 3 days looking at farm buildings in Brittany.

The reason for visiting the pig farm, on the second day, was to inspect a new building (still under construction) that would house sows in stalls along with farrowing and weaner accommodation. The controlled environment, totally insulated building did not meet the British Welfare of Pigs Regulations nor the proposed ban on sows stalls in Europe by 2005. The farmer appeared to be totally unconcerned about EC Regulations - hence his remarks

The building was constructed from precast GRP panels, which slotted together and contained a core of insulation material within. The building was totally slatted with below ground slurry tanks.

MUCK'95 - SEMINAR 'FROM WASTE TO RESOURCE'

The Chairman - Brian Finney

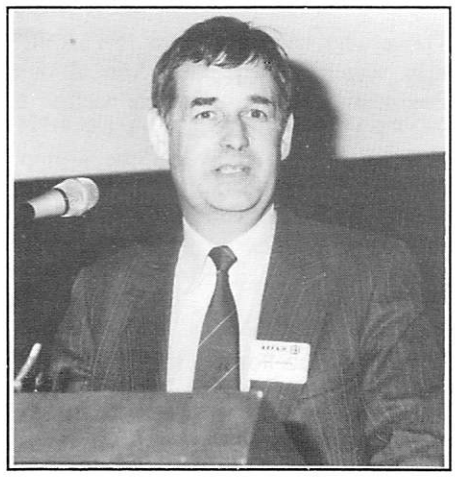
One hundred and ten delegates increased their technical knowledge on developments in waste management, from three speakers, at a seminar held during Muck'95. The seminar on Wednesday 5th April 1995, jointly organised by the IAgrE and the RASE and sponsored by MAFF was chaired by Brian Finney, past-president of the Institution.

The first, John Archer, an ADAS soil scientist working for MAFF in London, gave a paper entitled 'Practice the Codes'. He posed the question 'what is good practice'? This he suggested was the balance between agricultural production and environmental protection. To try to achieve this aim he outlined the Codes of Practice currently published by MAFF.

The Code of Good Agricultural Practice for the Protection of Water is a guide to help to avoid water pollution from:

slurries, dirty water, solid manure, other organic wastes, silage effluent, fertilisers, fuel oil, sheep dip, pesticides, nitrates, disposal of animal carcases

John Archer ADAS



The Code of Good Agricultural Practice for the Protection of Air is a practical guide to help to avoid air pollution from:

odours, ammonia, smoke, greenhouse gases

The Code of Good Agricultural Practice for the Protection of Soil is a guide to help to avoid damage to soil from:

soil fertility, physical degradation, contamination, restoring disturbed soils

To encourage their use these codes are being distributed free and are available from MAFF Publications, London SE99 7TP or Tel: 01645 556000. They usefully help with the drawing up of Farm-waste management plans. Every encouragement is being given to farmers to produce such plans with ADAS providing a free pollution risk assessment and assistance to draw up these plans. These plans identify areas where and when manures should and should not be spread and enables the farmer to calculate the areas needed for total fertiliser use. Risk assessments concerning pollution from land spreading are also carried out as part of the plan.

He stated that it is important to maintain a voluntary approach and he concluded that this was necessary if in the pollution risks are to be kept to a minimum.

The next paper considered the more restrictive controls operating in the Netherlands. Jan Huijsman of IMAG-DLO gave an illustrated presentation on the Dutch approach to making the most of farm livestock waste. Farmers in the Netherlands are concerned with the economics of utilisation along with environmental protection, from ammonia emissions and nutrient leaching.

Dutch legislation states that application rates must not exceed crop nutrient demand and that applications should only be made during the growing season with the application method reducting the ammonia released. He explained that the emission levels changed with application methods and that these are measured both during and after spreading. In reducing these levels farmers must consider:

* Diluting the slurry with water when carrying out organic irrigation.
* Spreading slurry from a tanker while driving underneath water from an irrigation system.
* Slurry injection with particular concern for tine shape and slit depths.
* Possible other methods such as band spreading and slurry incorporation during tillage.

Jan Huijsman IMAG-DLO

The final speaker, Mr Ken Smith, ADAS, Wolverhampton, considered the impacts and implications of utilisation. In the UK approximately 189 million tonnes per annum (76 million within buildings) of farm manures are produced with a nutrient value of £190-200 million.

Frequent analysis of well-mixed farm wastes is necessary to ensure an even application of nutrients in order to obtain the best value. Mr Smith reminded the delegates that farmers need to be aware of the variability in stored slurry due to stratification and therefore, stores need to be well stirred to prevent crusting and the settlement of sludge. It is also important to be aware of the distribution patterns created by the application machinery and the availability of nutrients within a given sample. In order to assist with this latter problem he described the development by ADAS of a slurry hydrometer.

Ken Smith ADAS

COMPUTER, VIDEO & BOOK REVIEWS

TRACTOR PULLING - THE POWER TO PERFORM

If you like the thrill of seeing really powerful machines at work then this is definitely the video for you.

The video features exciting on-track material from Britain and Holland. However, for the bulk of it's sixty minutes you are taken behind the scenes to see four drivers at work on their machines - four very distinctive machines chosen to illustrate the range of tractors competing at events.

First of all, Peter Clarke takes the covers off his diesel-powered superstock, 'JBJ Express' and shows in details how he engineers an ordinary farm tractor to harness thousands of horsepower. Then the Dutch driver Willem Veldhuizen runs through the adaptation he has made to burn alcohol to power his John Deere "Bits'n'Pieces".

The giants of the track are the modifieds. We watch Jim Snell as he builds up the new 'Starlight Express III' from scratch, using three 28-litre aeroplane engines, and finally Brian Armistead displays the construction of 'Desperate Dan' with it's five V8 Chevrolet engines.

The video is presented by Geoff Ashcroft whose close association with the sport, includes editing the British Puller and driving in the super stock class. His complete understanding of the sport and its engineering shows throughout this detailed, exciting and superbly filmed programme.

This is the best video I have seen for some time, it is a must for you.

Published by Farming Press Videos - £14.95

MAINTAINABILITY EVALUATION

The British Standards Institution has published two new standards for maintainability evaluation as follows:

BS 6548: Maintainability of equipment BS 6548: Part 6: 1995 - Guide to statistical methods in maintainability evaluation

BS EN ISO 3785: 1995 - Steel - Designation of test piecer axes

This standard specifies a method for the identification of test piece axes in relation to the grain flow., by means of a sytem of co-ordinates.

These can be pruchased from BSI Customer Services, 389 Chiswick High Road, London. W4 4AL Tel: 0181 996 7000

COMPUTERIZED FINDER SYSTEM

A computerized index of technical articles in agricultural engineering periodicals - along with searching software - is available without charge from W.J. Chancellor (BIOAGENG@UCDAVIS.EDU).

The periodicals include Agricultural Engineering (since 1950), Transactions of the ASAE (since 1958), Applied Engineering in Agriculture (since 1985), Canadian Agricultural Engineering (since 1963), Journal of Agricultural Engineering Research (since 1956), Agricultural Mechanisation in Asia, Africa and Latin America (since 1971), Grundlagen der Landtechnik/ Landtechnik (since 1965), Transactions of the Chinese Society of Agricultural Machinery (since 1984), Journal of the Japanese Society for Agricultural Machinery (since 1985), The International Agricul tural Engineering Journal (since 1992) and the Journal of Agricultural Machinery (since 1992).

The purpose of the search system is to help the user locate ar ticles on a given subject or by a specific author - not to provide complete citations of articles or to convey the informa tion content of the articles.

Two forms of the same index database are available for IBM-compatible personal computers using MS-DOS or PC-DOS. The original form (AE-INDEX.EXE) permits searching from the floppy diskette, as well as use on a hard disk, and allows use of user-supplied dBase III software. The modified form (AE-NDX95) includes streamlined searching software, and is intended for hard disk use only. Additional optional features can be obtained using BASIC. The database is in ASCII text file format and can be used on other types of computers or with other operating sys tems.

Those wishing to have a copy may send one formatted 1.44 Mbyte 3½ " diskette for each index form desired, to:

W.J. Chancellor
Biological and Agricultural Engineering Department
University of California
Davis, CA 95616-5294, USA

The material will be copied to the diskette(s) and the diskette(s) returned to the sender.

Those wishing to use INTERNET to obtain either the database sys tems may download A E-INDEX.EXE or AE-NDX95>EXE, self extracting (1.3 Mbyte) compressed files, by using File Transfer Protocol (FTP) from POPPY.ENGR.UCDAVIS.EDU (or 128.120.65.75 for those wishing to use numeric characters), User = anonymous, Password = guest. Before "getting" A E-INDEX.EXE or AE-NDX95.EXE by FTP, first type; binary (enter). Placing AE-INDEX.EXE by itself in a separate subdirectory and typing: AE-INDEX (enter) will produce a set of compressed files. Place these files (excluding AE-INDEX.EXE) on a 1.4 Mbyte floppy diskette. Instructions for hard disk use or for searching from floppy disk are contained in README.TXT on the floppydiskette. AE-NDX95.EXE may be placed in any hard disk sub directory by itself. Typing: AE-NDX95 (enter) will produce a system ready to use upon typing: HI (enter).

Those who have access to INTERNET may search an expanded Agricul tural Engineering database by connecting to POPPY.ENGR.UCDAVIS.EDU (128.120.65.75) and when the prompt: "Username" appears, type: SEARCH (enter). No password is required, and there is no charge.

Editors note

William Chancellor sent me a copy of the index that I have loaded on to my PC. It works well and is very user friendly.

DIARY OF EVENTS

3rd - 6th July 1995

Royal Show, National Agricultural Centre, Stoneleigh, Warwickshire
Tel: 01203 696969

10th - 16th July 1995

Tenth International Farm Management Congress - trade policies and the effects on farming. Further details from P.J. James, Farm Management Unit, University of Reading, PO Box 236, Reading, RG6 2AT Tel: 01734 351458 Fax: 01734 756467

4th September 1995

Muck South West - traditinally held in the spring now switched to the autumn.
Further details from Mandy Bloom, Publicity Officer, Royal Bath and West Society Tel: 01749 822200

11th - 14th September 1995

RSS95: Remote Sensing in Action, Conference and Exhibition at University of Southampton
Further information can be obtained from Prof. Paul Curran, Dept of Geography or Dr. Colette Robertson, Department of Oceanography, University of Southampton, Southampton. SO17 1BJ
Tel: 01(+44)703 592259/2389/3642. Fax: 01(+44)703 593059/3295

19th - 23rd September 1995

Agro-Tech '95 International Supplements and Machinery Fair in Antalya, Turkey.
Details available from Hü samettin Ü nsal, FS Fuarcilik AS, CC. 120 80303 Mecidiyekö y - Instanbul, Turkey.

Fax: (90) 212 288 92 46

20th - 23rd September 1995

Agricultural & Biological Engineering: New Horizons - New Challenges.
International conference at Newcastle University. Details from: Marion Turner Tel: 0191 222 6891.

21st - 22nd September 1995

Engineering for Sustainable Development - expectations and responses on manufacturing and transport, Queen Elizabeth II Centre, London
Further information from Christa Langan, Royal Academy of Engineering, 29 Great Peter Street, Westminster, London. SW1P 3LW Tel: 01(+44)71-222 2688 Fax: 01(+44)71-233 0054

25th - 28th September 1995

Energy and Agriculture - international meeting considering enrgy production and mangement - CIGR section IV.
Further details from P. Epinatjeff, Universität Hohenheim, Institut für Agrartechnik, D-70593 Stuttgart. Tel: (07 11) 459-2508 Fax: (07 11) 459-2519

16th -17th October 1995

International Livestock Odor Conference '95. The aim of the scientific programme is to globally expand overall knowledge regarding livestock odour research. Further details from Streephen Gorton, Iowa State University, 208 Science I, Ames, Iowa. Tel: 515 294-4406 Fax: 515 294 6019 Internet: sgorton@iastate.edu

17th - 20th October 1995

Techmart Africa (COMESA) '95, Lusaka, Zambia. A technology initiative to assist the region to develop its Agro/food industry. Further details and compendium entry froms from The Technology Exchange, Wrest Park, Silsoe, Bedford MK45 4HAS Tel: 01525 860333 Fax: 01525 860664

7th - 9th November 1995

IWEX '95 9th International Water & Effluent Treatment Exhibition and TRENCHLESS TECHNOLOGY '95
National Agricultural Centre, Birmingham. For information contact Paul Tweedale or Howard Phillips, Turret Group plc.
Tel: (+44) 01 923 228577 Fax: (+44) 01 923 221346

28 November - 2 December 1995

Agritech Lebanaon '95, Beirut, The international exhibition for agricultural technology, farmign and irrigation equipment, and food processing and packaging machiery. Further information from International Fairs and Promotions, City Exhibition Centre, Martyrs' Square P.O. Box 55576, Beirut, Lebanon. Tel/Fax: 961 1 499 235

June 1996

New uses for old rural buildings in the context of landscape planning - International seminar of the second technical section of CIGR, Piacneza, Italy. Further details form Istituto di Genio Rurale, Università Cattolica del Sacro Cuore, Via Emilia Parmense, 84 29100 Piacenza (Italy) Tel: 0039 (523) 599.241 Fax: 0039 (523) 599.124 Email: GENUR@PC.UNICATT.IT

Short Courses at Silsoe College

October 1995

Postharvest Technology of Grains, 10 week continuing professional development programme

27th November - 1st December 1995

"Postharvest Technology and Commodity Marketing" - Conference in Accra, Ghana with Exhibition of Agriculture, Irrigation, Forestry and Food Processing Equipment.

January 1996

Postharvest Technology of Fruit, Vegetables and Root Crops, 10 week continuing professional development programme.

Further information can be obtained from Mrs Gill Burrows, Cranfield University, Silsoe Bedford. MK45 4DT. Tel: 01(+44)525 863349. Fax: 01(+44)525 863344

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