



SAIAE News Bulletin

South African Institute of Agricultural Engineers

June 2007



EDITORS' NOTE

The SAIAE newsletter will feature four times a year with news on the progress of various aspects regarding the strategic plan. A business manager will also soon be appointed.

Prof Peter Lyne gives his ideas on the innovative vehicle design that may reduce transport costs. He discusses two projects currently being implemented which involve the Road Transport Management System (RTMS) and the Performance Based Standards (PBS).

The School of Bioresources Engineering and Environmental Hydrology (BEEH) at the UKZN produces well equipped agricultural engineers to the South African economy. Read the interesting UKZN snippets sent in by Louis Lagrange. These involve the third and fourth year students, the expansion of the course material and vacation work.

SASRI is engaged in many projects in an attempt to reduce production costs and to improve efficiency. Read about the several aspects currently receiving attention through projects at UKZN

The increase in crude oil prices during the past few years has placed the focus on alternative fuels to crude oil. Adriaan Louw & Frans Hugo have a most interesting article regarding the future role of crude oil biofuels and agricultural development.

Enjoy!

Editor

From the Council

The SAIAE Council reviewed the SAIAE Strategic Plan during February 2007. A decision was taken to publish the SAIAE newsletter four times a year in e-mail friendly format. Progress on different aspects of the execution of the strategic plan must also feature in each edition, to keep the members up to date with development. The newsletter must also reflect and share the variety of projects handled by agricultural engineers.

During the AGM in October 2006, the suggestion of a business manager was welcomed unanimously by members. The institution of a business manager to arrange and drive matters for the SAIAE Council is high on the agenda. A job description was compiled for discussion during the next Council meeting and decisions regarding the financing of such a person will be attended to.

The process and contracts for student loans has been finalised and the first student loan from the Council was awarded to a second-year agricultural engineering student.

The Council thought it best to take the 2007 Continuous Professional Development opportunities (CPD) to specific regions to make participation for members easier, cheaper and more practical. In the process, the national unity between members is no longer stimulated so strongly and a combined multi-day CPD is considered in 2008.

The following CPD events are planned:

- Optimising and comparing of irrigation systems in SA (Elsenburg, Western Cape) 17 & 18 July 2007
- Biodiesel (Pietermaritzburg), 2 Aug 2007.
- Mechanisation – particulars not known yet.

Watch this space for further information.

Louis Lagrange

Reducing Transport Costs – innovative vehicle designs may be the solution

Prof Peter Lyne Pr Eng

The South African sugar industry spends approximately R750 million per annum on road transport, and innovative ways are being investigated to reduce these costs substantially. This is in addition to the current initiatives including the scheduling of vehicles, which will also have a major impact on costs.

Two projects currently being implemented involve the Road Transport Management System (RTMS) and Performance Based Standards (PBS).

RTMS

RTMS is an industry-led self-regulating regulation scheme, which encourages transport operators to implement management systems that preserve road infrastructure, improve road safety and increase the productivity of the transport system. The sugar industry has realised that RTMS has real benefits and encourages all operators to comply with the system. The benefit of implementing RTMS is reduced costs that result from:

- a) a consistent maximum payload
- b) capable drivers
- c) well-maintained vehicles
- d) a productive system

In addition the Department of Transport (DOT) has indicated that if one embraces and complies with RTMS, one can then apply for authorisation to operate a PBS vehicle.

PBS

To put it into context, the current fleet of haulage vehicles must comply with a set of prescriptive regulations which specify items such as Length, Power-to-Weight- Ratio, Braking requirements, Axle

loadings and Gross Mass. This is an attempt to ensure that vehicles are safe and do not cause damage to roads. However it has been recognised that:

- a) These regulations do not address the vehicle dynamics and some vehicles which do comply, are not as safe as they should be.
- b) The current system restricts innovative designs.
- c) The current system provides little incentive to use new technological developments.
- d) The PBS approach not only achieves less road damage and safer vehicles but also vehicles that carry a higher payload.

To overcome the limitations of the present prescriptive legislation, it has been proposed that PBS regulations be introduced. With this system the criteria for the design is that the vehicle should perform to a set of performance standards which will ensure that less damage is caused to the roads and that the vehicle is safer than current designs. If such a system were introduced, it would be essential for their owners to implement higher standards of loading and management, and in this respect the RTMS offers a solution.

Pilot project

To test the system, the Minister of Transport agreeded to approve a pilot project where RTMS accredited operators could apply to have a PBS vehicle. The pilot project would be aimed at designing, building and operating vehicles that could carry higher payloads (e.g. 40 tons) but which do not exceed the legal axle load limits. One can only see the benefit of such a system.

SAIAE IRRIGATION WORKSHOP A SUCCESS

The beautiful Cape wine lands were the setting for the latest SAIAE Continuing Professional Development (CPD) workshop, on 17-18 July 2007. Attendees from throughout South Africa gathered at Elsenberg Agricultural College in the Western Cape for a 1½ day training session on “Irrigation Systems Benchmarking and Optimisation”. This ECSA-Accredited event included



Mist on the Mountains near Elsenberg.

sessions on irrigation evaluation, water conservation practices, real (vs theoretical) efficiencies, optimisation techniques, and benchmarking of irrigation systems against various design and performance standards.



The Historic Elsenberg Manor House.

Presentations were given by Nationally and Internationally renowned speakers, including mr Felix Reinders of the ARC Institute for Agricultural Engineering, mr Kevin Greaves of CPH Water, and Dr. Wim Bastianne of WaterWatch in the Netherlands. The workshop included a full day of technical sessions, held in the historical Manor House at Elsenberg, followed by a half day of practical training. Thus, the workshop provided attendees with not only the theoretical understanding of the

material, but also the practical understanding needed to actually implement the theory.

Mr Kevin Hundley (Ninham Shand Consulting), the new chair of the Western Cape branch of SAIAE, served as the local host, and organised excellent meals for the event. Attendees found the workshop extremely worthwhile, and also enjoyed the opportunity to interact with colleagues from throughout the country.



Felix Reinders Addresses the Workshop.

UKZN Snippets

Louis Lagrange

The School of Bioresources Engineering and Environmental hydrology (BEEH) at the University of KwaZulu-Natal has always produced well equipped agricultural engineers to the South African economy. BEEH is also at present the only University to offer the degree in SA. Here are some interesting snippets of what is happening at UKZN at present.

Third and fourth years now in Pietermaritzburg

Previously the third year students were at the Durban Campus and the fourth year students completed their studies at the Pietermaritzburg campus where the school is physically situated. From 2008 onwards both third year and fourth year students will be based at Pietermaritzburg allowing for more contact time with the agricultural engineering lecturers.

Expansion of the course material

BEEH has expanded the program with the above mentioned change to include subjects like food processing and food engineering from 2009. It also now allows students to choose a few additional optional subjects in management like orchard-, farm-, field crop-, greenhouse-, water resources- and soils management, electrical applications, forest engineering, environmental assessment, post harvest technology, etc. It is envisaged that the expansion will result in a bit more specialisation and better equipped students.

Vacation work

Students are required to complete a minimum of 14 weeks of practical work for degree purposes. This serves to give students some idea of the environment in which they may practice. A report of the work must be submitted and it is expected that the work should provide opportunity for the students to put their theoretical knowledge into practice. At present it appears that the students are finding it very hard to organize this practical work themselves and BEEH has compiled a list of CVs of students that are available for vacation work and is available on request. Four companies have responded to the e-mail note to SAIAE members expressing interest in vacation work students and have received the list of CVs from which to select possible candidates. There is, however, a large number of students that have not found work and will be stranded at the end of their degree if they do not complete this requirement. Companies are urged to support the continuous development of future students.

Watch this space for feedback on research in the next edition.

Engineering Research at SASRI



A huge component of a sugarcane grower's production costs are related to Engineering issues. With this in mind the South African Sugarcane Research Institute is engaged in many projects in an attempt to reduce production costs and improve efficiency. Research into mechanisation and related issues has been enhanced through SASRI's relationship with the Schools of Bioresources Engineering and Environmental Hydrology and Mechanical Engineering at the University of KwaZulu-Natal.

The main aim of this research is to contribute to the overall supply chain by getting sugarcane to the mill quickly and efficiently at the lowest cost possible. Funding for these projects comes from several sources including SASRI, the Department of Transport, the National Research Foundation, CSIR, Illovo Sugar and the University of KwaZulu-Natal.

Project registered with UKZN

The following aspects are currently receiving attention through projects registered with UKZN.

Cane Deterioration

An MSc student is involved in a project to model the deterioration process and quantify the losses more effectively.

Mechanisation rating / road train

An Msc Eng student is working on developing maps which will indicate whether mechanisation and innovative transport systems are feasible in a particular area.

Onboard Weighing

An MSc student is working on a research project which will provide guidelines for onboard weighing systems on transport vehicles.

Vehicle Design

There are two aspects to this area of work. An Msc Eng student is working on the physical design aspect to increase payloads and another MSc Eng student together with five 4th year BSc Eng students are working on vehicle dynamics, which relate to safety and impact on road surfaces.

Performance based standards

Related to the vehicle design, this project has a PhD student working on the possibility of introducing PBS to the sugar industry.

Supply Chain Management

One PhD and one MSc student, plus a further MSc student from the French Agricultural Research Centre for tropical and subtropical crops (CIRAD) are currently developing tools to simulate and improve the entire supply chain for the industry.

The future role of crude oil biofuels and agricultural development

Adriaan Louw Pr Eng & Frans Hugo Pr Eng

The increase in crude oil prices during the past few years has placed the focus on alternative fuels to crude oil. The reason for the increase can be found in the following Figure 1. As can be seen from the graph, the oil reserve should reach a peak at approximately 2005 to 2010 (currently), as predicted in the seventies by the Club of Rome and later by Camphall & Laherrere and M K Hubert. At the same time, the oil demand also increases for growing industry development. This can be seen in Figure 2 for China and the USA respectively.

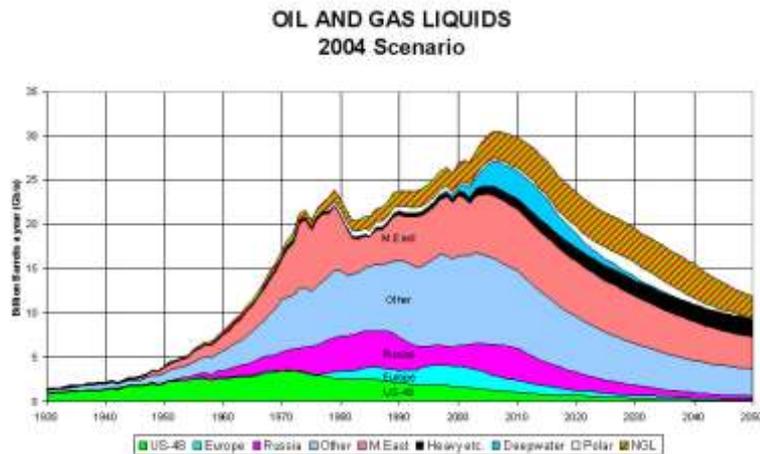


Figure 1: World crude oil and gas production

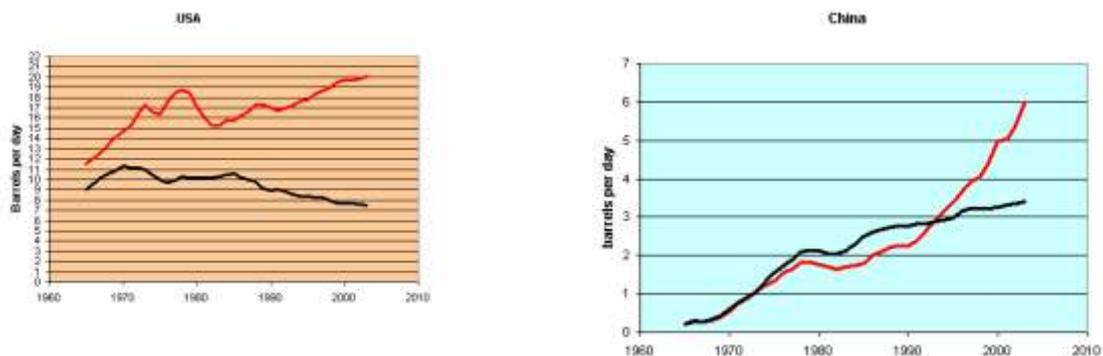


Figure 2: Crude oil production (black) and consumption (red) in the USA and China with the consumer figures that exceed the production figures by far.

The projected reduction in crude oil production is not doubted by anyone, but there are those who allege that the crisis will only come later. According to a report by the BBC, the world's problem is as follows: the current crude oil consumption is six barrels for each barrel discovered. The discovery of large oil fields (more than 500 million barrels) reached its peak in 1964. In 2000 there were 13 such discoveries, in 2001 six, two in 2002 and none in 2003. Three new projects are coming into production during 2007 and three in 2008. Thereafter no big projects are envisaged. There are however other smaller fields, among others gas fields that are being developed, but is either deep under the sea or in forms that make it expensive. There have been reports in the press referring to the lack of sufficient and new refinery capacity and the question can be asked why new facilities are not created. It could be that there won't be any crude oil to refine, therefor only one conclusion can be made about the price of oil and that is that it will increase even more.

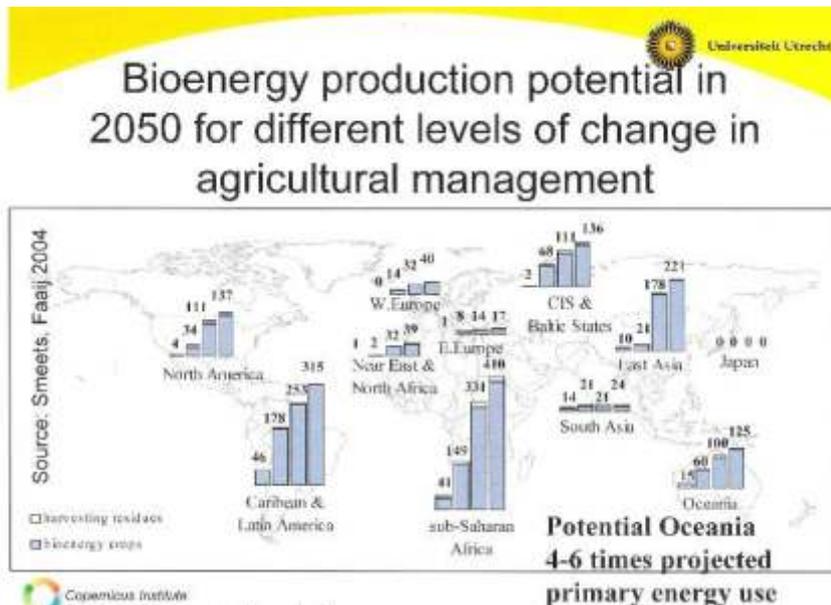


Figure 3: A huge challenge awaits the agricultural development

The question is now, what alternatives are there? For network energy, or electricity, there are a number of alternatives, namely nuclear, hydro, solar and wind energy, of which nuclear, notwithstanding environmental resistance, will still have to make a great contribution. Wind energy is also beginning to play a greater role in Europe. The biggest problem is however to find an alternative energy source for road transport. Hydrogen and fuel cells are seen as an alternative but it will still take a number of years before it will be seen on our roads. There are a number of technical problems that have to be solved first. Hydrogen first needs another energy source to manufacture it, which places a further burden on the network systems.

Biofuels are therefore becoming important for road transport, especially for trucks and in agriculture, for tractors. Biofuels are in liquid form that is easily handled and transported and is a highly concentrated form of energy.

The European countries, the USA, as well as South Africa, have, as a result of the important role that biofuels will play as energy source in future, laid down directives for the replacement of crude oil by biofuels. The challenge will however be where to find or cultivate sufficient agricultural products to supply in the future demand, without influencing food security adversely. A chart compiled by the Copernicus Institute of the University of Utrecht is shown in Figure 3, with the different agricultural potentials for biofuels in the world. It is clear from this study that Africa has the greatest potential, just waiting to be developed. The Germans admit that they cannot produce more than 7% of their fuel demand from their own agricultural potential before they will have to import.

The good part of this challenge is that, if the correct crops are chosen for producing biofuels, it will not be in competition with food security, but actually complimentary. This is especially the case with biodiesel, where only the oil component is used for fuel manufacturing. The protein-rich oil cake can be used as food for people and for animal fodder in the animal production industry. With the world's fish reserves fast being depleted, this oil cake can unlock great new opportunities with aquaculture production systems, as substitute for sea fisheries.

For South Africans who know Africa and its climate, enormous opportunities are on the horizon to get involved in agricultural production. For agricultural engineers, there are opportunities to become involved in the planning, development and management of large projects where the production of biofuels and food goes hand in hand.

Here is a great challenge for agricultural development .