SA waterbulletin

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MdeP

WATER TREATMENT
Novel low cost filtration plant officially opened at Burgersfort

WATERBESTUUR
Resultate van werksessie oor laevloei hidrologie beskikbaar

GROUND WATER
Pesticide levels investigated in a selected area of intensive agriculture in the Western Cape and Vaalharts

AFRICAN WATER CONFERENCE & EXHIBITION

6 - 9 JUNE 1994

NATIONAL EXHIBITION CENTRE
JOHANNESBURG

PROGRAMME

Venue	Organising Association	Topic
Monday 6 June		
Hall 1	Mine Water Technical Division, WISA	Mine Water Management
Hall 2	Institute of Waste Management	A workshop on the "Minimum requirements for handling waste", as published by the Department of Water Affairs and Forestry.
Hall 3	Membrane Technology Technical Division, WISA	Electro-Membrane Processes
Tuesday 7 June		
Hall 1	Southern African Industrial Water Association	Industrial water treatment workshop
Hall 2	Sludge Management Technical Division, WISA	Sewage sludge management in the context of current legalisation
Hall 3	Water Scientists Technical Division, WISA	The role of scientists in water purification.
Wednesday 8 June		
Hall 1	Pipeline Interest Group of southern African Corrosion Institute	Practical rehabilitation of pipelines
Hall 2	Nutrient Removal Technical Division, WISA	Appropriate operating technologies for African conditions
Hall 3	South African Chemical Institue.	Chemistry and water quality
Thursday 9 June		
Hall 1	Water Distribution Technical Division, WISA	Water supply and rapid urbanisation
Hall 2	Southern African Society of Aquatic Scientists	South African riverine water quality: management and current research
Hall 3	To be confirmed	

Prof Chris Buckley of the University of Natal will also be organising three computer modelling courses based on his Water Research Commission projects during the conference period. This will be held at a different venue. The three courses are: Chemical speciation; Modelling of reverse osmosis; Modelling of the residence time distribution. For further information please fax your details to Prof Buckley at 031 260 1118.

For more conference details, please contact:
Sally Keeling, Focus Conferences, PO Box 31368, Braamfontein 2017.
Tel (011) 643 4824/8 Fax (011) 642 6011.

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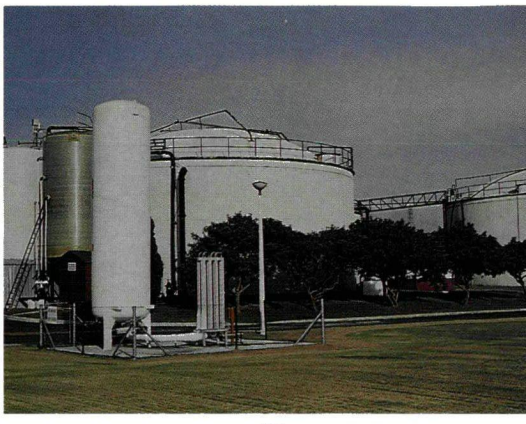

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Inhoud

Cover: The novel water treatment works at Burgerfort, Eastern Transvaal.

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BURGERSFORT OPENS UNIQUE LOW COST WATER TREATMENT PLANT

A novel water purification system developed by a South African engineer now makes it possible to produce purified water for small rural communities at a fraction of the normal cost.

The design consisting of two components instead of the usual seven phases of purification, is the brainchild of Mr Piet van der Merwe, a retired engineer.

This simplified system makes it possible to construct a small, inexpensive and easy to operate, purification plant which can be operated without expensive supervision.

From left: Mr Piet van der Merwe, Mr Schalk van Schalkwyk (Regional Services Council - Lowveld Escarpment), Mr Fritz Pretorius (Local Area Committee, Burgersfort), Mr Piet Odendaal (Executive Director, Water Research Commission), Mr Lucas van Vuuren and Mr Adam Botha (Both from Bergman Consulting Engineers).

Recently the little town of Burgersfort nestling amongst the eastern Transvaal mountains, officially opened their new water works based on this innovative design.

Bergman Consulting Engineers designed the Burgersfort water works which abstract water from the nearby Spekboom River to supply the town, which in recent years has experienced unprecedented growth and an increasing water demand.

The Burgersfort site was far from ideal for a conventional works. Physical restraints that the Consultants had to contend with included an old, small water works and a high lift pumpstation located in the middle of a L-shaped property. Additional restraints were existing boreholes, a steeply sloping site, electrical power lines and rising mains.

Mr Fritz Pretorius, chairman of the Burgersfort Local Area Committee, ready to press the button and set the Burgersfort water works going officially, and Mrs Magriet Rautenbach, vice-chairman of the Burgersfort Local Area Committee.

The novel compact series filtration plant of Burgersfort is based on prototype designs featuring a series flow filtration plant in which the two conventional unit processes of flocculation and sedimantation are replaced by a simple upflow filter.

The series flow filtration plant consists of:

- an upflow filter with a deep bed of graded media, from coarse at the bottom to fine at the top.
- a standard rapid gravity filter for final polishing.

Otherwise the plant is similar to a conventional works.

PROTOTYPE PLANTS

Local Affairs Government Council has experimented with three prototype plants based on this concept of series flow filtration, in operation at Magaliesburg (0,5 Ml/d), Marloth Park (1,0 Ml/d) and Hectorspruit (1,5 Ml/d). Numerous tests were conducted on the Hectorspruit works to optimise the operation. An additional process control system was developed which allows the complex backwash system to be operated by unskilled or semi-skilled labour. The prototype system has has proved to be robust and reliable.

UNIQUE FEATURES

Unique features of the **Burgersfort works** are

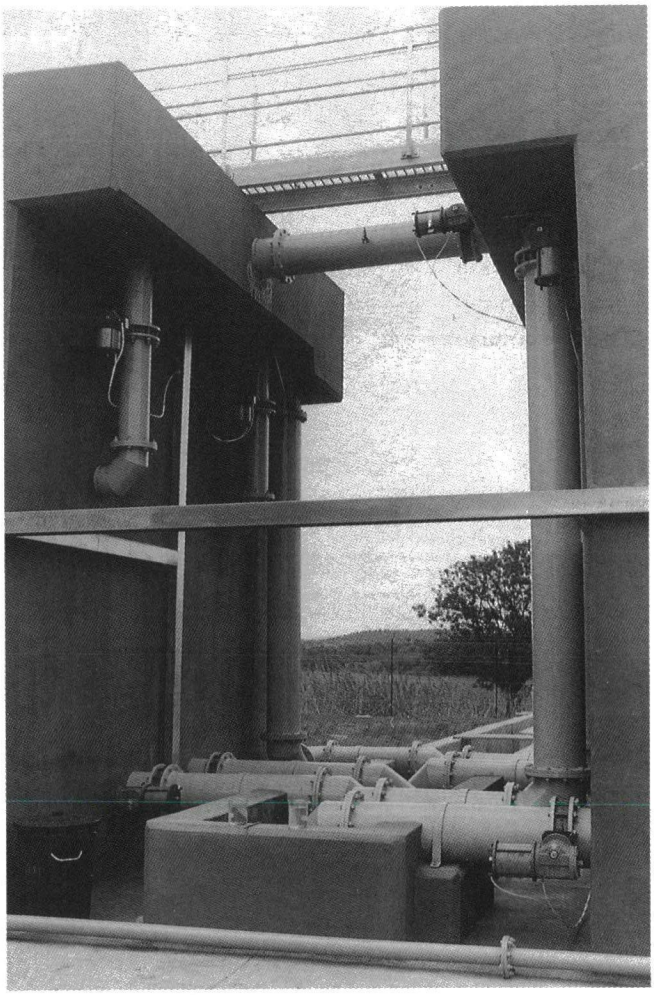
- the series flow filtration plant which incorporates flocculation and filtration in a single unit
- the ability to double capacity by small alterations to the works
- two backwash systems and the use of decanted water
- a hydraulically controlled backwash system for symple operation
- a large number of sampling points to assist in optimising the operation of the plant
- a simple gantry type river abstraction point which has an adjustable water level control off take point to overcome the lack of flow regulation in the river
- ease of access to the raw water pumps and protection of the abstraction point against floods
- substantial capital cost savings over a conventional treatment works.

DESIGN PARAMETERS

The design parameters for Burgersfort water works were obtained from the results of the Hectorspruit prototype plant. The layout, however, was adapted to the site and additional modifications were required to reduce the use of filtered water for backwashing purposes. Settled raw water is used to backwash the upflow filter while treated chlorinated water is used to backwash the rapid gravity filter. The collection of all backwash water in two sludge dams from which decanted water is returned to the raw water settling pond and re-used for backwashing the upflow filter, has resulted in significant water savings.

The Burgersfort water works plant has been design so that its treament capacity can be doubled with very little additional work. The chlorine tank and all pipeworks were sized to cater for twice its present flow.

Presently the Water Research Commission is funding a project for further research and development of this novel water purification system, particularly its application with regard to different water types.



The Burgersfort water works provides 2 Ml of purified water per day.

A number of representatives from various municipalities, Water Boards and Regional Services Councils as well as the Department of Water Affairs attended the opening of the new Burgersfort water works.

WISA SEMINAAR GOED BYGEWOON

Die Tegniese Divisie Waterwetenskaplikes van die Water Instituut van Suidelike Afrika het onlangs 'n halfdag seminaar aangebied by die Universiteit van Pretoria. Die Afdeling Waterbenuttingsingenieurswese, UP, was die gashere by die geleentheid.

Die seminaar is goed bygewoon deur sowat 96 belangstellendes uit die privaatsektor, plaaslike owerhede en opleidingsinstansies.

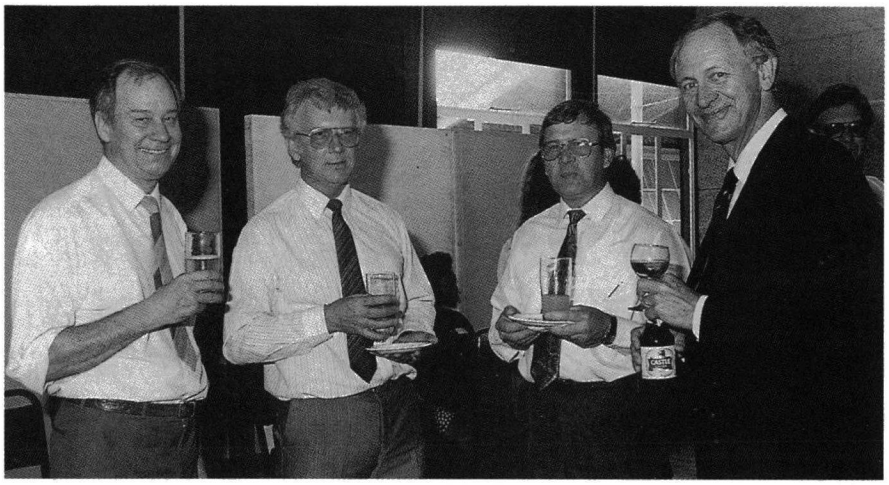
Die lesing-aanbiedings was uit die boonste rakke en is aangebied deur prof At Pretorius en mnr Johan Botha van die Afdeling Waterbenuttingsingenieurswese.

Die gebruik en waarde van bekertoetse vir die waterwerkebedryf asook die kritiese faktore wat aangespreek moet word tydens daardie prosesfunksies, is bespreek deur mnr Johan Botha, senior lektor in die Afdeling Waterbenuttingsingnieurswese, UP.

Die alombekende prof At Pretorius het die karakterisering van riool en rioolvloei en die eienskappe daaraan verbonde, bespreek en tegelykertyd ook 'n paar mites rondom die onderwerp uitgewys.

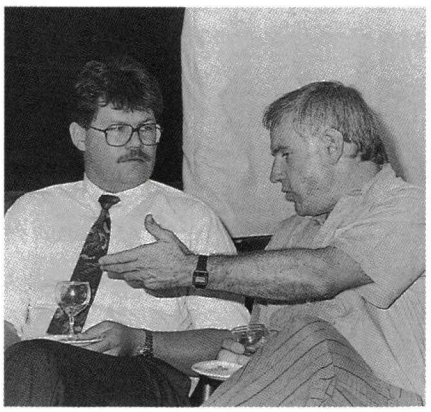
Na afloop van die seminare en demonstrasies is 'n skemerkelk aangebied deur die borge National Chemical Products (NCP).

ONDER: 'n Aantal van die studente van die Technikon van die Noorde wat onder leiding van hul dosent die WISA seminaar bygewoon het, kyk hier na 'n demonstrasie.



Van links: Prof At Pretorius en mnr Johan Botha (beide van Waterbenuttingsingenieurswese, UP), mnr Dries Louw van ERWAT (East Rand Water Care Company) en prof Jan Malherbe, die dekaan van die Fakulteit Ingenieurswese, UP.

Mnr Herman van der Westhuizen (regs) van Waterbenuttingsingenieurswese besig met een van die demonstrasies vir belangstellendes na afloop van die seminare.



By die WISA seminaar: mnr JA St Arnaud en mnr Smuts Marais bespreek watersake.

Waterlab receives certificate for high quality

Mr Mike Smith (left) of THV Rheinland hands the certificate of compliance to Dr Bob Smith, Programme Manager: Analytical Services, CSIR.

A CSIR waterlab, the Analytical Services Programme at Watertek in Pretoria, has been awarded a certificate for complying to European quality standards.

After a recent audit of the Programme's facilities, personnel, methodology and quality control procedures, it became the first commercial and water analysis laboratory in South Africa to be awarded a certificate of compliance to the Quality Management System of the European Standard EN 45001: General Requirements for the Operation of Testing Laboratories. EN 45001 is widely recognised internationally and can be equated to ISO guide 25 (on which SABS 0259 is also based), which is the laboratory equivalent of the ISO 9000 series of quality standards for manufacturing organisations.

The quality management system established and maintained by the CSIR waterlab is for the chemical analysis of water and wastewater for a total of 52 determinands. The audit was conducted by THV Rheinland (SA).

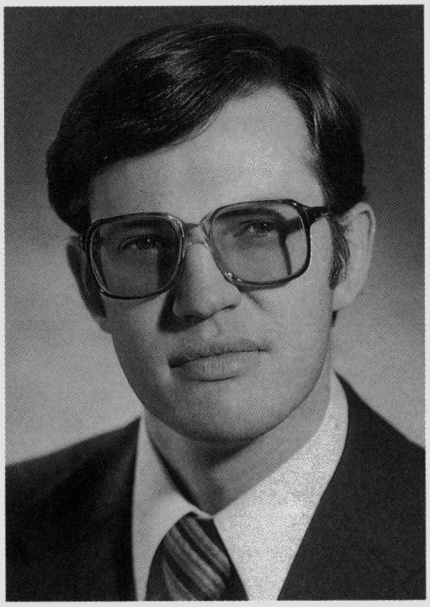
Stewart Scott enter the environmental management field

Consulting engineers Stewart Scott Inc. have widened the scope of services they offer clients by establishing an Environmental Unit. They have appointed well-known water scientist, Dr Herman Wiechers, to head up the Unit and have been operating since February 1993. Dr Wiechers is assisted by Peter Teurlings, environmental specialist, previously from Department of Environment Affairs .

According to Bill Alexander, environmental division director at Stewart Scott, the company has always been active in the environmental field in that most roads, urban development and water and sewage projects have environmental aspects to them which have to be addressed.

"We are also very active in the modelling of the water and air environments through our Mathematical Modelling Unit run by Dr Bill Pitman and Dr Chris Herhold," he says.

Stewart Scott has formed a close working relationship with the specialist mining environment firm Pulles Howard & de Lange and together they offer the full range of environmental management services.



Dr Herman Wiechers, manager of Stewart Scott's newly established Environmental Unit.

The company has adopted the key elements of the Fédération Internationale des Ingénieurs Conseils policy statement on the environment. Because of their professional training and background, engineers have a particular role and obligation towards the protection of the environment. Stewart Scott endeavours to provide leadership in achieving sustainable development - development that will meet the long term needs of future generations without causing major modifications to the earth's ecosystems.

One of the general actions they endeavour to apply is to provide information to clients, the public and government about environmental problems and how adverse effects can be minimised. Furthermore, they strive to recommend that an integrated environmental management procedure be performed as part of all relevant projects and to urge clients to prevent or minimise the adverse environmental effects of projects in all phases, that is, initial planning, design, construction, commissioning, operating and decommissioning.

Pesticide levels surveyed in groundwater

The Hex River Valley is as well known for its autumn beauty as for the table-grapes grown in this Valley.

"Worldwide concern has been expressed regarding the occurrence of pesticides in groundwater. These concerns are especially valid in those areas where groundwater resources comprise the main source of drinking water as pesticide contamination will affect the drinking water supplies." This was said by Mr John Weaver of Watertek, CSIR (Stellenbosch), in his report to the Water Research Commission on pesticide levels in groundwater investigated in two selected areas of intensive agriculture in South Africa.

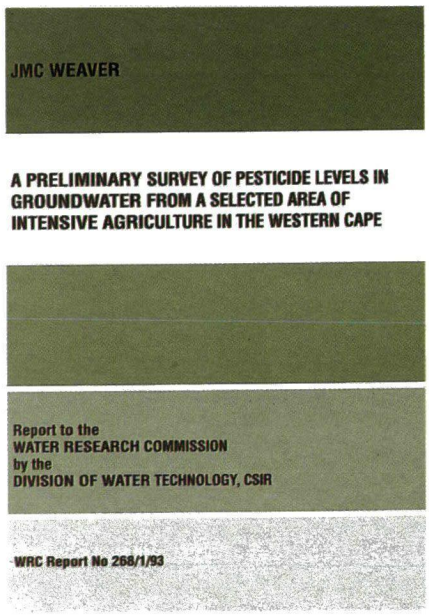
Phase I of the project investigated the levels of pesticide found in the groundwater in the Hex River Valley where tablegrapes are cultivated intensively, while phase II of the project investigated the persistence of atrazine, a herbicide, in the soil profile at the Vaalharts Irrigation Scheme.

Copies of the report entitled **A preliminary survey of pesticide levels in groundwater from a selected area of intensive agriculture in the western Cape** (WRC report no. 268/1/93), are available free of charge from the Water Research Commission, PO Box 824, Pretoria 0001. (Please note: Overseas orders will be charged a list price of $ 20.)

In 1988 the Groundwater Programme, Division of Water Technology (Watertek) CSIR, submitted a project proposal to the Water Research Commission (WRC) to investigate pesticide levels in groundwater.

The aim of this investigation as proposed was:

- to ascertain the problem level of pesticide in a selected area; in other words



  - are the pesticide levels so low as to be of no concern; or
  - are the pesticides present at sufficiently low levels that they can be regarded as *contaminants;* or
  - are they present at such levels that they are *pollutants.*
- results of this survey would indicate whether surveys should be necessary in other areas.
- should further surveys be indicated, the methods and procedures for the surveys would have been established.

It was decided to investigate the "newer generation" pesticides.

HEX RIVER VALLEY

The Hex River Valley was identified as a most suitable study area in that:

- intensive use is made of pesticides during the fruit-farming activities;
- the various processes of the hydrological cycle in the area and the geological controls are well understood; and
- physical data on potential sampling sites are (readily) available.

During the 1980's an intensive hydrogeological survey of the Hex River Valley was conducted by the Department of Water Affairs in order to explain the observed deterioration in quality and quantity of the groundwater over the past 20 years. Consequently a database of some four hundred boreholes in this area, (some of which are shallow but most of which are deep,) is available.

The Hex River Valley area receives winter rains averaging between 240 and 320 mm per annum. During the summer months extensive irrigation takes place. The precipitation due to irrigation in December and January is 125 mm per month, which is higher than the average maximum monthly rainfall of 50 mm in June. The steep valley sides comprise quartzites of the Table Mountain Group and the valley floor is made up of alluvials overlying shales of the Bokkeveld Group. Where the mountain streams enter the valley, extensive alluvial fans have developed.

SAMPLING

Eight shallow wells were chosen for groundwater sampling points. In addition to these eight wells four tile-drains were identified as sampling points to give a total of twelve sampling sites.

Considering the irrigation practice and winter rainfall in the Valley, it was decided that the groundwater should be sampled three times per year;

- July for the winter rainfall and maximum water-table,
- October/November after maximum pesticide application, and
- February following maximum appli-

The researcher, Mr John Weaver, at one of the tile-drains in the Hex River Valley.

cation of irrigation water and when water-table levels are reaching a minimum.

Detailed records of types and quantities of pesticides in use in the Valley were obtained. The pesticides in use were assessed in terms of

- potential impact on groundwater
- toxicity;
- quantity used.

The pesticides were then grouped in three categories with category 1 being those which pose the greatest threat in terms of groundwater contamination.

Due to the high cost of analysing for the full range of pesticides in use in the Hex River Valley, it was resolved that only certain pesticides would be tested for, namely: aldicarb, aldicarb sulphone, dimethoate, fenamiphos, fenamiphos sulphone, fenamiphos sulfoxide, methidathion, mevinphos, nuarimol, penconazole, propoxur, prothiofos, simazine.

Analysis for the pesticides was performed by the laboratory of the South African Bureau of Standards (SABS).

RESULTS

The target pesticides were not detected in the shallow ground water of the Hex River Valley, although the groundwater and soil conditions (a shallow water-table, an unconfined aquifer, coarse soils with a low clay content, a low pH and high hydraulic conductivity) are all conducive to pesticide leaching and concomitant contamination of the ground water.

The results of the analyses for the identified pesticides showed that **none** of the pesticides were present, in any of the samples, in quantities above the detection limit. The detection limit was 0,005 mg/ℓ for all the pesticides, except aldicarb which had a detection limit set at 0,025 mg/ℓ.

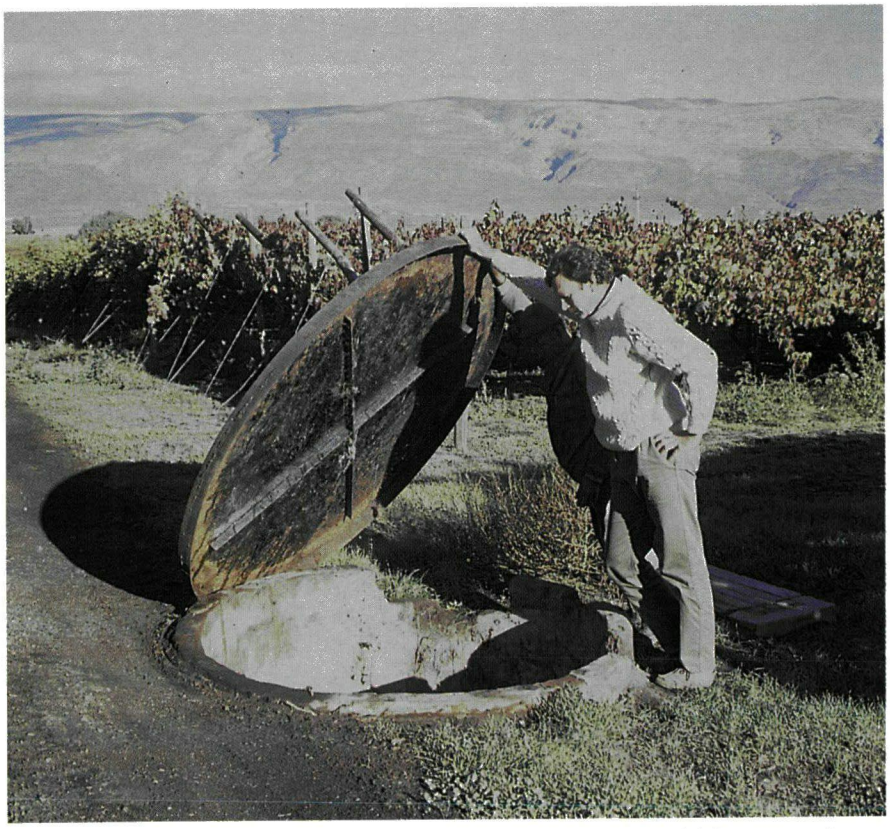
However, the presence of high levels of nitrate and potassium in the water samples collected showed that leaching of surface applied agricultural chemicals does take place. Nitrate, phosphate and potassium are used extensively in the Valley as fertilizers. As leaching does take place, it is expected that at least the potential does exist for pesticides to reach the groundwater-table.

Since no pesticides were detected in the groundwater, this indicates that

- either processes occur which prevent or retard the pesticides, but not nitrate and potassium, from reaching the water-table
- or other processes degrade the pesticides before they can reach the water-table.

VAALHARTS IRRIGATION SCHEME

Concurrent with the Hex River Valley investigation the Hydrological Research Institute (HRI) of the Department of Water Affairs and Forestry carried out an inten-



Mr John Weaver and a farm worker checking one of the wells which was used as a groundwater sampling point for this reseach project. In the background some of the vineyards can be seen

sive investigation of the occurrence of certain pesticides in surface water and, to a lesser extent, in groundwater of the Vaalharts Irrigation Scheme. The HRI investigation monitored seven pesticides: atrazine, parathion, trifluralin, carbofuran, EPTC, bromoxynil and endosulfan. These pesticides were selected as being representative of the main pesticide groups, the triazines, carbamates, organochlorines and organophosphates.

The WRC research project was consequently extended in order to investigate the atrazine concentration in the soil profile at Vaalharts. It was proposed that this information would then be used to determine whether the rate of vertical transport of the herbicide is faster or slower than its rate of breakdown and thus determine the probability of encountering the herbicide in groundwater.

The soil profile sampling was carried out in collaboration with the HRI, taking into account the distribution of sampling points and the results of their previous investigation.

The Vaalharts Research Station was selected for the WRC project investigating atrazine residues in the soil profile. This is the only place at the irrigation scheme where atrazine is still in use as a herbicide. Atrazine is applied prior to the planting of maize.

Sampling was carried out in three fields in close proximity where atrazine had been applied three months, 15 months and 27 months previously. A short distance away was another field where atrazine had been applied 63 months previously.

At these sites the soil profile showed that the upper zone is dark red-brown soil with an abundance of organic material. The neutron probe tubes in these fields showed that at approximately one metre the soil is saturated.

Water samples were collected from two boreholes which are situated down-gradient of the research station. A water sample was also collected from a subsurface drain which drains these fields.

No residual atrazine was found in the soil profiles of the four fields where atrazine had previously been applied, nor in the borehole water sampled. The researcher concluded that:

- either all the atrazine has been flushed out by percolating irrigation water; or
- the atrazine has been degraded.

CONCLUSIONS

From the results of this second phase of the project, the following conclusions were reached:

- None of the target pesticides were detected at either study area, even though elevated nitrate levels in the groundwater proved that leaching of agricultural chemicals does take place. The most probable reason for non-detection of pesticides is that the pesticides have been degraded due to hot weather conditions and low soil pH.
- Low soil pH leads to a lower half-life for atrazine, which has been reported by other researchers. Indications are that no atrazine would be found at the Vaalharts study site after 90 days.
- Low soil pH, however, leads to a longer half-life for other pesticide groups. Aldicarb sulphone, for example, has a hydrolysis half-life of 3,5 weeks in water with a pH of 8,0 water, but 347 weeks in pH 6,0 water. Thus soil pH plays a very important role in pesticide breakdown rates.

The researcher concluded that under the prevailing climatic and soil conditions of the two study areas, degradation of the pesticides is such that pesticide occurrence in groundwater is below the currently accepted limits. At such low concentrations, human health would not be at risk using groundwater found in these areas as drinking water.

However, Mr Weaver felt that routine monitoring for certain target pesticides in groundwater should be encouraged to provide early warning of groundwater contamination from this source.

Pelletisation studied in upflow anaerobic sludge bed systems

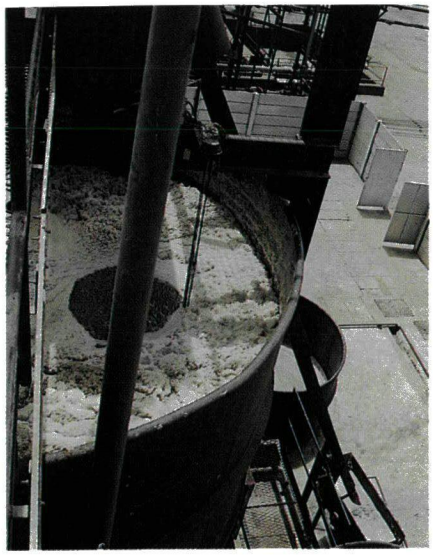
The characteristics that waste must possess to stimulate bio-pellet formation in upflow anaerobic sludge bed (UASB) systems could be identified in a UCT study.

A report summarising the results of a research project on the formation of bio-pellets in upflow anaerobic sludge bed systems has been released by the Water Research Commission in Pretoria.

The project focused, in particular, on pellets composed of a polypeptide matrix binding the anaerobic organisms in the sludge into aggregates. An hypothesis for the bio-pellet formation has been developed and validated against literature and experimental observations. From the hypothesis the characteristics that a waste must possess to stimulate bio-pellet formation could be identified. A mathematical model describing the kinetic behaviour of the pelletised system could also be developed.

The research was conducted at the University of Cape Town by the Water Research Group and was financially supported by the Water Research Commission.

Copies of the report entitled **Pelletisation in upflow anaerobic sludge bed (UASB) systems (WRC Report 249/1/93)** are available free of charge from the Water Research Commission, PO Box 824, Pretoria 0001. (Overseas price: $20).



Wastes that contain principally short-chain fatty or organic acids or their salts very likely will generate little or no pellets and hence will not be suitable for treatment in UASB system.

Wastes that contain an appreciable fraction of carbohydrate or protein in soluble and (possibly) colloidal form should generate a pelletised sludge bed and be suitable for treatment in a UASB system.

Wastes consisting principally of lipids (eg oleic acid) will not generate a pelletised sludge. Such wastes might generate a sludge bed, but of a gelatinuous nature.

The researchers, RE Moosbrugger, PALNS Sam-Soon, MC Wentzel, GA Ekama, RE Loewenthal and GvR Marais, say in the report that anaerobic digestion using the upflow anaerobic sludge bed system has great potential application for many different types of wastes. The principal benefits of the system are the following:

- Loading rates can be up to seven times greater than those for completely mixed systems, which implies that smaller reactor volumes are required.
- High nitrogen removal, in fact, the report says the upflow anaerobic sludge bed system is the only anaerobic system that can remove significant concentrations of nitrogen.
- No artificial mixing of the mixed liquor is required. This can be an expensive and difficult operation in completely mixed systems.
- No separate gravity sedimentation tanks are required.

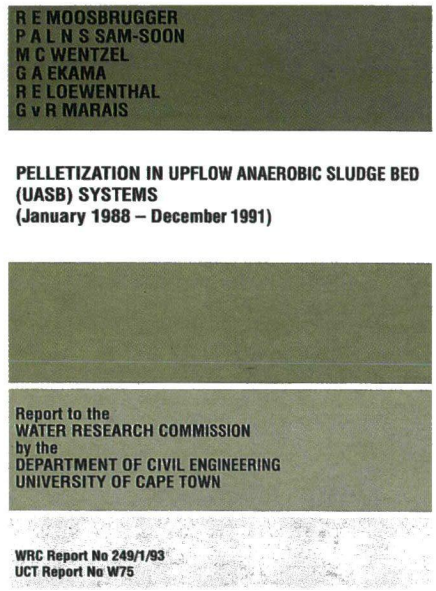
PELLETS

The report says the successful application of upflow anaerobic sludge bed technology hinges on the generation of sludge aggregating into pellets, to facilitate retention of the sludge in the reactor. However, by the mid 1980s the causes and mechanisms for pelletisation in anaerobic upflow systems were ill-defined and not understood.

In 1985 the University of Cape Town's Water Research Group were approached by a consultant to conduct a feasibility study of pelletisation in an upflow anaerobic sludge bed system treating apple juicing waste waters. This investigation proved very successful in that this waste water generated a clearly defined pelletised sludge bed in the anaerobic upflow system. The investigation also exposed the need for further research on upflow anaerobic sludge bed systems for potential application to other waste waters.

In 1988 a three year contract was set up between the University of Cape Town and the Water Research Commission with the following principal objectives:

- To develop an hypothesis for pelletisation in upflow anaerobic sludge bed (UASB) systems;
- To verify the pelletisation hypothesis;
- To develop a mathematical model describing the kinetic behaviour of UASB systems;
- To assess H_2CO_3*alkalinity requirements and pH control in UASB systems;
- To develop a set of process design, operation and control strategies to optimise the UASB system;
- Develop a simple experimental method for measurement of H_2CO_3* alkalinity and short-chain fatty acids.



RESULTS

The researchers say an intensive experimental investigation was undertaken to identify strategies for operation and control of the pelletised UASB system. In this regard, provision of H_2CO_3*alkalinity in adequate concentrations to ensure the minimum bed pH > 6,6 was identified as essential. Guidelines for provision of this alkalinity requirement were set out, eg recycles, point of alkalinity addition, etc. As part of the control strategy a simple titration method was developed to measure both H_2CO_3*alkalinity and short-chain fatty acids concentrations in aqueous solutions containing also known concentrations of other weak acid/bases.

The research work summarised in this report has addressed and met all the objectives set out at the start of the contract, except two, namely, pelletisation by introducing hydrogen from an external source and the formulation of models for mineral precipitation.

Researchers evaluate prototype capillary UF membranes

The hydrodynamic behaviour and performance of prototype capillary ultrafiltration modules were investigated by two researchers at Membratek (Pty) Ltd in Noorder-Paarl.

The study, which was sponsored by the Water Research Commission, found that module pressure drop may be predicted by a combination of the Blasius and Darcy relationships for friction losses through pipes. Although not exact, the predictions may be used as a practical tool in the design of capillary systems.

The prototype capillary modules showed performance characteristics similar to tubular units, with the major advantage of lower pressure drop at increased flow velocities. This may be exploited to achieve better control of the dynamic gel-layer thickness with positive effects on membrane flux.

Copies of a report summarising the research results are available from the Water Research Commission, PO Box 824, Pretoria 0001. The report is entitled **The evaluation of prototype capillary ultrafiltration membranes in application studies (WRC Report 397/1/93).** Overseas price: $20.

The first phase of the project was performed in the wet- laboratory of the Institute for Polymer Science at Stellenbosch University. This laboratory was equipped with the necessary utilities, especially cooling facilities required for accurate feedwater temperature control to ensure controlled experimental conditions as well as reliable plant monitoring and data collection.

APPLICATIONS

In the second phase, capillary modules were included in two application studies to evaluate their performance. The first was a pilot study concerning the use of ultrafiltration on seawater as pretreatment to reverse osmosis. This study was conducted at West Point Fishing Company, St Helena Bay, which provided the necessary facilities. The second application study entailed the decolourising of natural water and was performed on the premises of Membratek.

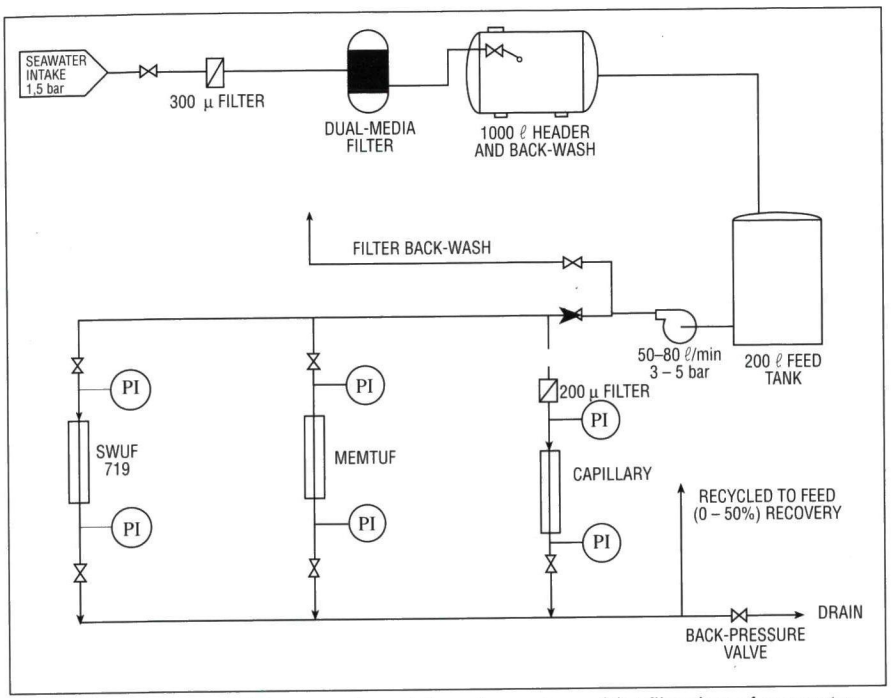
HYDRODYNAMICS

According to the two researchers, NKH Strohwald and A Wessels, the hydrodynamic characteristics of the capillary module are an important consideration in the design and configuration of a full-scale ultrafiltration plant. Module pressure drop specifically has a direct bearing on the configuration of the plant, dictating attainable circulation rates, which in turn affect membrane performance and recovery rates.

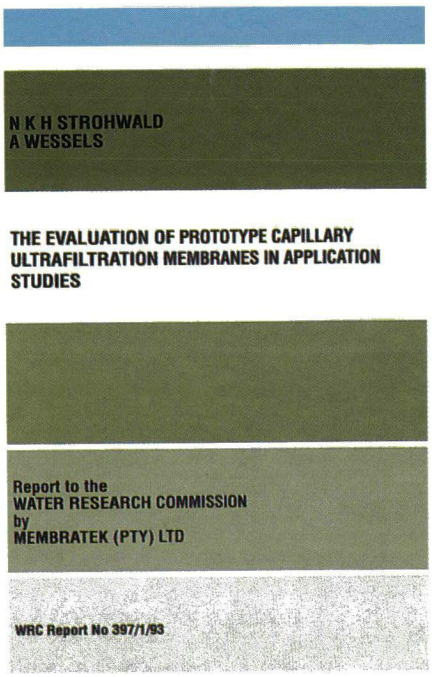
Experiments were therefore performed to determine the module pressure drop at different flow velocities in an effort to gain an insight into the hydrodynamic characteristics of these modules.

The total pressure drop consists basically of two components, namely, the pressure

Membrane modules.



Schematic lay-out of the experimental equipment used for filtration of seawater.



drop due to resistance against flow through the capillary (tube friction effect) and the pressure drop due to the flow distribution to and from the tube bundle (in/outlet-effect).

Using the experimentally determined pressure drop data, friction factors were calculated with the aid of the Darcy equation for pressure losses in pipes. A pressure drop model for capillary modules which accounts for capillary diameter and number, as well as fluid characteristics in terms of the flow velocity number, was developed. A very good correlation was obtained between the values of the pressure drop model and those predicted by Blasius.

The experimental data and the pressure drop model therefore corroborate that the Darcy equation, in conjunction with the Blasius law for friction factors, may be used as a useful practical tool to predict hydraulic pressure drop across any capillary module.

ADVANTAGES

The researchers say some of the advantages of the capillary modules were identified as the following:

- Due to the parallel configuration of the capillaries, the pressure drop across the capillary bundle is considerably less than that of a series configured tubular module of similar membrane area. It is therefore possible to operate at higher linear flow velocity for increased turbulence. This in turn results in better control of the dynamic gel-layer thickness with resultant higher flux.
- The high packing density (ratio of membrane area per volume) together with low cost of construction, makes this configuration a potential candidate for the clarification of a variety of feed waters.
- Membrane productivity may be increased and fouling may be controlled by adopting higher than normal flow velocities (when compared to series configured tubular modules and standard chemical cleaning methods.

The researchers say the current capillary membranes and prototype modules evaluated in this study have demonstrated possibilities in a number of applications. With minor changes to the present design and finish, these modules may be considered to be a potential commercial product.

Dual Digestion of sludge: fin

A three-part document summarising the final results of an extended research project on the dual digestion treatment process for sewage sludge can now be ordered from the Water Research Commission.

The research was carried out by the Division of Water Technology at the CSIR in collaboration with the Milnerton Municipality, the University of Cape Town and Afrox Ltd., and the researchers, HA de Villiers, GA Ekama, K Kenmuir, SJA Laubscher and JR Messenger, were financially supported by the Water Research Commission.

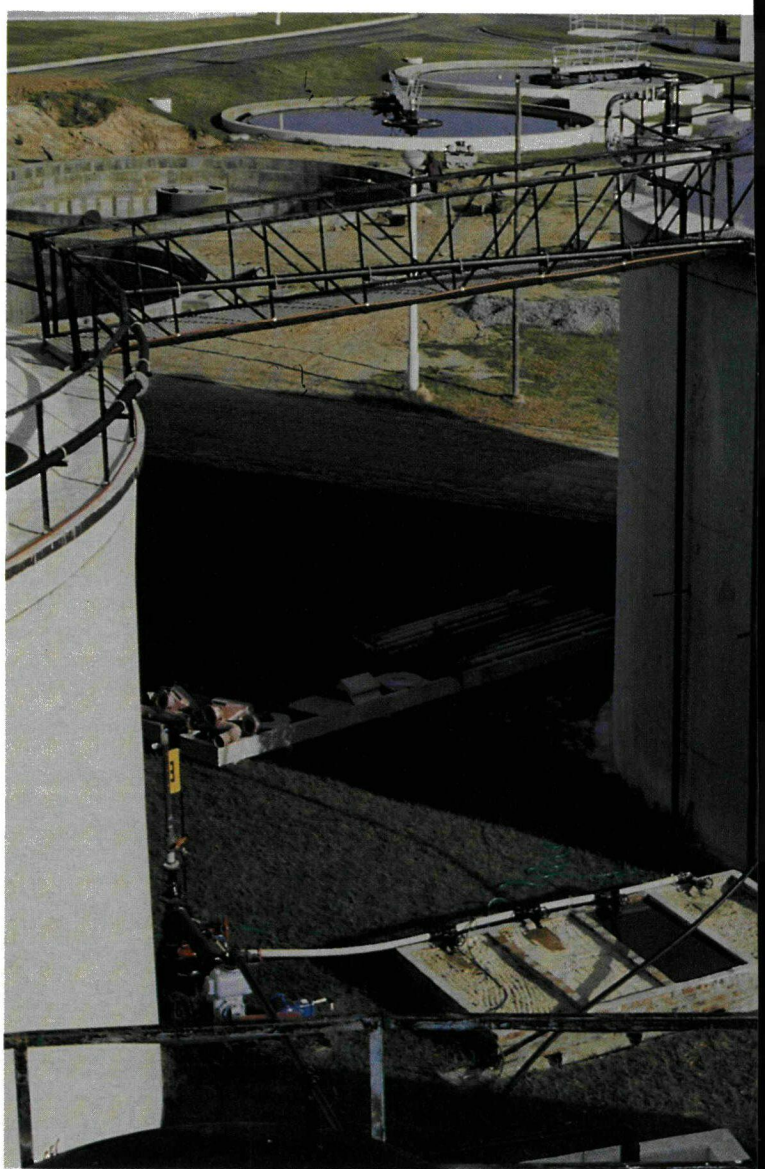
The potential advantages offered by the dual digestion process motivated the Water Research Commission to initiate research, first at pilot scale level and thereafter at full-scale level so as to evaluate and optimise the process under South African conditions.

The publication can be obtained, free of charge, from the Water Research Commission. Please write to the Librarian, Water Research Commission, PO Box 824, Pretoria 0001. The publication consists of the following three parts, which may be ordered separately:

- **Part 1: Overall system performance** (WRC Report 189/2/92) deals with the actual research carried out, the operation of the full-scale dual digester plant and the results obtained. (Overseas price: $20).
- **Part 2: Aerobic reactor performance** (WRC Report 189/3/92) deals in detail with the stoichiometry and kinetics of biological heat generation in the aerobic stage of dual digestion. (Overseas price: $25).
- **Part 3: Evaluation of the technology for practical implementation** (WRC Report 189/4/92) provides an overall view of the dual digestion system to decision-makers in order to assist them in assessing the suitability of the process for their specific applications. (Overseas price: $20).

Dual digestion is an alternative treatment process by means of which sewage sludges can be pasteurised and stabilised. The application of the technology is finding increasing favour in both the USA and in Europe as a method designed to improve on the performance of the conventional anaerobic digestion process and also to produce a final product which is environmentally more acceptable.

Research on the process to assess its suitability for application to the South African environment was initiated by the Water



One of the digesters used in the research at P

l evaluation results available

Research Commission and undertaken by a number of organisations.

Johannesburg City Council carried out pilot-scale research on the aerobic phase of the two-stage process. Milnerton Municipality, in Cape Town, used a full-scale system to evaluate both the aerobic and anaerobic phase of the process, utilising pure oxygen. Cape Town City Council also carried out full-scale research on both phases of the process, but utilised air for their system.

The experience gained with the dual digestion systems which have been in operation overseas, together with the data and practical experience obtained with the process through research in South Africa, are used to evaluate the technology for implementation locally. Aspects which are covered in the publications are the technology itself, the design and practical considerations for the establishment and operation of the system, the quality of the final product that can be expected and finally the economic implications.

dam Wastewater Treatment Works, Milnerton.

SLUDGE TREATMENT

The development of an urbanised South Africa will result in an increasing number of wastewater treatment works which will serve an ever-increasing percentage of the population. The volume of organic sludge produced by these installations will also increase accordingly and treatment facilities will therefore have to be provided in order to accommodate the expected growth in demand.

Facilities for the treatment of organic sludges, which originate as by-products of the primary and secondary treatment processes incorporated in a wastewater treatment plant, can represent up to 50 per cent of the capital and operating budget of such a plant. The effective and efficient employment of capital to establish sludge treatment facilities can therefore play a significant role in the economics of a treatment plant. A fair amount of effort has therefore been devoted, and will continued to be required, to the development and improvement of sewage sludge treatment technologies. Past research and development has ensured that a large number of alternative technologies are available to address sludge treatment problems, whilst present and future research will be aimed primarily at improving their effectiveness and efficiency.

ENVIRONMENTAL AWARENESS

The goal of sludge treatment requires that the solid fraction of waste water, after being separated from the liquid fraction, be treated and disposed of in an aesthetically and environmentally acceptable fashion. The pressure of urbanism and of resulting production of associated wastes such as sewage sludge have created a greater awareness of the potential detrimental effects on the environment. Policies on the disposal of treated sewage have therefore had to be reviewed to ensure that mankind and the environment within which he lives be adequately protected.

One result of this international awareness of the need for safer and more acceptable methods of disposal is that, in addition to the stabilisation of the organic content of the sewage sludge, hazardous substances have also to be eliminated or reduced to acceptable levels.

The site and method of final disposal for the sludge will determine the levels to which toxic chemicals, heavy metals and

HA DE VILLIERS
JR MESSENGER
K KENMUIR
SJA LAUBSCHER
GA EKAMA

EVALUATION AND OPTIMIZATION OF DUAL DIGESTION OF SEWAGE SLUDGE
PART 1: OVERALL SYSTEM PERFORMANCE

Report to the
WATER RESEARCH COMMISSION
by the
DIVISION OF WATER TECHNOLOGY, CISR
MILNERTON MUNICIPALITY
UNIVERSITY OF CAPE TOWN
AFROX LTD

WRC Report No 189/2/92

JR MESSENGER
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HA DE VILLIERS
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SJA LAUBSCHER

EVALUATION AND OPTIMIZATION OF DUAL DIGESTION OF SEWAGE SLUDGE
PART 2: AEROBIC REACTOR PERFORMANCE

Report to the
WATER RESEARCH COMMISSION
by the
DIVISION OF WATER TECHNOLOGY, CSIR
MILNERTON MUNICIPALITY
UNIVERSITY OF CAPE TOWN
AFROX LTD

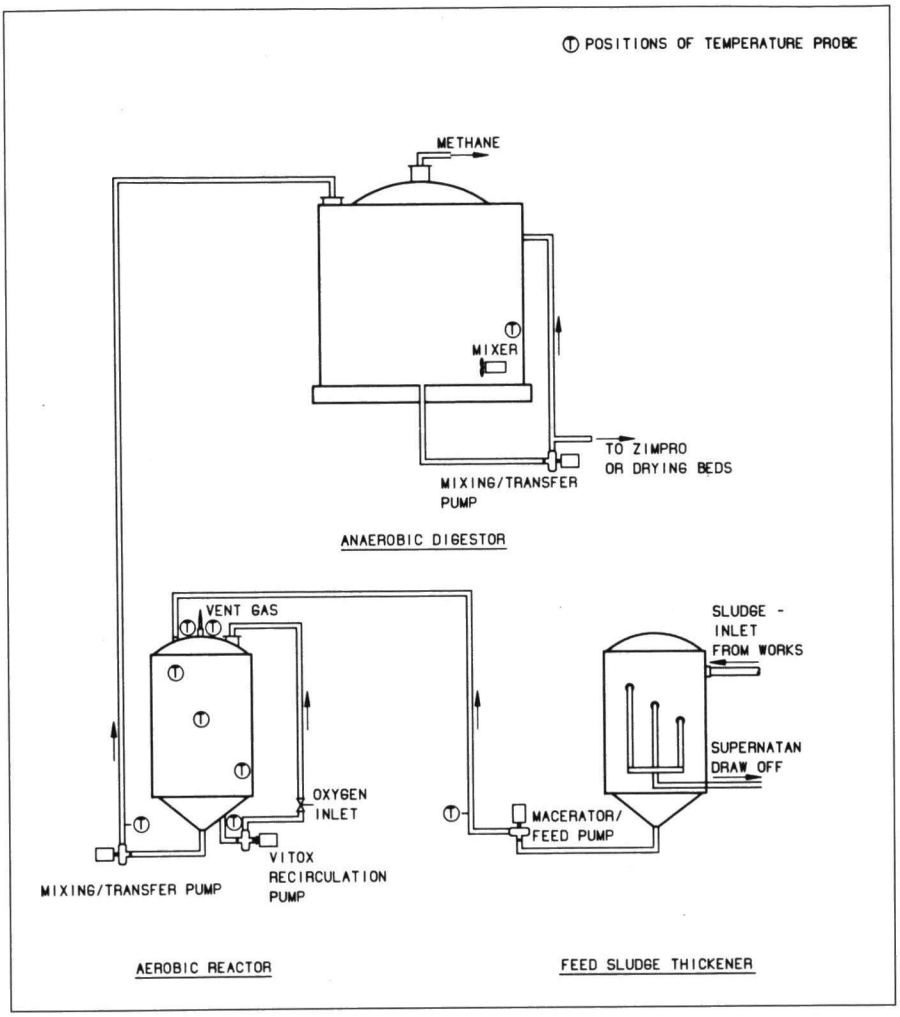
WRC Report No 189/3/92

SJA LAUBSCHER
K KENMUIR
HA DE VILLIERS
JR MESSENGER
GA EKAMA

EVALUATION AND OPTIMIZATION OF DUAL DIGESTION OF SEWAGE SLUDGE
PART 3: EVALUATION OF THE TECHNOLOGY FOR PRACTICAL IMPLEMENTATION

Report to the
WATER RESEARCH COMMISSION
by the
DIVISION OF WATER TECHNOLOGY, CSIR
MILNERTON MUNICIPALITY
UNIVERSITY OF CAPE TOWN
AFROX LTD

WRC Report No 189/4/92



Schematic layout of full-scale dual digestion plant at Milnerton, near Cape Town.

pathogenic organisms which may be contained in the sludges have to be eliminated or inactivated.

As a result of the trend towards environmental awareness, pressure has increased on managers and designers of wastewater treatment facilities to produce treated sewage sludges which are acceptable in terms of their specific final disposal option. Health authorities in many countries have laid down parameters through regulations and guidelines intended to exercise control over the disposal of sewage sludges and thereby reduce the health risk to the public.

The Department of National Health and Population Development in South Africa under whose jurisdiction the re-use of sludge as a disposal option will fall, has compiled Guidelines which define the classes of sludge after different types of treatment, together with the types of permissible re-use options that will be permitted in South Africa. A summary of the requirements for each of the four types of sludge is given in the publication.

PROBLEMS

One result of the more stringent measures to control the disposal of sewage sludge on current sludge treatment practices in South Africa is that many authorities will be faced with a situation where the following issues have to be addressed:

- Traditional methods of sludge disposal such as land filling or application on land as a soil conditioner will have to be reviewed in the light of the requirements of the guidelines laid down by the Department of Health. In future, the final disposal of sewage sludge will depend primarily on the quality of the end-product achieved after treatment.
- Limited areas of land available in and around wastewater treatment plants, together with the danger of diffused pollution, especially within the urban environment, preclude traditional methods of disposal of sewage sludge such as landfilling on site.
- A higher quality of treated sludge will be required so as to be able to dispose of the end product in alternative ways.
- A higher quality end product will necessitate stricter control of industrial effluent as well as improvements to sludge treatment facilities. In many cases, improved sludge treatment will have to include a higher grade of stabilisation and some form of disinfection or sterilisation.

The dilemma which many local authorities responsible for the treatment of sewage sludge have to face is that they may have unit processes in their wastewater treatment works which are not sufficiently effective to achieve a desired standard. Despite the fact that technology and sludge treatment processes are available to produce a high quality final product, it could well be extremely expensive to change to other treatment processes in mid-stream, or to replace existing processes with new ones.

Upgrading of existing treatment facilities is an avenue which will normally provide the most cost-effective method to improve on the quality of treated sewage sludge. New and improved technologies which concentrate on this aspect are therefore of exceptional interest to managers and designers of sludge treatment facilities.

DUAL DIGESTION

A relatively new sludge treatment process which has been developed in the United States of America is dual digestion of sewage sludge which combines two individual sludge treatment processes, viz thermophilic aerobic digestion and anaerobic digestion, in a single two-step process.

From experience obtained in the United States of America and Europe it appears that a number of advantages and benefits are offered by this new process.

By employing aerobic digestion as the first step of the two step process, the following are possible:

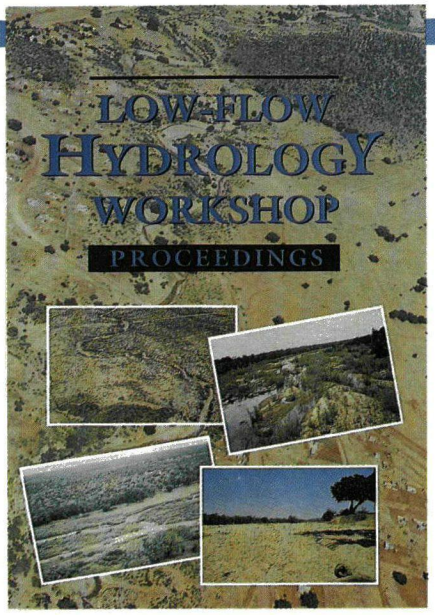
- Disinfection (or pasteurisation) of the sludge can be achieved, provided that a sufficiently high thermophilic temperature and suitable retention time are maintained;
- Due to a retention time of as low as one day in the aerobic reactor, energy and oxygen requirements are lower than would be required for full aerobic treatment of the sludge, while a degree of stabilisation will be achieved;
- Sludge is conditioned and solubilised during the aerobic treatment phase and this enhances the anaerobic digestion of the sludge as well as acting as an absorber for shock loadings which might be detrimental to the more sensitive anaerobic digester;
- The hot sludge from the aerobic reactor (thermophilic range) ensures that the anaerobic digester can be operated at mesophilic temperatures without additional external heating. The anaerobic digester, operating with conditioned and disinfected hot sludge from the aerobic reactor, possesses the following advantages over a conventional externally-heated anaerobic system:
- The methane produced by the anaerobic digester is available as an energy source for purposes other than that of heating the anaerobic digester sludge;
- A retention time in the anaerobic digester which is shorter than that required by conventional anaerobic digestion is possible with a similar or even improved volatile solids removal.

The process as a whole offers other advantages:

- Much more rapid start-up than conventional anaerobic digestion;
- Stable, reliable process performance;
- Simple operation and control which can be automated.

Some of the opportunities that the dual digestion system specifically offers for South Africa are the following:

- Existing anaerobic sludge digestion systems can be upgraded so as to produce a pasteurised sludge simply by adding the thermophilic aerobic stage as a first step. This would permit alternative methods of final disposal of treated sludge.
- By adding an aerobic step to existing anaerobic sludge treatment facilities, treatment capacity can be increased as a result of improved performance and a shorter retention time for anaerobic digestion.
- It may very well be feasible to add an anaerobic stage to existing aerobic sludge treatment facilities so as to increase treatment capacity and also to reduce operating costs due to less oxygen and power being required than for full aerobic treatment.
- A full dual digestion system can be considered as an alternative to other sludge treatment processes.



Laevloei hidrologie in werksessie bespreek

'N Publikasie wat die besprekings en besluite van 'n werksessie oor laevloei hidrologie dokumenteer, kan gratis vanaf die Waternavorsingskommissie (Posbus 824, Pretoria 0001) bestel word.

Die publikasie is 'n samevatting van die verrigtinge tydens 'n tweedaagse seminaar en werksessie oor ekohidrologie en laevloei hidrologie wat in Februarie 1993 in Pretoria gehou is.

Mnr Hugo Maaren, navorsingsbestuurder by die Waternavorsingskommissie, sê, die onlangse droogtes het die bestuursprobleme wat deur lae watervlakke in suider-Afrikaanse riviere veroorsaak word, weer skerp in die kollig geplaas. Landelike watervoorrade het verminder, rivierekosisteme is onder kwaai druk geplaas, waterbesoedeling het uiters moeilik geword om te hanteer en selfs grootmaat watervoorrade moes vergoed vir grootskaalse oorplasingsverliese.

Mnr Maaren sê, die Waternavorsingskommissie het in 1991 'n ooreenkoms met die Instituut vir Waternavorsing aan die Universiteit van Rhodes aangegaan om aan die begin van 1993 'n projek oor laevloei hidrologie te loods. Daar was egter 'n behoefte om die navorsingsprioriteite van die projek duideliker te fokus en 'n werksessie is as die aangewese manier beskou om dit te doen.

Toe dit bekend raak dat twee kundiges op die gebied van hidrologie en ekohidrologie, professor Tom McMahon en dr Brian Finlayson van die Universiteit van Melbourne in Australië, Suid-Afrika gaan besoek, het dit die ideale geleentheid geskep vir 'n werksessie oor laevloei hidrologie.

SLEUTELKWESSIES

Mnr Maaren sê, die werksessie het talle sleutelkwessies na vore gebring waaraan aandag gegee sal moet word in laevloei hidrologie en waterbestuur. Die belangrikste kwessies word in die publikasie gelys as die volgende:

- Rivierekosisteme is natuurlike hulpbronne wat ideaal gesproke vir volhoubare benutting bestuur moet word.
- Waterbestuurbesluite het behoefte aan aanvaarbare motivering om gebruik te maak van ekonomiese, sosiale en omgewingskriteria.
- Landelike en ontwikkelende gemeenskappe is meer afhanklik van lae riviervlakke as stedelike en ontwikkelde gemeenskappe.
- Suid-Afrika se waterbronne moet as 'n geheel bestuur word. Die ietwat kunsmatige onderskeidings soos oppervlaktewater en grondwater, normale vloei, surplusvloei en privaat water teenoor openbare water behoort geïntegreer te word.
- Die huidige waterwet het hersiening nodig aangesien dit nie moderne benaderings tot geïntegreerde waterbestuur ten volle ondersteun nie. Veral die voordelige benutting van landelike water, besproeiing uitgesluit, het behoefte aan 'n nuwe omskrywing.
- Laevloei is 'n dinamiese begrip wat data op die deurlopende daaglikse hidrograaf benodig. Korrelasies met maandlikse data moet ondersoek word.
- Vanweë die ruimtelike aspekte van laevloei is een of ander vorm van streeksverdeling van ontleding nodig. Die akkuraatheid van vloeimeting en kontinuïteit in die laer gedeelte van die vloeispektrum moet hersien en verbeter word.
- 'n Duidelike beleid is nodig oor die gebruik van seisoenale riviere vir afvallading toekenning. Veral tydperke van geenvloei moet met omsigtigheid hanteer word.

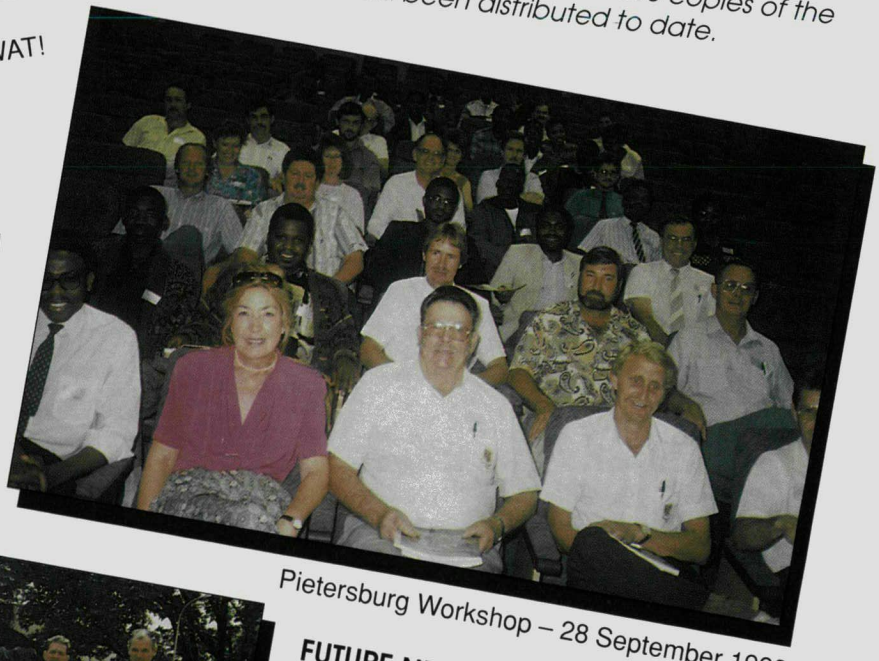
WRC sponsored workshops – well received

Standerton Workshop – 22 September 1993

Eight Water Research Commission sponsored workshops were held throughout South Africa during 1993 to explain the contents of the recently WRC published Operating Guide on Anaerobic Digestion of Waste-water Sludge. Dr Bill Ross, workshop organiser, reported that the success of the workshops could be gauged by the fact that attendance certificates had been presented to 700 workshop delegates while 1 600 copies of the Guide had been distributed to date.

Pretoria Workshop – 24 September 1993 – where all refreshments were sponsored by ERWAT!

Discussions with operating personnel had revealed significant areas of neglect in anaerobic digestion practice such as sludge pretreatment, digester mixing, heating, gas measurement and routine monitoring and control. The availability of the Guide and the presentation of the workshops had greatly rectified these areas of neglect and had assisted in the training of operating personnel to achieve higher operational standards at waste-water treatment plants.



Pietersburg Workshop – 28 September 1993

Potchefstroom Workshop – 1 October 1993

FUTURE NEEDS

Dr Ross said the workshops had identified the following future needs:

- The water industry needs to upgrade the status of operating staff in terms of the important role they play in water pollution control.
- The communication between operating personnel and the designers of treatment works is generally inadequate and needs to be corrected so that improvements in both design and operating procedures are not neglected.
- The organisational hierarchy need to encourage their operating personnel to become members of WISA and participate in the activities of its various technical divisions.

Rainfall-runoff modelling: A UK Perspective

A recent meeting of the British Hydrological Society (BHS) on rainfall-runoff modelling attracted 85 participants representing the National Rivers Authority regions, universities, consultancies and the Institute of Hydrology. The report on this meeting, published in 'Circulation', the newsletter of the BHS, provides some very useful insight into the current practices and approaches to hydrological time-series modelling from a UK point of view.

Starting the proceedings, Dr Howard Wheater identified three generic types of models; black box or metric (e.g. unit hydrograph), conceptual or parametric (e.g. Stanford Watershed Model) and physics-based or mechanical (e.g. the SHE model). Increases in model order are supposedly reflected by increases in the information content of the models, their data and computer resource needs and the range of scenarios that can be simulated. However, there is not necessarily an increase in accuracy or "scientific achievement". The perceived advantage of metric models is that the parameter values can be well identified, permitting regional analysis and assessment of the effects of catchment changes. Parameters of conceptual models are usually meaningful, but not measurable, usually quantified through calibration and are generally unidentifiable. The indeterminacy of optimum parameter values makes regional analysis difficult. Physics-based model parameters are, in principle measurable, but scale differences between the theoretical basis of the parameters and the model grid elements often mean that calibration, or parameter value optimisation, is required. Dr Wheater concluded by suggesting that for ungauged catchments, only metric models are practicable, whilst physics-based models can be used for 'what-if ?' type problems. This does not seem to correspond to the South African experience where the Pitman model (a conceptual type) is used extensively for water resource estimations in ungauged catchments and part of the purpose of the Water Resources of South Africa projects (both the 1980's one and the 1990's update) is to determine regional parameters for this model.

Several participants referred to the limitations of models caused by sparse rainfall data and the fact that this problem has stimulated the use of radar data, particularly for operational applications. Bob Moore from the Institute of Hydrology discussed an approach based on distributed radar data combined with digital terrain models to define the parameters for travel time to the catchment outlet and a runoff production function which could make use of LandSat land-use data. Cliff Dobson of NRA Severn-Trent described an operational flood-forecasting scheme used in the Severn and Trent basins which uses a 26 parameter conceptual model applied to 65 sub-areas in the Severn and 48 in the Trent. The parameters have been derived by calibration from the 40% of sub-areas which are gauged (i.e. about 45 gauged sub-catchments) and regionalisation based on regression with measurable catchment characteristics for the remaining sub-areas. Given the earlier comments by Howard Wheater, it is unfortunate that there is no discussion reported of the success of this parameter transfer exercise.

In the section on the application of models to engineering design only conceptual type models were referred to, providing an indication of those models in current use by engineers. The RORB (a flood design model from Australia) model and the Stanford Watershed model (SWM) received some attention. Both seemed able to produce very good fits in some situations and not so good (to very poor) in others. Howard Wheater commented that, although the SWM model parameters are identifiable from catchment characteristics in theory, this has usually not worked in practice and that attempts to regionalise model parameters had generally proved to be inconclusive. This is the conclusion that has been reached by a number of rainfall-runoff researchers, but the reasons are not very clear. This often leads to two different schools of thought; one that says we need to develop models, or improved model application approaches, that can be used in this way in un-gauged catchments and the other that says we shouldn't bother to try and do something that will clearly not work! Both schools are well represented in South Africa. Tania Jones described the HYRROM daily model which is available in a simple to use, menu-driven PC format. Again, indications are that the parameters have to be determined by calibration and *a priori* identification has not been successful so far. One comment was that menu-driven interfaces are not always desirable developments as they reduce the user's contact with the model to a minimum.

The last session allowed the exponents of physics-based models to have their say and James Bathurst of the University of Newcastle-Upon-Tyne started off with the SHE model (now renamed SHETRAN-UK since the introduction of sediment transport functions). The Newcastle group are currently addressing the question of scaling plot scale measurements of parameters to grid scale values - this is seen by many to be the most difficult problem with the application of physics-based models. New measurement techniques are required that allow observations to be made at model scales and not just point scales. The claim that the model can 'reach the parts that other models could not reach' met with a counter claim from the metric modelling group that simpler models should not be under-valued and have ❑

been used to predict the impacts of land-use and climate change.

Keith Beven, from Lancaster University, asked the question "how can the discipline of rainfall-runoff modelling progress while current models have multiple optimal solutions to a single problem?". He suggested that everyone has to recognise the uncertainties by using measures of belief to evaluate the risk of false prediction. In response to a comment on prior conditioning, based on the modellers perception of hydrological processes, Prof. Beven suggested that this is a valid approach as long as updates are made on the basis of observed information. The question then arose as to whether our knowledge of processes is sufficient to be able to do this.

Brian Wilkinson of the Institute of Hydrology suggested that instead of expressing gloom and despondency about the future of modelling, what is needed is to identify those components of models (or the hydrological cycle) which could be considered to work and then concentrate on those where our knowledge base is poor. The real problem seems to be the unsaturated zone and groundwater components of models. This certainly sounds like a better approach to model development than the ad hoc creation of so-called 'new' models that commonly use the same basic algorithms packaged in a slightly different way. From the South African modeller's point of view it is somewhat comforting to see that, despite the much greater number of researchers and projects involved in rainfall-runoff model research in the UK than locally, they still seem to be facing the same problems and having the same difficulty solving them.

Denis Hughes
Institute for Water Research
Rhodes University

IAHS '95 – Symposia at Boulder, USA.

The XXI General Assembley of IUGG will be held at the University of Colorado in Boulder near Denver, USA, from 2 to 14 July 1995.

The subjects for the symposia and workshops are:

Inter-Association meetings

"Clouds, convection and land surface processes" is the proposed title for an inter-association symposium organised by IAHS and the International Association of Meteorology and Atmospheric Sciences (IAMAS).

Titles proposed for inter-association workshops are:

- Large-scale modelling of the hydrological cycle in mountain regions.
- Remote sensing algorithms in hydrology.
- Dynamic monitoring and estimation of the water balance of the globe and its continents.

Proposed titles for IAHS symposia

- Effect of scale on interpretation and management of sediments and water.
- Man's influence on fresh-water ecosystems and water use.
- Assessing, monitoring and modelling of groundwater and its quality/ Field-scale water flow and chemical transport in the subsurface: modelling, parameter identification and model testing.
- Biogeochemical cycling in snow-covered systems: the dynamics of chemical exchanges between the atmosphere, snow and underlying strata.
- Comparison of tracer technologies for hydrologic systems.
- Modelling and management of sustainable basin-scale water resources.

Proposed titles for IAHS workshops

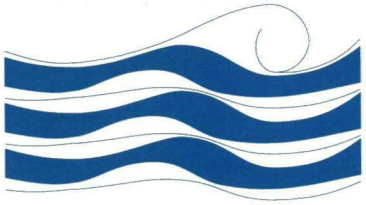
- Hydrology and water resource systems in extreme situations.
- Spatial information systems in hydrology.
- Predictability, uncertainty and prejudice in hydrology.
- Hydrology and water resources of developing economies in the light of possible global change.
- Groundwater (possibly to be associated with the relevant abovementioned symposium).
- Quality assurance in hydrological measurements.

A newsletter on the IUGG Assembley will be distributed in February 1994.

For further information on the IAHS meetings, please contact:

Dr R Hadley
3784 S. Depew Street
Denver
Colorado 80235
USA

Tel. +1 303 9867130
Fax +1 303 8714000
(c/o Dept of Geography)



WATERLIT CD-ROM now on SilverPlatter

Users who are familiar with WATERLIT on CD-ROM will be pleased to hear that it is now available on the very popular SilverPlatter software. Compact Cambridge, who previously produced and marketed the CD-ROM, have sold their electronic publishing interests to SilverPlatter, the world's largest producers of scientific CD-ROM products. SilverPlatter is now producing all the CD-ROM products formerly marketed by Compact Cambridge.

According to Mrs Angela Rethman, manager of the South African Water Information Centre (SAWIC), feedback from users who already have the SilverPlatter version of WATERLIT, indicate that this version is well received and reported to be particularly user-friendly. The Department of Water Affairs and Forestry has installed the network version of this CD-ROM in their Pretoria offices and according to reports received some 20 - 25 users are concurrently utulising this system. The convenience of being able to access the information from a PC in the office is sure to increase the awareness of the valuable information obtainable from this database. Users in the Department of Water Affairs and Forestry who are not yet connected to the network or who wish to have very complex searches undertaken, can approach the Water Affairs library to carry out searches on their behalf.

SilverPlatter has produced a very comprehensive manual to assist users, however, most users find that the instructions in the software are quite adequate. Anyone with queries about WATERLIT or requiring assistance with search strategies, is welcome to contact SAWIC staff by telephone at (012) 841 2048 or E-mail at sawic@csir.co.za.

WATERLIT Thesaurus – an invaluable aid to searching WATERLIT effectively

Indexing of articles for WATERLIT are done by indexers, who all have scientific qualifications and have received special training in indexing. The indexers allocate up to 15 relevant keywords to the article by consulting the thesaurus. The thesaurus contains the specific terms used by the indexers for a concept and relates these to

- broader terms,
- narrow terms,
- more specific terms, and
- related terms.

Use of the thesaurus ensures that the correct term is used; it then is not necessary to include a list of possible alternative terms.

The WATERLIT Thesaurus has been reprinted and copies are available from the South African Water Information Centre at R150.00 per copy.

Sources of water-related information

SAWIC is currently updating a list of sources of water-related information. When completed the list will be made generally available. This list will serve as a "road map" to direct enquiries to the right database or information source. It is requested that anyone with relevant information which should be included in the list, please forward details of the type of information to:

The Manager
South African Water Information Centre
PO Box 395
PRETORIA 0001
Tel. (012) 841 2048
Fax: (012) 86 2869 (SAWIC)
or E-mail to sawic@csir.co.za.

RedR Southern Africa invites applications

RedR (Registered Engineers for Disaster Relief) is a non-political organisation and charity whose main purpose is to supply engineers and other relief professionals for disaster relief work, anywhere in the world.

Generally, the demand is for water, structural or transport engineers to provide water supply, basic sanitation and shelter or to repair damaged roads and bridges. RedR aims to supply suitably qualified, trained and experienced professionals for such work at very short notice. RedR also gives technical advice to relief agencies on any aspect of disaster relief engineering.

REGISTER

RedR's source of engineers for this work is its membership, which comprises several hundred experienced and motivated engineers whose details are kept on a register. An engineer joins the register by passing a detailed interview, designed to confirm that he or she is both professionally and personally suited for disaster relief work. Once on the register, each member continues in normal full-time work, while maintaining contact with RedR through correspondence, local meetings and training courses.

When a relief agency needs an engineer urgently to work in a disaster, it contacts RedR with a description of the work and the type of engineer needed. RedR then contacts all appropriate members on the register. Details of the suitable and available people are then passed on to the agency, which selects and appoints the preferred candidate.

Assignments can last from one to twelve months (typically three months), for which time the engineers are generally given leave of absence from their employers and are paid by the relief agencies. After the assignment they return to their job.

REQUIREMENTS

RedR invites membership applications from engineers and technicians who fulfil the following requirements:

- Humanitarian motivation;
- Age approx 26 - 50;
- Engineering degree or vocational qualification;
- At least 5 years' engineering experience;
- Main expertise in water, sanitation, roads, bridges, buildings, mechanical, electrical, transport or logistics;
- Field experience desirable.

INFORMATION

For more information please contact RedR at 13 Engwena Road, Sebenza 1610. Tel (011) 609-4150. Fax (011) 609-2417.

Weather satellite launched

The latest US weather satellite to be launched is the NOAA-13. Water Newsletter (16893) reports that the $67 million "eye-in-the-sky" will circle the earth every 102 minutes and view the whole planet twice a day.

The report says NOAA tries to maintain two polar-orbiting weather satellites - one crossing the equator in the morning, the other in the evening - so weather in any area is monitored every six hours. NOAA-13 replaces NOAA-11 which has drifted and is crossing the equator too late in the day. In addition to clouds, sea and air temperature, floods and snow cover, NOAA-13 will monitor toxic red tides, El Nino, ocean sewage and fisheries. a NOAA official said information from weather satellites saves industry about $5 billion per year in the US.

Fluoride safe in drinking water

Fluoridated drinking water does not lead to cancer, kidney failure or bone disease, reports the American National Research Council (NRC).

The NRC study, released in August this year, called for research on patterns of fluoride exposure from dental products and food, as well as effects on bone strength and tooth enamel.

With the current standard at four parts per million, a small percentage of the population gets fluorosis, a discoloration of tooth enamel. However, the overwhelming benefits of reduced tooth decay from fluoridated water far outweigh fluorosis problems, the NRC says.

(Water Bulletin 310893)

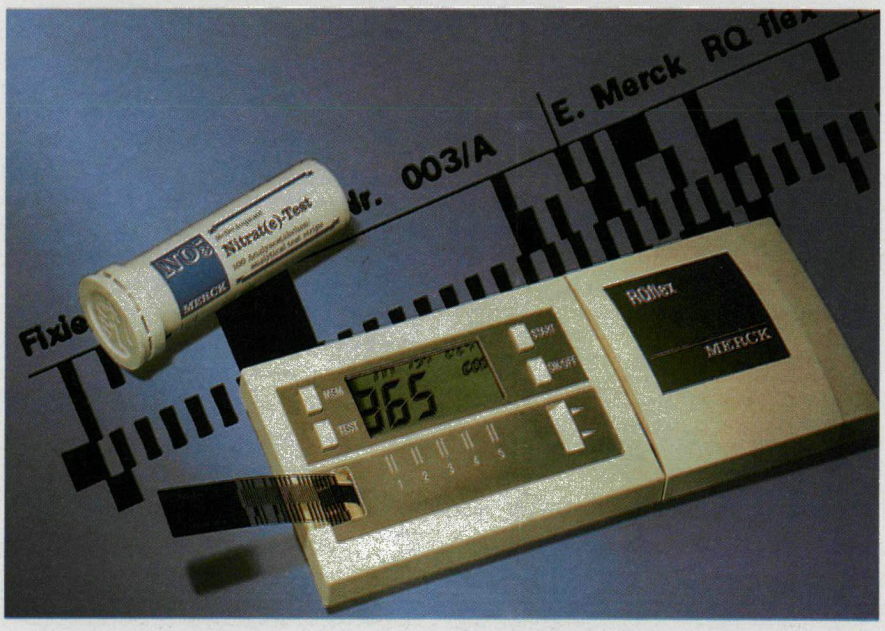
Pocket-size water analyser

Merck has introduced a water analyser which is no larger than a pocket-size calculator, for convenient quantitative on-site measurements. As a "pocket laboratory" the Reflectoquant scans special analysis strips which are dipped into the liquid to be sampled. The strips are biodegradable and have been developed from the existing Merckoquant test strips, already in successful use worldwide. A bar code is included in every pack of analysis strips for calibration and device control.

Merck's David Jeans, product manager: speciality reagent products, said that the Reflectoquant is designed for use by non-experienced users.

"All the chemistry the user needs for making quantitative determinations is incorporated in the analysis test strips which are placed in the Reflectoquant. Another major advantage of the system is that it does not involve the use of chemicals and so there is no chance of polluting the sample or the environment."

At present, 11 parameters have been launched. These include nitrate, peroxide, chromate and pH. A further 14 parameters will be available by the end of the year. The battery powered Reflectoquant can store up to 50 results (time, date, parameter, concentration) in its memory. Measurement data, accurate to 0,5 per cent can be downloaded onto a PC or printer.



Reflectoquant joins a family of mobile water analisers which includes Merck's flagship Spectroquant SQ118 photometer and the recently launched Spectroquant SQ200 photometer. The Spectroquant SQ200 is a fully portable photometer with 62 pre-programmed test methods based on the Spectroquant range of test kits.

This system also has a PC and printer connection for downloading information, as well as an available graphic software package. The SQ200 is very easy to operate and all instrument parameters are controlled by the use of just four function keys.

Enquiries: Mr D Jeans, Merck (Pty) Ltd, PO Box 1998, Halfway House 1685. Tel (011) 315-1100 Fax (011) 315-1353.

Swimming pool water treatment

by Herman N S Wiechers*

There are approximately 400 000 swimming pools in South Africa with a replacement value of about R4,0 billion. Most of these are private pools and represent a significant asset to the private house owner. Effective treatment of the pool water is required to protect this asset and to ensure an aesthetically attractive feature, as well as maintaining hygienic conditions within the pool. The challenge to the swimming pool industry is to provide water treatment processes which are safe, convenient, reasonably priced and simple to operate.

There are three essential steps in effective swimming pool water treatment. Firstly the removal of solid matter, be it floating, suspended or settled material. Secondly, the disinfection of the water to destroy disease causing micro-organisms and for controlling the growth of undesirable biota such as algae. Thirdly, the chemical conditioning of the water to ensure that it is not scale forming, corrosive and irritating to the eyes, nose or throat.

Modern pool water treatment only began in the late 1940s and early 1950s (Powick, 1989). Many different processes have been developed over the last 45 years and new innovations are still being introduced at regular intervals. The trend has been toward simplification and automation. The primary objective is to minimise time spent on pool maintenance and to make it possible for pool owners to manage their own pools.

In this article a brief review is given of the water treatment processes currently most widely used in southern Africa. Their advantages and limitations are discussed and a few promising new processes which claim to overcome some of these limitations are high-lighted.

REMOVAL OF SOLID MATTER

Solid matter is removed from pool water by filtration. The most popular system in use is high-rate sand filtration (up to 50 m/h). Older swimming pool systems may use medium-rate sand filtration (15 - 25 m/h) or diatomaceous earth filters (5 - 10 m/h). These systems are effective in removing fine to coarse suspended solids from swimming pool water. However, chemical treatment using flocculants may be necessary when the suspended solids comprise very fine or colloidal matter. Very high clarity water can be produced by diatomaceous earth filtration, but at a higher cost than for high-rate sand filtration and requiring more maintenance.

Removal of solids is accomplished by manually "vacuuming" the pool once or more per week, a very time-consuming activity. Major advances have been made in the automation of solids collection systems. The process was simplified by the South African invention of automated pool floor suction devices, such as the "Kreepy Krauly", "Barracuda" and "Aquanaut". These devices have been refined to such an extent that they can access most parts of a pool, reducing the need for manual vacuuming to an absolute minimum. As a result they are now considered a standard pool maintenance feature.

DISINFECTION

The most commonly used disinfectant is chlorine. Breakpoint or free-residual chlorination was discovered and introduced in the late 1940s and early 1950s. A variety of chlorine compounds are commercially available for pool disinfection, amongst others: calcium hypochlorite (so-called "granular chlorine"), trichloro-isocyanuric acid (so-called "stabilised chlorine") and sodium hypochlorite (so-called "liquid chlorine"). Furthermore, there are a number of electrolytic chlorine generating devices on the market which generate gaseous chlorine.

Chlorine is a very effective disinfectant but has various limitations. These include:

- Operation within a narrow pH range, e.g. 7,2 to 7,6.
- Dissipation by sunlight.
- Reaction with, *inter alia*, ammonia and urea, organic and inorganic reduced compounds such as iron (Fe^{2+}) and manganese (Mn^{2+}).
- Can cause eye, nose and throat irritation.

Alternative disinfectants which do not have some of these drawbacks are polymeric biquanide (eg Baquacil), sodium bromide (eg Aquazone) and ozone. However, to date these alternative disinfectants have found only limited application in southern Africa.

A major development in the pool disinfection field has been the method of disinfectant application. Disinfectant demand can vary significantly, depending on a number of pool water parameters, such as temperature and pollution load. A common practice is to add a cup of HTH to the pool every second evening, However, this is rather inconvenient as well as resulting in major problems when the pool owner is away from home. This led to the development of a large number of automatic disinfectant dosing devices, *inter alia*, the slow dissolving pool "pill" (trichloro-isocyanuric acid - TCIA), the "month mate" (a device containing ten "pills") and the "chloro boy" (a device containing slow dissolving calcium hypochlorite).

HEALTH RISK

The average bather is reported to add between 50 - 600 x 10^6 bacteria on first immersion (Powick, 1989). Fortunately, most of these bacteria are non-pathogenic, but infections are introduced into the water and cross-infections can and do occur. To ensure hygienic pool water,

* Stewart Scott Inc., PO Box 784506, Sandton 2146. Tel (011) 783-5480 Fax (011) 883-6789.

disinfection is essential. In addition to bacteria, viruses introduced by pool users may also present a health risk and disinfection can also adequately deal with this problem.

Chloramines, the chemical products resulting from the reaction of chlorine with ammonia and urea (originating from human sweat and urine), can give rise to irritations of the eyes, nose and throat. Therefore, chloramine levels should be maintained to the absolute minimum. This is achieved by applying breakpoint chlorination. In practice, breakpoint chlorination is assured when the free chlorine concentration is 0,5 mg/ℓ or higher.

High levels of chlorine, or long exposure to low levels, may be irritating to the eyes, nose and throat. It is, therefore, desirable to keep the free chlorine level well below 10 mg/ℓ , preferably between 1,0 and 2,0 mg/ℓ . Certain individuals have skin or lung allergies towards chlorine and cannot tolerate even low concentrations of chlorine. In such cases an alternative disinfectant has to be used, eg polymeric biquanide.

Recently, in the RSA, a potential new health risk has come to the fore. It is claimed that isocyanuric acid and its derivatives (eg TCIA - the commonly used pool stabiliser) may be deleterious to pool users' health. Cyanurates belong to the chemical class triazines which have been used as herbicides and fungicides. They have been shown to be absorbed through human skin (Canelli, 1974). In response to this controversy the Department of Health and Population Development has recommended a TCIA concentration of less than 100 mg/ℓ in pool water (private communication, 1991). In practice 20 to 40 mg/ℓ TCIA will suffice for stabilisation purposes.

CHEMICAL CONDITIONING

The majority of pools in southern Africa are "Marbelite" (calcium carbonate) lined pools. This white liner gives the pool an aesthetically pleasing appearance, but requires careful chemical control of the pool water quality. In order to ensure that the water does not dissolve the Marbelite the pH must be in excess of 7,2. However, the pH should not be higher than 7,6 since this is disadvantageous from a disinfection point of view when using chlorine as the disinfectant. The problem of Marbelite dissolution can be overcome by increasing the calcium content of the pool water, eg by dosing with calcium chloride (calcium concentrations between 200 and 500 mg/ℓ as $CaCO_3$ are recommended). The correct balance between calcium, alkalinity and pH can be determined by using Modified Caldwell-Lawrence diagrams (Loewenthal and Marais, 1976) or computer programs such as STASOFT (Loewenthal *et al*, 1988).

Pool water pH is affected by the addition of disinfectant chemicals. For example, addition of HTH results in the raising of the pH. This effect needs to be counteracted by the addition of acid, hydrochloric and sulphuric acid are used for this purpose. An alternative approach is the use of trichloro-isocyanuric acid (TCIA) for disinfection. This chemical is slightly acidic and hence water treated with it does not require pH adjustment. However, use of this chemical can result in chlorine "lock" due to an excessive quantity of pool stabiliser. This effect can be overcome by controlling the TCIA concentration within the range 20 - 40 mg/ℓ .

CONCLUSION

Modern swimming pool water treatment has been developed for convenience and hence minimal maintenance by pool owners. Correct usage of various water treatment devices and chemicals requires little technical skill or basic understanding of the processes involved, as long as the suppliers' instructions are carefully followed. Their use result in an aesthetically pleasing and hygienically safe recreational facility, as well as reasonable operating and maintenance costs.

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Powick, DEJ (1989) Swimming Pools - Brief outline of water treatment and management. *Wat Sci Tech*, Vol 2, pp 151-160.

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SA WATERKALENDER

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The Water Research Commission is placing this calendar in order to assist with the co-ordinating of water events in South Africa.

You are invited to send information about conferences, symposia or workshops to the SA Waterbulletin.

Address:
The Editor,
SA Waterbulletin,
P.O. Box 824,
0001 Pretoria
Tel (012) 330-0340
Fax (012) 331-2565

Legend:

- ○ An SA Water Event arranged for these dates.
- □ 2nd SA Water Event scheduled for these dates.
- ✗ 3rd SA Water Event scheduled for these dates.

See conferences and symposia pages for events.

1995

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Die Waternavorsingskommissie plaas hierdie kalender om te help met die koördinering van watergebeurtenisse in Suid-Afrika.

Alle belanghebbendes word uitgenooi om inligting aan SA Waterbulletin te stuur.

Adres:
Die Redakteur
Posbus 824
0001 Pretoria
Tel: (012) 330-0340
Faks: (012) 331-2565

Gids:

- ○ Een SA Watergeleentheid vir hierdie dae.
- □ 'n Tweede SA Watergeleentheid gereël vir dié datums.
- ✗ 'n Derde SA Watergeleentheid gereël vir dié datums.

Sien Konferensies- en Simposiumbladsy vir aangeduide geleenthede.

SOUTHERN AFRICA 1994

MICROBIOLOGY

JANUARY 1994
An introductory course in water microbiology will be held at the CSIR. See advertisement on page 30 in this Bulletin.

ANAEROBIC DIGESTION

JANUARY 23 - 27
The seventh international symposium on anaerobic digestion will be held in Cape Town.
Enquiries: Symposium Secretariat, IAWQ: AD-94, PO Box 3123, Tygerpark 7536 SA.

URBAN AGRICULTURE

FEBRUARY 23 - 24
A conference to introduce the concept of urban agriculture in a changing South Africa and to consider the contribution urban agriculture can make towards community development, will be held at the Technikon conference centre in Pretoria.
Enquiries: Anna-marie de Kock, Department of Environment Affairs, Private Bag X447, Pretoria 0001. Tel (012) 310-3745.

ENVIRONMENTAL MANAGEMENT

MARCH 7 - 9
An environmental management technology and development conference will be held at the Indaba Conference Centre, Fourways, Johannesburg.
Enquiries: Lesley Stephenson, Conference Secretary, PO Box 327, Wits 2050. Tel (011) 716-5091 Fax: (011) 339-7835.

BESPROEIING

MAART 9 - 11
Die tweejaarlikse kongres van die Suid-Afrikaanse Besproeiingsinstituut (SABI) sal by die ESKOM konferensiesentrum in Midrand naby Johannesburg gehou word.
Navrae: Die Sekretaris, SABI, Privaatsak X515, Silverton 0127. Tel (012) 804 1540 Faks (012) 804 0753.

DISINFECTION

MARCH 13 - 18
An international conference on disinfection of potable water will be held in the Kruger National Park.
Enquiries: Miss Louise Fourie, Conference Secretariat, Rand Water Board, PO Box 1127, Johannesburg 2000. Tel (011) 682-0472. Fax (011) 682-0444.

WATER & VOEDSEL

MAART 21 - 22
Die 8ste jaarlikse voedselwetenskapsimposium met die tema "Food Science in Africa" word in die Wes-Kaap by die Lord Charles Hotel, Somerset-Wes, gehou.
Navrae: Professor G van Noort Tel (02231) 74-506 Faks (02231) 833-737.

SA WATERWEEK

MAART 21 - 27
Die Suid-Afrikaanse nasionale waterweek sal in die toekoms inskakel by die die Verenigde Nasies se wêrelddag vir water wat op 22 Maart val. Die tema vir 1994 se waterweek is "Water vir Almal/ Water for All".
Navrae: Mev C Barnard, Departement van Waterwese, Privaatsak X313, Pretoria 0001. Faks (012) 326-1780. Tel (012) 299-2596.

WATER TECHNOLOGY

JUNE 6 - 9
The 1994 international African water technology exhibition and conference, Afriwater, will be held at the National Exhibition Centre, Johannesburg.
Enquiries: Natalie Sanders, McNaughton Victor CC, PO Box 31368, Braamfontein 2017. Tel (011) 643-4824/8 Fax (011) 642-9860.

SASAQS

JULY 13 - 15
The annual conference of the Southern African Society of Aquatic Scientists will be held at the SAB Institute for Coastal Research at the University of Port Elizabeth.
Enquiries: Dr Eileen E Campbell, Congress Secretariat, Botany Department, University of Port Elizabeth, PO Box 1600. Port Elizabeth 6000. Tel (041) 504-2329. Fax (041) 53-2317.

WATER ENGINEERING

JULY 14 - 15
A symposium entitled "50 years of water engineering in South Africa (a tribute to Prof Des Midgley)" will be held at the University of the Witwatersrand, Johannesburg.
Enquiries: Ms C Bernard, c/o Dr SJ van Vuuren, BKS Inc, PO Box 3173, Pretoria 0001. Tel (012) 209911 Fax (012) 20 9220.

CORROSION CONTROL

AUGUST 29 - 31
The sixth international corrosion conference entitled "Cost effective corrosion control into the 21st century" will be held at the Elangeni Hotel in Durban. CALL FOR PAPERS.
Enquiries: SA Corrosion Institute, PO Box 77, WITS 2050. Tel (011) 802-5145 Fax: (011) 804-3484.

WASTECON '94

SEPTEMBER 27 - 29
A conference on waste management will be held in Somerset West, Western Cape.
Enquiries: WASTECON '94, PO Box 1303, Cape Town 8000. Tel (021) 400 2423 Fax (021) 25 3848.

ENVIRONMENTAL MANAGEMENT

OCTOBER 18 - 21
The 2nd Southern African international conference on environmental management will be held at Victoria Falls in Zimbabwe.
Enquiries: SAICEM 2 Secretariat, c/o PO Box BW 294, Borrowdale, Harare, Zimbabwe. Tel (263) 4 739 822. Fax (263) 4739 820.

ICOLD

NOVEMBER 1 - 5
The 62nd executive meeting of ICOLD will be held at the Elangeni Hotel in Durban.
Enquiries: Mrs Ginny Eslick, ICOLD 1994 Organising Committee, PO Stamford Hill, 4025 Durban. Tel (031) 303 2480 Fax (031) 239 441.

ICOLD

NOVEMBER 6 - 11
The 18th ICOLD congress will be held at the Durban Exhibition and Conference Centre.
Enquiries: Mrs Ginny Eslick, ICOLD 1994 Organising Committee, PO Stamford Hill, 4025 Durban. Tel (031) 303 2480 Fax (031) 239 441.

ANALYTICA '94

DECEMBER
The second national symposium on analytical science will be held early in December 1994 in the Western Cape. Theme: "Toward the Welfare of Man and his Environment".
Enquiries: Dr IM Moodie, ANALYTICA '94, c/o PO Box 19070, Tygerberg 7505. Fax (021) 932-4575.

1995

RIVER MANAGEMENT

MAY 14 - 19 1995
The IAWQ conference on river basin management will be held in the Kruger National Park.
Enquiries: Dr Ben van Vliet, Watertech, CSIR. Tel (012) 841-2237 Fax (012) 841-4785.

HYDROLOGY

SEPTEMBER 4 - 6
The 7th national southern African hydrological symposium will be held in Grahamstown.
Enquiries: Prof Denis Hughes, Institute for Water Research, Rhodes University, Grahamstown 6140. Tel (0461) 24014 Fax (0461) 25049. E-mail: Denis @ iwr.ru.ac.za.

IWSA

SEPTEMBER 11 - 15
The biennial congress of IWSA will be held in Durban.
Enquiries: Mrs E Nupen, SA National Committee: IWSA, DWT< CSIR, PO Box 395, Pretoria 0001

OVERSEAS 1994

HYDROLOGY

Commencing Semester: 1 February 1994
The joint universities' masters program in hydrology and water resources will be held in Adelaide, South Australia.
Enquiries: Project Administrator, The Flinders University of South Australia, FPO Box 2100, Adelaide, South Australia 5001. Tel: (61-8) 2012650. Fax: (61-8) 2012676.

WATER IN AFRICA

FEBRUARY 1 - 4 1994
An international conference on the efficient utilisation & management of water resources in Africa will be held in Khartoum, Sudan. Call for papers.
Enquiries: Dr Gamal M Abdo, Faculty of Engineering and Architecture, University of Khartoum, PO Box 321 Khartoum, Sudan. Tel 011 75931 Fax 249 11 44898.

AQUIFERS

APRIL 11 - 15
An international symposium on transport and reactive processes in aquifers will be held at ETH Zürich, Switzerland.
Enquiries: Symposium Secretariat, IAHR Symposium, c/o Institute of Hydromechanics and Water Resources Management, EJH Hönggerberg, CH-8093 Zürich, Switzerland. Tel (01) 377 3065 Fax (01) 371 2283.

SLUDGE

APRIL 12 - 15
A European conference on sludge and organic waste will be held at the University of Leeds, England. CALL FOR PAPERS.
Enquiries: Mrs Zena Hickinson, Course Secretary, Dept of Civil Engineering, University of Leeds, Leeds LS 9JT. Tel (0532) 347158 Fax (0532) 332265.

HYDROTOP

APRIL 12 - 15
An international conference and "World Water Market" exhibition will be held in Marseilles, France.
Enquiries: SAFIM Organisation, Parc Chanot - BP 2, 13266 Marseilles cedex 8 - FRANCE. Tel (33) 9176-1600 Fax (33) 9122-1645.

MEMBRANES

APRIL 26 - 28

A conference with the theme: "Engineering of membrane processes 2" will be held in Tuscany, Italy.
Enquiries: Kay Russell, Elsevier Advanced Technology, Mayfield House, 256 Banbury Road, Oxford OX2 7DH, United Kingdom.

INDUSTRIAL WASTE

MAY 9 - 11
The 49th annual Purdue University Industrial Waste Conference will be held at the University in Indiana, USA.
Enquiries: Ms Cynthia S Dalton, Conference Secretary, School of Civil Engineering, Purdue University, 1284 Civil Engineering Building, West Lafayette, Indiana 47907-1284, USA. Tel (317) 494-2194 Fax (317) 496-1107.

WATER SUPPLY

MAY 15 - 20
An IWSA regional conference entitled Water Supply 2000 "Rehabilitation" will be held in Zürich, Switzerland.
Enquiries: Zürich Water Supply, Hardhof 9, PO Box CH-8023 Zürich. Tel (*1) 435 2111 Fax (*1) 435 2557.

GROUNDWATER

MAY 23 -25
The 8th National Groundwater outdoor action conference and exposition will be held in Minneapolis, Minnesota, USA.
Enquiries: National Groundwater Ass. PO Box 182039, Dept. #017, Columbus, OH 43218-2039, USA. Tel (800) 551-7379 or (614) 761-1711 Fax (614) 761-3446.

DAM SAFETY

JUNE 6 - 17
An international dam safety, operation and maintenance seminar and study tour will be held in Denver, Colorado, USA.
Enquiries: American Water Foundation, PO Box 480632, Denver CO 80248-0632. USA. Tel (303) 628-5516. Fax: (303) 628-5469.

GROUNDWATER

JUNE 13 - 16
An international conference on future groundwater resources at risk will be held in Helsinki, Finland.
Enquiries: Ms Tuulikki Suokko, FGR 94, National Board of Waters and the Environment, PO Box 250, SF-00101 Helsinki, Finland. Fax: +358 0 4028 345.

WINERY WASTEWATERS

JUNE 20 - 24
An international specialised conference on winery wastewaters will be held in Narbonne, France.
Enquiries: Dr Rene Moletta, INRA, Boulevard du General De Gaulle, 11100 Narbonne, France. Fax: (33) 68 32 89 10.

INTRODUCTORY COURSE IN WATER MICROBIOLOGY

Health Programme Division of Water Technology • CSIR • Pretoria

25 – 28 January 1994

PURPOSE:

The purpose of this course is to provide a practical approach where participants will be trained in the basic concepts of health related water microbiology. The course will include practical (60%) and theoretical (40%) aspects.

WHO SHOULD ATTEND:

The course is aimed at people working in the water industry who require knowledge about basic techniques for the microbiological analysis of water. Industry, municipalities, government departments, water boards are among the bodies who may find such a course useful.

ATTENDANTS:

A maximum number of 12 attendants will be allowed to ensure personal attention.

COURSE DURATION:

The course will run over a period of four days, from Tuesday 25 to Friday 28 January 1994.

COURSE CONTENTS:

Attendants will be trained in the basics of water microbiology.

- Detection and analyses of faecal indicators of pollution (Standard plate count; Total coliform; Faecal coliform; Faecal streptococci/Enterococci; Coliphage and the confirmation of Escherichia coli).
- Interpretation and reporting of results.
- Demonstrations on the detection of other pathogens in water (Viruses; Parasites; Legionella; Bio-assays for toxicity and Ames mutagenicity test).
- Quality Control.
- Laboratory Safety.

COST:

R1 200 per person. Morning tea, lunch and afternoon tea will be included.

ACCOMMODATION:

Accommodation as well as the travelling to and from the CSIR are not included in the price.

CONTACT PERSON:

Mr Gerrit Idema • Health Programme
Division of Water Technology • CSIR
PO Box 395 • Pretoria • 0001

Tel (012) 8413948 • Fax (012) 8414785

NOTE:

A detailed programme will be sent on request.

A minimum of six participants is required for the course to be presented.

SABI

SUID-AFRIKAANSE BESPROEIINGSINSTITUUT

Tweejaarlikse Kongres

Besproeiingsgeleenthede in 'n veranderende Suid-Afrika

9 - 11 MAART 1994

ESKOM KONFERENSIESENTRUM MIDRAND, JOHANNESBURG

Die Suid-Afrikaanse Besproeiingsinstituut (SABI) wil graag 'n geleentheid skep vir belangstellendes om die moontlikhede van groter besproeiingsbetrokkenheid in Afrikalande te ondersoek – 'n kontinent waar daar tans 'n dringende behoefte aan ontwikkeling en ekonomiese selfstandigheid bestaan.

Faktore wat suksesvolle besproeiingsontwikkeling in opkomende gemeenskappe beïnvloed, sal tydens die konferensie bespreek word in die lig van veranderende ekonomiese en politieke omstandighede, met ondersteuning van kundigheid uit die ontwikkelende wêreld.

Aandag sal geskenk word aan die vereistes waaraan geskikte tegnologie in Afrika moet voldoen asook aan die bestuur van projekte wat wissel van grootskaalse besproeiingskemas tot bestaansboerderye op gemeenskapspersele.

Die SABI-kongres sal in besonder aandag skenk aan:

- ❑ Logistiek, infrastruktuur en potensiaal in Afrikalande.
- ❑ Ontwikkelingsbefondsing en finansieringsreëlings.
- ❑ Die beskikbaarheid van navorsing en ontwerp–ondervinding vir besproeiingsontwikkeling in en om Suid-Afrika.
- ❑ Die beskikbaarheid van besproeiingstoerusting en die rol wat SABI kan vervul in die bevordering van invoere en uitvoere.

Die doelwitte van die simposium sal bereik deur o.a.:

- ❑ Hoofredes en referate deur kundiges uit 'n aantal Afrikastate.
- ❑ Werkgroepsessies vir afgevaardigdes waartydens moontlike oplossings vir tipiese probleme ontwikkel sal word.
- ❑ Ruim geleentheid vir informele gesprekke tussen afgevaardigdes rondom uitstallings en tydens teetye en middagetes.

Vir meer inligting kontak:

Die Sekretaris, SABI, Privaatsak X515, Silverton 0127.

INTERNATIONAL SPECIALISED CONFERENCE

ON
RIVER BASIN MANAGEMENT FOR SUSTAINABLE DEVELOPMENT

IAWQ

Kruger National Park
14 - 16 May 1995

CALL FOR PAPERS

TOPICS

- River basin management philosophy (integrated planning)
- Strategic planning and setting of goals
- Methodology and execution of catchment planning
- Impact assessments
- Decision support systems and modelling
- Development versus environmental protection

Oral papers: twelve pages in length, to be included in volume of papers.
Poster papers: for graphic presentation, a six-page abstract to be included in the volume of papers.

Prospective authors for oral or poster papers should complete and return a reply form together with a 600-word (two A4-pages in single spacing) EXTENDED ABSTRACT by not later than 31 January 1994. Authors will be informed of the acceptance of their papers or posters by May 1994. Papers/posters to be submitted by 15 December 1994 on 5¼"and 3½" floppy disk on WordPerfect or in ASCII format.

The organisers will not do scientific editing, but reserve the right to adjust the layout in order to ensure uniformity throughout.
Papers/posters will be accepted on the understanding that the main author or a co-author will personally attend the conference and present the paper/poster.
Note: All contributing authors will be liable for full enrollment fee.

ENQUIRIES & INFORMATION

Conference Planners (Att. Cilla Taylor or Ammie Wissing)
PO Box 82, IRENE 1675. Tel (012) 63-1681 Fax (012) 63-1680.