SA waterbulletin

ISSN 02548-2244 Volume 17 No 4 September 1991

SLUDGE
New PC program simulates activated sludge process

NAVORSINGSBESTUUR
Samewerkingsooreenkoms gesluit tussen WNK en SNO

TEXTILE EFFLUENTS
WRC releases design guide for waste-water treatment plants in the textile industry

WORKSHOP

WRSM90

(Water Resources Simulation Model)

VENUES AND DATES

- **University of Stellenbosch:** 12 & 13 November 1991
- **University of Natal, Pietermaritzburg** 26 & 27 November 1991

COST

• Workshop only	R 500,00
• WRSM90 Program & Workshop	R2 500,00
• WRSM90 Program only	R2 500,00

WATER RESOURCES SIMULATION MODEL

Simulation of surface water flow through an interlinked system of catchments, river reaches, reservoirs and irrigation areas.

In 1990 a project to update water resources information for South Africa was initiated by the Water Research Commission. At the outset of this project it was decided that the Pitman Model in its existing form needed to be modified to facilitate calibration of catchments subjects to intensive development.

The new version of the model is designed to run on a PC and is of a modular construction, with four different types of module (runoff, channel, reservoir and irrigation) linked by means of arcs to form a network.

The modules can be linked in any feasible way to form a complex system. The size of the system that can be simulated at any one time is limited to 30 modules by the 640 kb memory of DOS. Very large systems can be broken down into smaller subsystems and the output from these subsystems stored for later use as inputs to other subsystems downstream.

Screen graphics are incorporated to facilitate calibration of the runoff modules and calibration at up to six gauging points can be undertaken more or less simultaneously. Once the model has been calibrated it can be used to answer "What if . . ." questions related to changes in land use.

The purchase price of the program, which comes with a comprehensive manual, is R2 500 including GST/VAT, postage and packing.

GENERAL INFORMATION

- All participants will work on PC's provided at the Workshop
- Enrolment is limited to 30 participants per workshop
- Participants do not need prior knowledge of the techniques to be discussed
- Participants should be persons involved in water resource modelling
- Venues to be given at a later date
- Workshop fees include a copy of the workshop notes, teas and lunches
- Accommodation may be available at Pietermaritzburg and Stellenbosch Universities.

COURSE LEADERS/INSTRUCTORS

- W V Pitman
- B J Middleton
- J P Kakebeeke
- J A Stern
- J R Hansford
- C Schultz
- J Hudson

WORKSHOP PROGRAM

Day 1

Overview and history of development of WRSM90
Introduction to system network design
WRSM90 discussion, overview and demonstration
Network file data prepartion
Modules description and data preparation
Creation and calibration of sample system

Day 2

Selection of rainfall data
Design and compilation of an entire system
Background and hints on runoff module calibration
Calibration of the system
Simulation of the system

Should you be interested to attend a workshop please complete the applicable post card in the Bulletin or contact: W V Pitman at Tel: (011) 783-5393.

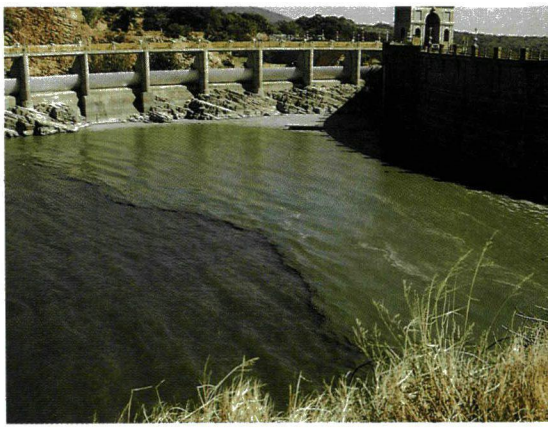
Volume 17 No 4 1991

SA waterbulletin

September 1991

p 8

p 20

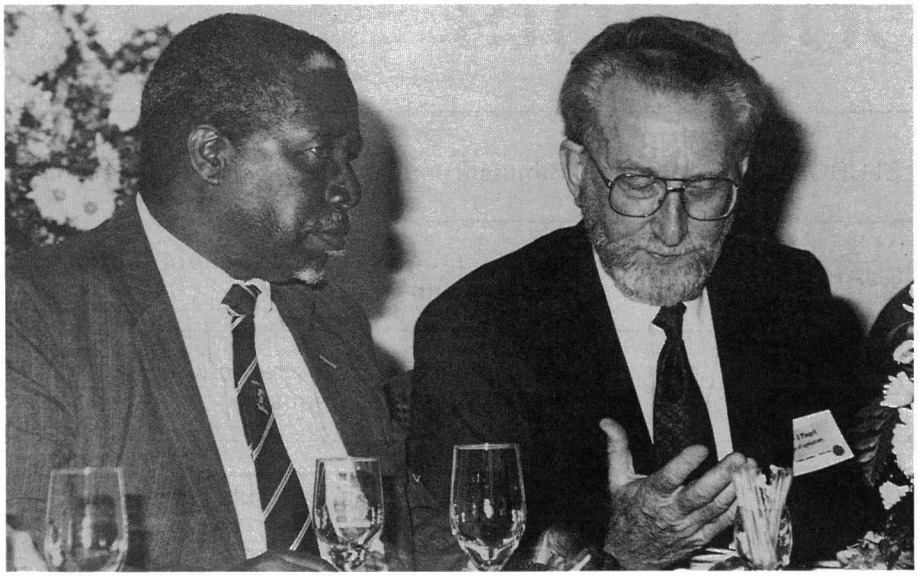


p 12

Contents

Cover: *Secondary clarifier for the treatment of sewage effluent at Johannesburg Northern Works*

SA Waterbulletin is a two monthly magazine on water and water research published by the South African Water Research Commission (WRC), a statutory organisation established in 1971 by Act of Parliament. Subscription is free. Material in this publication does not necessarily reflect the considered opinions of the members of the WRC, and may be copied with acknowledgement of source. Editorial offices: WRC, P O Box 824, Pretoria, 0001, Republic of South Africa. Tel: (012) 330-0340. Fax: (012) 70-5925. Editor: Jan du Plessis, Asst Editor: Helene Joubert, Ed Secretary: Rina Human, Typesetting: Type Technique, Colour separations: Lithotechnik, Printing: Creda Press, Cape Town.



Symposium

The Southern African Irrigation Symposium was recently held in Durban. This was the first symposium of this nature to be held since the National Irrigation Symposium held in 1967. Delegates from all over southern Africa attended this 1991 regional symposium.

Approximately 270 delegates attended the symposium, including some 27 visitors from beyond the borders of South Africa – representing the USA, England, Australia, Israel, Lesotho, Botswana, Swaziland and Malawi.

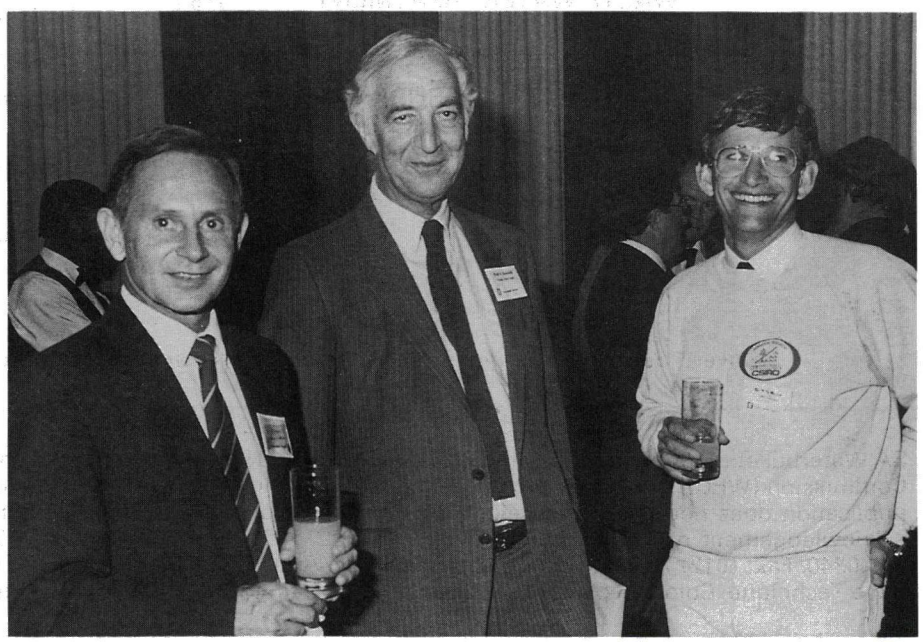
Invited foreign speakers came from Swaziland: Mr P Lukhele, Australia: Dr W Meyer, Israel: Prof G Stanhill, and as far afield as the USA: Prof T Anderson, Prof W Walker, Dr R Reginato and Dr C Phene.

Dr John Hennesy, President of the International Commission on Irrigation and Drainage (ICID), was an invited and honoured guest and his active participation and interest in the symposium was much appreciated.

This very successful symposium was characterised by excellent papers and posters. Papers presented covered a very wide range of irrigation and irrigation related topics such as soil and water, crop water relations, irrigation scheduling, water distribution and irrigation design, economics, research and development.

Top: The Mayor of Durban, Councillor Gys Müller welcomed the delegates to the symposium at a civic reception in the City Hall. Here the mayor is having a word with Prof Terry Anderson from the USA.

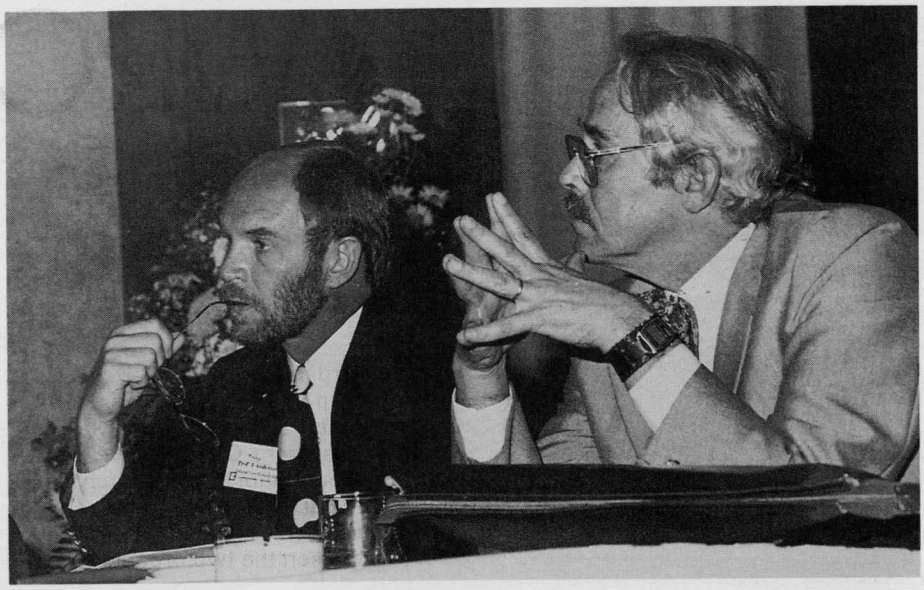
Above: Dr Frank Mdlalose, Kwazulu Government in conversation with Dr Jean Piaget, president of the SA Irrigation Institute at the symposium banquet. Dr. Mdlalose presented the address of Dr Mangosothu Buthelezi, Chief Minister of Kwazulu, at the symposium banquet.



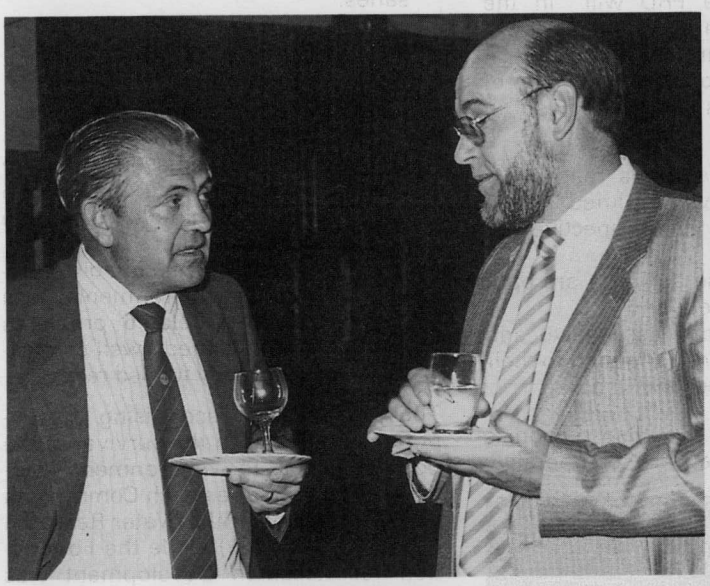
Right: Dr. George Green (WRC) with two of the guest speakers, Prof Stanhill (Volcani Institute, Israel) and Dr Wayne Meyer (CSIRO, Australia).

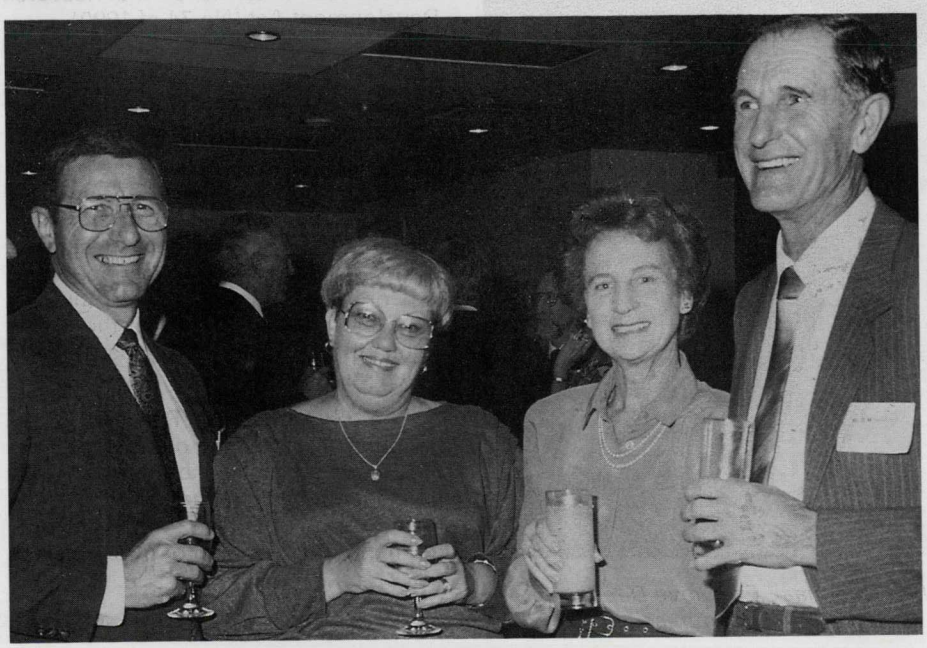
on Irrigation

A booklet of Extended Abstracts of the symposium papers are available upon request.



Right: Prof Terry Anderson, Montana State University, USA, and prof Jan Groenewald, University of Pretoria, were amongst the speakers presenting papers. Here they are listening intently to a presentation during the opening session.





Above: Dr Clement Mzembe from Malawi (Chief Irrigation Officer, Ministry of Agriculture) and Mr Frans Stoffberg (Deputy Chief-engineer, Dept of Water Affairs) having a word at the civic reception.

Above left: Mr David van der Merwe, (Deputy Director, WRC), in conversation with prof. M F Viljoen (Agricultural Economics, University of the Orange Free State).

Left: Dr Bob Reginato (Area Director: USDA) and his wife Donna along with Pearl Scotney and Dr Derek Scotney (Director: SIRI) having cocktails on invitation of the WRC.

WRC and FR

The co-ordination of water research activities in South Africa was further strengthened and promoted when the Water Research Commission (WRC) and the Foundation for Research Development (FRD) recently signed a document which will foster greater co-operation between the two organisations.

According to the statement of intent the WRC and the FRD will "in the interest of research and research development with regard to water, and in the interest of the optimal utilisation of the available funds and manpower" in future:

- Co-operate as far as is reasonably possible in activities aimed at the achievement of their respective objectives;
- Ensure that these activities are optimally co-ordinated; and
- Render reciprocal assistance and support in matters pertaining to their mutual objectives.

The WRC and the FRD also recognise the potential benefit of co-operative ventures. The statement says in this respect it has been agreed that possibilities such as the following exist:

- Joint research funding.
- Joint event funding, such as workshops or overseas fact-finding missions by groups of local researchers, for example.
- Fellowships, scholarships and bursaries.

According to the statement South Africa is characterised by:

- Limited water resources;
- An environment which is rapidly deteriorating to a level beyond recovery due to an unabated population growth and over-exploitation of the environment;
- A dearth of manpower suitably qualified to address environmental and particularly water-related problems through well-planned, well-co-ordinated and optimally funded research.

The Government, recognising the importance of water in the survival of the population and the environment, established the Water Research Commission in 1971 in terms of the Water Research Act (No 34 of 1971) while the Foundation for Research Development was established in terms of the Research Development Act (No 74 of 1990).

Mr Piet Odendaal, Executive Director of the Water Research Commission.

OBJECTIVES

The objectives of the WRC, as stated in the Water Research Act, are the co-ordination and promotion of research in respect of the occurrence, preservation, conservation, utilisation, control, supply, distribution, purification, pollution or reclamation of water supplies and water; and in respect of the use of water for agricultural, industrial and urban purposes.

On the other hand, the Research Development Act states the objectives of the FRD as research development through the rendering of financial support, the identification of fields of research development, the provision of bursaries, the

D join hands

establishment of databases of manpower and equipment, the facilitation and promotion of national and international liaison and the operation of national research facilities.

In addressing its mission the WRC through a process of evolution has developed the following mechanisms to secure the imputs of the expertise available in the RSA:

- Funding research on a priority basis at various institutions with the required expertise;
- Steering committees in support of research teams undertaking research projects with WRC funding;
- Co-ordinating committees for various fields of activity in water research with the terms of reference to inter alia develop master research plans and to prioritise these research needs;
- Workshops aimed at the investigation of specific topics in order to identify research needs in the South African context.

The FRD has also developed a number of mechanisms to promote the achievement of their objectives. These include:

- Forums, established to enable the scientific community to interact across disciplines and with user and decision-making communities, and to synthesise knowledge and to recommend effective courses of action. Workshops on specific topics are a variation on this theme;
- Advisory committees, created to ensure that resources are directed to those issues awarded high priorities after critical assessment of these issues;
- Financial support to persons (grants and bursaries) and institutions, using its own funds as well as those of partners in joint ventures, for the development of appropriate expertise; and
- Special programmes aimed at developing human resources in areas where expertise is lacking.

The statement says that in view of the fact that water resource management is of vital importance to South Africa's economy, it is inevitable that the FRD would just as the WRC, award water research a high priority in the execution of its mandate.

Areas of environmental research currently funded by the FRD and of importance to the WRC inter alia include atmospheric sciences, marine science, waste management as well as forestry, rivers and wetland programmes.

However, it is envisaged that co-operation between the WRC and the FRD as proposed in this statement of intent "would contribute significantly to the promotion of research and research development on all matters related to water.

"By achieving this objective both organisations would be addressing a facet common to their missions, that is, to improve the quality of life of all the citizens of the Republic of South Africa."

Dr. Reinhard Arndt, President of the Foundation for Research Development.

Simulate your activated sludge system on PC

Two computer programs for simulating the behaviour of single activated sludge systems on personal computers have been released by the Water Research Commission for distribution.

The two programs, UCTOLD and IAWPRC, are based on what are, arguably, the two most up to date mechanistic models of the activated sludge system in the world today.

UCTOLD is based on the model developed by the research group at the University of Cape Town (UCT) over the past fifteen years, while IAWPRC is based on a model proposed by a task group of the International Association on Water Pollution Research and Control incorporating some modifications by the UCT group.

The predictions of both models follow the measured reactions closely in most situations.

Mr P E Odendaal, executive director of the Water Research Commission (WRC), says in the foreword to the manual accompanying the programs that the WRC has sponsored research in the activated sludge system at the University of Cape Town since 1973. This research has resulted in the formulation of a comprehensive mathematical model for describing the behaviour of single sludge systems incorporating aerated and unaerated reactors.

He says the model has found application in the development of optimal design procedures, identification and solution of operational problems as well as the development of plant control strategies.

"The WRC requested the authors to develop user-friendly interactive computer programs of both the UCT and the IAWPRC model versions, suitable for personal computers."

He says this was done because the WRC believes that by sponsoring development of the programs it will facilitate transfer of technology to the end user, that is, persons involved in the design, management and operation of activated sludge systems.

Copies of the manual entitled Activated Sludge System Simulation Programs (version 1.0) together with the computer programs are available from the Water Research Commission, PO Box 824, Pretoria 0001.

Price: R55,00 per copy for South African orders. US $500 per copy for overseas orders. Please note: All orders must be prepaid and cheques made payable to the Water Research Commission.

POSKAART

Seël

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Universiteit van Pretoria
0002

Byvoegsel tot die: *SA Waterbulletin* September 1991

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Waterkortkursus/Nagraadse studie: Waterbenuttingsingenieurswese

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WRSM 90 Workshop – Registration

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☐ November 12 & 13 – Stellenbosch ☐ I require accommodation

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An aerator in the aerobic zone at Vlakplaats, Boksburg.

In the past, design, operation and control of activated sludge systems were based on relatively simplistic ideas about the behaviour of the systems, and on experience acquired in running such systems. Since about 1970 extensive development has taken place in the activated sludge method of treating wastewaters. The function of the single sludge system has expanded from carbonaceous energy removal to include nitrification, denitrification and phosphorus removal, all of these mediated biologically. These extensions have impacted on the system configuration in that multiple in-series reactors, some aerated and others not, with inter-reactor recycles have to be incorporated.

EFFLUENT STANDARDS

Not only have the system configuration and its operation increased in complexity, but more stringent standards for effluent quality have to be satisfied. To meet these effluent standards, the design of the selected system must be optimised and the system operated optimally. With such complexity it is no longer possible to make a reliable quantitative, or sometimes even qualitative, prediction as to the effluent quality to be expected from the design, or to assess the effect of a system or operational modification without some model of the system behaviour.

To design the system optimally and to operate it effectively, concerted efforts have been made over the past 15 to 20 years to model the behaviour of these systems. This has been the case in South Africa, where development of a reliable mathematical model has been given close attention. The result of this research endeavour is a powerful model that gives a reliable description of the nitrification and nitrification/denitrification (ND) system response over wide ranges of system configuration.

Although this model is grounded on a mechanistic interpretation of the behaviour of the organisms mediating the process reactions, this interpretation is a subjective one, a gross simplification of the complex nature of the phenomena. However, the fact that the model gives a reliable description of the system response over a wide range of conditions indicates that this simplification is acceptable.

USES

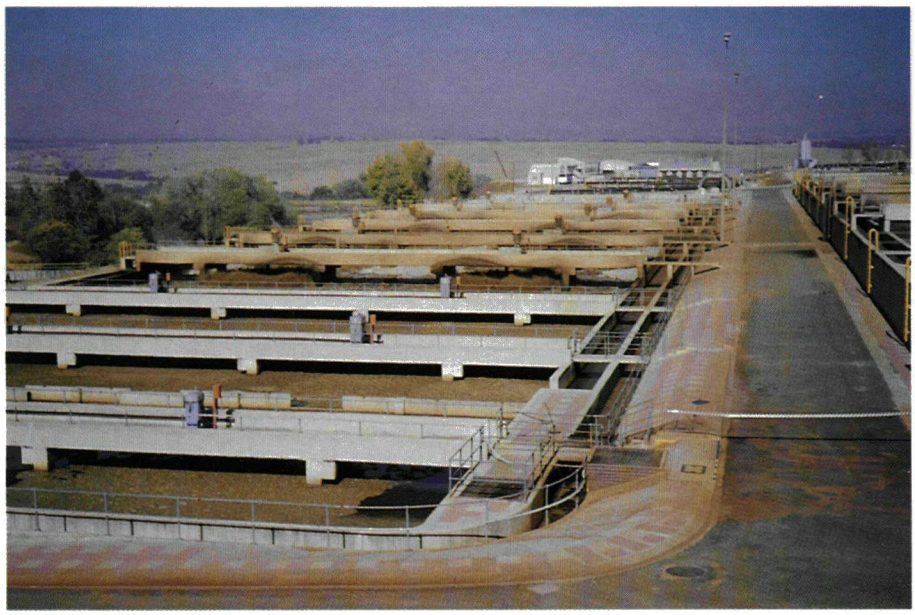
Both programs presented with this Manual can be applied to predict steady state and cyclic dynamic response behaviour for a range of system reactor configurations, operating conditions and waste flow and loads:

- The programs can be used to predict response of single or in-series completely mixed reactor systems with or without inter-reactor recycles (recycles opposite to the direction of the flow through the system) over the range of temperatures from 14 to 22° C. The reactors may be aerated or unaerated and the sludge age may vary from 2 to 30 days. Waste flow and loads may be steady state or cyclic.
- The programs predict the response of the following compounds with their various contributory components: chemical oxygen demand (COD), oxygen, volatile suspended solids (as COD), nitrogen and alkalinity.

LIMITATIONS

Applications of the programs has some limitations:

- The programs cannot be used to predict the behaviour of systems in which within a single reactor a part is anoxic and a part is aerobic.
- The programs do not provide for prediction of biological excess phosphorus (P) removal. Prediction of P removal behaviour requires a substantial increase in the number of processes and compounds to account for the response of the P removal organisms (which can constitute up to 40 per cent of the organism mass in P removal systems treating municipal effluents). Despite this constraint, experience has shown that the models give reasonable prediction of the sludge masses, nitrification/denitrification, oxygen utilisation and effluent COD and nitrogen of single sludge biological excess P removal systems. A separate model to include biological excess P removal is being developed.
- The programs have been developed from observations made on systems treating municipal waste flows at laboratory, pilot and full scale. Default values assigned to the constants in the programs, in particular to wastewater characteristics and organism growth rates, are approximate averages observed when treating South African municipal waste flows for temperatures in the range 14 to 22° C. Application of the programs to systems treating municipal waste flows in other countries may require that some of the constants be changed – the characteristics of such waste flows may consistently differ from those in South Africa and temperatures may fall outside the 14 to 22° C range. The Manual indicates the situations under which the constants may change. Also, procedures for independent determination of some of these constants are briefly set out.
- The programs have not been tested to simulate systems treating industrial waste flows.



A series of reactors at Johannesburg Northern Works.

Aeration of sludge in an aerobic zone at Johannesburg Northern Works.

DESIGN

The researchers say the UCT model has had a significant impact on design and operational procedures of single sludge nitrification and nitrification/denitrification activated sludge systems.

With regard to design, the model has led to the identification of procedures to estimate the optimal or near optimal design configuration, reactor sizes and operational parameters (e.g. sludge age) and to estimate the expected response. Once the system has been designed the time response under dynamic flow and load conditions can be estimated using the model. Thereupon the design can be modified if necessary to achieve improved performance, or the sensitivity of the design to changes in the flow and load conditions or to operational modifications can be assessed. In full-scale plant operation it has also found application in assessing the effects of changes in waste flows and loads, operational modifications (e.g. changes in cycles), and proposed modifications to plant configuration.

TRAINING

The model has proved valuable in operator training. Through simulation excercises using the model the operator acquires "instant" experience in the behaviour to be expected with changes in inputs, system configuration and operational strategies.

To make the model more widely available at the different levels of application, a computer program of the model is now presented that:

- Is suitable for personal computers
- Is "user-friendly"
- Is flexible, and
- Provides rapid solutions, numerical or graphical.

COMPUTER PROGRAMS

The two computer programs are menu driven. That is, for the most part the user selects a desired program option from a list of possible options displayed on the screen. This approach should be familiar to users of many commercial software packages and is adopted to simplify program operation and to minimise the amount of typing by the user. A number of other features have been included in the programs in an effort to make these as "user friendly" as possible. For example:

- The user will find that it is very difficult to upset program operation when inputting data. Protection against typing incorrect keys is built into the program wherever possible.
- As a consequence of the complexity of the models a large number of constants, kinetic, stoichiometric, and others are incorporated. Default values for all the constants, wastewater characteristics, etc., are included. These values have been selected and calibrated for South African conditions. The default values can be updated by the user if necessary for the situation where the model is applied. In the sections of the manual dealing with kinetic and stoichiometric constants and wastewater characteristics, guidance is given as to situations in which the constants may require alteration.
- Installation of the programs is very simple. The size of memory in the computer determines the maximum number of reactors in a system that can be simulated. This is detected automatically by the program. Also, the program automatically detects the type of graphics adaptor installed in the computer.

New PC program helps to control eutrophication in South Africa

A decision support system to help water resource managers control eutrophication in South African reservoirs has been developed through a project funded by the Water Research Commission. The decision support system is in the form of a user-friendly microcomputer program and represents the fifth phase in the relatively long history of management oriented prediction of the consequences of eutrophication and the development of control measures for the problem.

The support system which incorporates a series of dynamic reservoir eutrophication models describing the eutrophication process, consists of three parts, namely, a model base, a data base and a computer program.

The computer program links the model base with the data base and provides the interface with the user. The program helps the user prepare the input data to the models, then runs the models and displays the simulation results in different formats. The support system is the result of a joint research project between the Water Research Commission, the Department of Water Affairs and the CSIR's Division of Water Technology.

A final report summarising the research is now available from the Water Research Commission.

In South Africa management-oriented prediction of the consequences of eutrophication has gone through several phases, says Mr J N Rossouw, researcher at the Division of Water Technology, CSIR, and author of the final report to the Water Research Commission.

He says the first phase was a report by Toerien in 1977 reviewing eutrophication in South Africa and providing tentative guidelines for its control. A second report in 1980 by Walmsley and Butty also provided guidelines for the control of eutrophication. On the basis of these reports, the Department of Water Affairs decided to implement a special phosphorus (P) standard on effluents discharged in sensitive catchments.

The special P standard was severely criticised and led to a third study in 1984 by Grobler and Silberbauer in which available data and models were used to assess the impact of eutrophication control strategies on the trophic response of reservoirs in sensitive catchments.

One of the conclusions of the study was that the highly variable hydrological conditions in South Africa required dynamic eutrophication models to be developed. Therefore, during the fourth phase, Grobler developed a dynamic reservoir eutrophication model (REM) for South African reservoirs.

The development of a decision support system (DSS) for using the REM submodels as an aid to decision-making in implementing eutrophication control measures represents the fifth phase in this research and is described in this report.

A joint project was initiated between the Division of Water Technology, the Department of Water Affairs and the Water Research Commission. The primary goals of the project were:

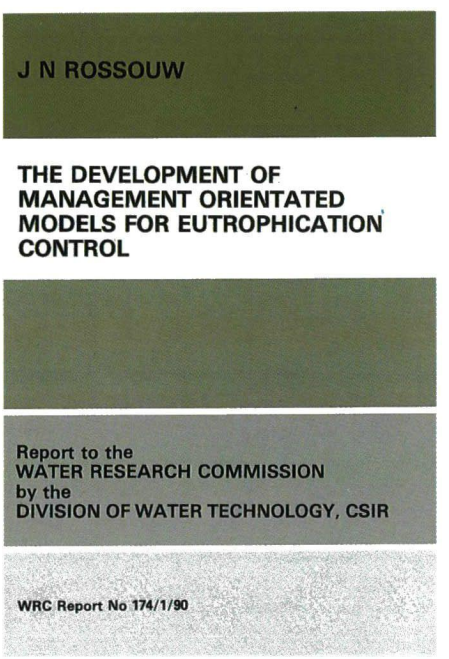
- To develop the reservoir eutrophication model further, and
- To implement this model by means of user-friendly software on a microcomputer to serve as a decision support system.

RESULTS

To assess the impacts of different P control measures on water quality in receiving water bodies, the simulation of the three main components of the eutrophication process was required.

The three components comprised the following:

- Subsystem 1. This system describes the relationship between P control measures in a catchment and the external loads received by reservoirs. A statistical approach, i.e. a regression model, was developed to simulate nonpoint source P export as a function of runoff and catchment properties. Point source loads, where the discharge and concentration can be measured, were estimated as the product of the mean effluent discharge and the mean P concentration.
- Subsystem 2. This system describes the relationship between external P load and P concentrations in a reservoir. The principle of conservation of mass was used to simulate the change in mass of P in the reservoir with time. A water balance was carried out simultaneously with the phosphorous mass balance to calculate the ambient P concentration in the reservoir.



- Subsystem 3. This system describes the relationship between in-lake P concentration and indicators of algal production, e.g. standing biomass (chlorophyll *a* concentration). A statistical approach, i.e. a regression model was used to simulate temporal changes in algal biomass (as chlorophyll) as a function of the ambient P concentration (in clear water reservoirs) as well as a function of inorganic suspended sediments (in turbid reservoirs).

DSS

The models which describe the eutrophication process were incorporated into a user-friendly decision support system (DSS). The DSS consists of three components, i.e. a model base, a data base and a computer program. The computer program links the model base and the data base and provides the interface with the user.

The model base contains the different reservoir eutrophication model's submodels which describe the different subsystems of the eutrophication process. The data base contains the hydrological, point source, catchment and reservoir characteristic data of a specific reservoir.

The decision support system which was developed for the reservoir eutrophication model, is a program which helps the user prepare the input data to the models, then runs the models and displays the simulation results in different formats. It is responsible for storing and retrieving data, organising interim results and displaying results in graphical form. The interface with the user is a dialogue system using menus which have to be completed by the user. Furthermore checks for errors, correcting these as necessary and provides help facilities to new users.

The dialogue system is the most important feature of the decision support system because it characterises the power, flexibility and usability of the decision support system. In the past modellers were preoccupied with the structure of their models. Separate models were developed for each distinct part of the problem but were not integrated with each other. It was left to the manager as a manual and frustrating process to establish the necessary communication between the relevant models. With the decision support system this problem is solved by incorporating the models into a framework which performs the integration between the different models and the data as well as provide an interface with the user. The interface which was developed is largely menu driven and makes ample use of graphics to display numerical data.

DEVELOPMENT

An important feature in the development of the decision support system was the iterative development process in collaboration with the users. The users were presented at the earliest opportunity with a prototype of the decision support system. Through using the system, the user fed back information on shortcomings experienced and enhancements required. These were taken care of in subsequent versions of the decision support system which, upon completion were passed back to the user for re-evaluation. The value of the user in this phase of the

The Hartbeespoort Dam is popular for yachting and angling, it supplies irrigation water to farmers as well as drinking and domestic water to the surrounding urbanized area.

development cannot be overemphasized.

The program software which was developed for the reservoir eutrophication model and the decision support system runs on an IBM compatible personal computer under the MS-DOS operating system. All the simulation results are displayed on screen and the user has the option of downloading results to a printer or plotter. The program was developed with Turbo Pascal and various third party supporting software. A comprehensive user's manual for the decision support system was developed by Rossouw and Kelly in 1989 as part of the project.

MANAGEMENT

The decision support system described so far provides decision makers only with information about the predicted physical, chemical and biological response of the reservoir to different eutrophication control measures. In the selection of appropriate control strategies, decision makers are often faced with a multiplicity of conflicting objectives. Decision makers are faced with the problem of integrating quantitative and qualitative information in the same decision framework. In this project the Analytical Hierarchy Process (ahp) developed by T L Saaty in 1982 was used as decision model.

The Analytical Hierarchy Process was applied with water resource managers from the Department of Water Affairs to select an optimum eutrophication control measure for Hartbeespoort Dam. The reservoir eutrophication model and decision support system were used to predict the impact of different control measures on water quality. After the actual control measure was selected for Hartbeespoort Dam, the Analytical Hierarchy Process was retrospectively applied to analise the decision which resulted in the particular control measure being selected.

TECHNOLOGY TRANSFER

The success of the project can be measured in the acceptance of the decision support system by water resource managers. The decision support system for eutrophication control was used to assess the impact of the standard of 1 mg/ℓ P on reservoirs in sensitive catchments. The project team were also directly involved in applications which resulted in eight reports to the Department of Water Affairs. The following systems were investigated by the project team:

- Crocodile River catchment – Hartbeespoort Dam and Rietvlei Dam
- Umgeni River system catchment – Midmar, Albert Falls, nagle and Inanda dams
- Vaal River catchment – Vaal Dam, Bloemfhof Dam and the middle Vaal River system.

The system was also used by the Department of Water Affairs for application to the following reservoirs:

- Roodeplaat Dam in the Pienaars River catchment
- Loskop Dam and Bronkhorstspruit Dam in the Olifants River catchment
- Shongweni Dam in the Umlaas River catchment
- Laing Dam and Bridle Drift Dam in the Buffalo River catchment
- Grootdraai Dam in the Vaal River catchment.

The decision support system played an important role in the following studies as well:

- An assessment of the impact of point and nonpoint source P pollution from Botshabelo, a high density, low cost, housing project near Bloemfontein, on reservoirs in the Modder River, and
- a study to assess the economic impact of eutrophication.

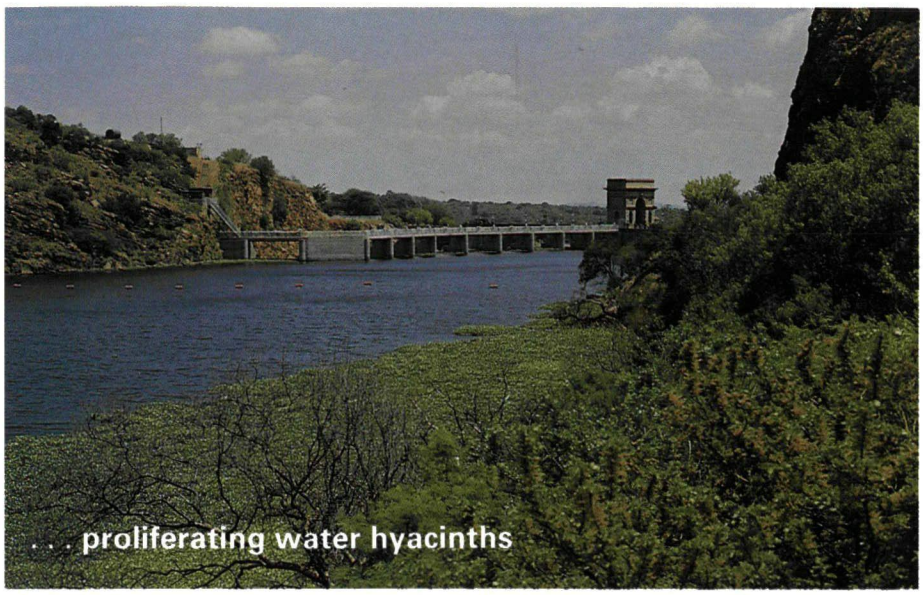
SHORTCOMINGS

At present, the decision support system only simulates the transport and fate of P in catchment-river-reservoir systems. In the course of applications, four limitations in the decision support system were identifed. In order to develop realistic eutrophication control strategies, these shortcomings should be addressed in future development work on management oriented models.

- Nitrogen limited systems – It was found that in some cases eutrophication related water quality in reservoirs were primarily regulated by the availability of nitrogen (e.g. Rietvlei Dam). Under these circumstances the export of nitrogen (N) from a catchment, its fate in water bodies and the biological response to the ambient N and P concentrations should be simulated.
- Light limited systems – In reservoirs where the growth of algae is limited by the availability of light as a result of high suspended sediment turbidity, much higher nutrient concentrations can be tolerated than in clear water systems. To simulate algal growth in these systems turbidity should be incorporated into the models. This may also require that attention be given to characterising the effects of salinity on turbidity.
- Spatial variability – the reservoir eutrophication model decision support system assumes a completely mixed system. In some cases the water quality at specific abstraction points are of importance rather than the average water quality of the system. To meet these needs, methods to simulate spatial variability in management oriented models should be investigated.
- Sediment release process – Methods should be investigated to modify the sediment parameter to describe the increase in P losses which were observed after the sediment was exposed during a drought.

Copies of this final report entitled The development of management oriented models for eutrophication control (WRC Report No 174/1/90) are available on request from the Executive Director, Water Research Commission, P O Box 824, Pretoria 0001.

Hartbeespoortdam: The Scourge of Eutrophication . . .


. . . proliferating water hyacinths


. . . algae


. . . algae and scums

STRATEGIC PLAN TO G
ON HEALTH- RELAT

A new strategic plan to guide research work in the field of health-related water quality has been drawn up by a coordinating committee of the Water Research Commission (WRC). According to Dr Thys Pieterse, deputy executive director of the WRC, the new plan has been formulated by the Coordinating Committee for Health-Related Water Quality, whose mission is to strive to minimise human health risks related to water quality and use, through effective coordination and promotion of research as well as information and technology transfer.

He says the Committee was established in 1989 and has the same objectives as the other coordinating research and development (R & D) committees of the WRC, namely, to identify and prioritise research needs in the field of interest of the Committee, to develop, revise and update research plans, to document present and past research, and to evaluate research progress and recommend technology and information transfer actions.

The Committee has now, through various meetings and a strategy session, decided on the research needs and their priorities and has developed a strategic research plan.

The goal structure and priorities of the research plan are as follows:

PRIMARY GOAL

The assessment of the impact (actual and potential) of water quality and use of a specific user sector* on human health, with a view to establishing research needs in this field.

The following five *user sectors have been identified:

- domestic
- recreational
- industrial
- irrigation
- aquaculture

SECONDARY GOALS

In order to fulfil the primary goal, it is necessary to assess the effect of the *source water quality on the user sector water quality and its use as reflected by the impact (actual or potential) on human health, with a view to establishing research needs in this field.

The following five *water source sectors have been identified:

- raw water (surface water)
- treated drinking water
- ground water (underground water)
- waste water
- sea water

TERTIARY GOALS

In order to fulfil the secondary goals, it is necessary to assess the effect of the microbiological, chemical or physical/aesthetic water quality on the source water quality and the concomitant user sector water quality and its use, as reflected by the impact (actual or potential) on human health, with a view to establishing research needs in this field.

PRIORITIZATION OF GOALS

Certain criteria were selected and by using the Analytical Hierarchy Process (AHP), the various goals were prioritized with respect to meeting the criteria and were then synthesised to provide relative priorities within the overall goal structure.

Primary and secondary goals

Table 1 contains the priorities (weights) for the primary and secondary goals. Reference is made only to the health-related water quality of the various user sectors (representing the primary goals) and to the health-related water quality of the various water sources (representing the secondary goals).

Table 1. Priorities for primary and secondary goals

	Domestic 0,39	Recreation 0,20	Irrigation 0,19	Aquaculture 0,16	Industry 0,06
Raw water	0,37	0,35	0,36	0,25	0,08
Potable water	0,33	0,29	0,05	0,03	0,23
Waste water	0,04	0,04	0,45	0,37	0,55
Ground water	0,22	0,04	0,11	0,05	0,08
Sea water	0,04	0,28	0,03	0,30	0,06

UIDE RESEARCH WORK
ED WATER QUALITY

	Microbiological	Chemical	Physical/aesthetic
Domestic			
Raw water	0,74	0,20	0,06
Potable water	0,35	0,59	0,06
Ground water	0,45	0,48	0,07
Recreation			
Raw water	0,77	0,11	0,12
Potable water	0,67	0,21	0,12
Sea water	0,77	0,15	0,08
Irrigation			
Raw water	0,67	0,27	0,06
Waste water	0,67	0,27	0,06
Aquaculture			
Waste water	0,59	0,35	0,06
Sea water	0,59	0,35	0,06

Table 2. Priorities for tertiary goals

Tertiary goals

Table 2 gives the priorities (weights) for the tertiary goals. Reference is only made to the health-related microbiological, chemical or physical/aesthetic source water quality (representing the tertiary goals). Only local weights are given.

Notes

1. Where specific water sources have been omitted from Table 2, those sources are regarded as not applicable or relevant for the specific user sector. In the case of recreation, ground water is considered as potable water. The industrial sector was omitted at this level due to its overall low priority.
2. Although the Committee has awarded weights to all the goals, these weights – especially the secondary and tertiary goals – should never be regarded as rigid. One should rather concentrate on the ranking of the goals.

STRATEGIES

The following strategies have been develop for addressing the primary, secondary and tertiary goals:

- **Guidelines** for the microbiological, chemical and physical/aesthetic quality should be addressed.

  The following should, *inter alia,* receive attention:

  – development of new guidelines
  – revision of existing guidelines
  – monitoring strategy
  – control strategy
  – management strategy

- **Methodology** should be assessed, improved and developed to determine microbiological, chemical and physical/aesthetic quality and health impact.

  The following should, *inter alia,* receive attention:

  – analytical techniques
  – epidemiology
  – risk assessment
  – monitoring and survey techniques
  – data analysis and interpretation

- **Surveys** should be carried out to determine water quality and health impact (actual and potential).

  The following should, *inter alia,* receive attention:

  – establishment of data bases
  – impact and extent of pollution

- Assessment of the efficiency of the **water treatment technology** as related to human health.

  Note: Water treatment technology is being addressed by a separate Coordinating and Development Committee.

- Collation and dissemination of **information** and promotion of **technology transfer** (i.e. implimentation of research results) regarding health related water quality.

GUIDE FOR THE PAPER AND PULP INDUSTRY

A guide for water and waste-water management in the paper and pulp industry, NATSURV 12, has been released by the Water Research Commission (WRC). The guide establishes norms for water intake and waste-water disposal in the paper industry and is based on a WRC research project entitled National Industrial Water and Waste-water survey which was carried out by Steffen, Robertson and Kirsten, a firm of consulting engineers, in collaboration with the Department of Water Affairs and Forestry and the paper industry.

Copies of the report are available free of charge from the Water Research Commission, P O Box 824, Pretoria 0001.

The pulp and paper industry in South Africa dates back to 1920 when the Klipriver mill near Johannesburg was built to recycle waste paper into wrapping paper at a rate of 3t/d. It was another 18 years before the first fully integrated chemical pulp and paper operation started operating using wheat straw as the basic raw material from which it derived its name Enterprise Straw (Enstra) near Springs. Initially two paper machines produced approximately 40 t/d of fine paper. However, the straw process was not a success and in 1948 the mill changed to the pulping of wood as the demand for paper and pulp products escalated.

Today there are 21 mills in South Africa ranging from small household tissue mills to the most modern integrated pulp and paper mills of world standard, in terms of size and technology.

The major raw material used in the paper mills is timber for which about 1,3 million ha are cultivated at an estimated investment of some R3 500 million. The industry offers employment to approximately 60 000 people. Recycled waste represents about 30 per cent of the raw material, with bagasse from sugar cane (the waste fibrous residue after the extraction of sugar from cane), providing a viable alternative in the cane growing regions. The report says pulp and paper manufacture represents a direct capital investment of about R5 000 million, provides direct employment to about 15 000 people and generates about R4 000 million per annum turnover. Some 3 000 000 t of paper products is produced annually.

According to the report the pulp and paper mills in South Africa can be grouped into integrated, non-integrated and secondary fibre mills. Mills which use waste paper as their primary raw material are referred to as secondary fibre mills.

HIGH VOLUMES

The high volumes of water required in the pulp and paper industry, have resulted in the majority of the mills in South Africa being situated close to rivers where inexpensive water is readily available. Inland, where water is usually scarcer, process water is also derived from treated domestic waste waters.

Waste-water disposal often occurs directly to rivers or to sea with or without prior biological treatment. Other avenues of disposal include irrigation onto pasture land or discharge to sewer (attracting a local municipal discharge levy).

The industry uses some 130 million m^3/a of water. The waste water produced is high in both organic material (200 to 17 000 mg/ℓ COD) and inorganic material (500 to 13 000 mg/ℓ TDS).

Specific water intake for the mills varied between 33 and 136 m^3/t for integrated pulp and paper mills and between 1 and 49 m^3/t for pulp and paper products plants. The specific pollution load was found to vary between 9 and 80 kg COD/t and 21 and 183 kg TDS/t for integrated pulp and paper mills, and between 4 and 10 kg COD/t and 2 and 110 kg/TDS/t for non-integrated plants.

VARIATION

The results of this study reveal that although a degree of water management is practised in many mills and that the water use figures are generally impressive in terms of international practice, there is still considerable variation in water intake between factories producing the same commodities. In many cases this occurs because:

The variation in water intake and waste-water quality is dependent upon the

tree species or pulp material utilised, the efficiency of the mill in terms of process control and operation, the paper product produced and the degree of chemical recovery or waste-water treatment prior to discharge.

- the mill has ample process water available;
- historically the installed plant has not been designed or managed for optimum water intake;
- discharge of mill waste water to high volume rivers close to sea outfalls has generally been considered acceptable; and
- until recently optimisation of water intake, chemical and fibre recovery and minimising pollutant loads have not been allocated a consistently high level of priority by the industry.

In terms of water and waste-water management, the mills in South Africa perform between average and highly efficient in relation to international practice. The pressure to improve efficiency in production coincides with advances in product loss control and chemical recovery, reduced bleach plant waste-water discharges and improved process sequences.

The report says these improvements include reduced water consumption by closing loops throughout the production line and by pretreatment and total treatment of final waste water prior to reutilization or discharge.

REDUCED WATER CONSUMPTION

According to the report the water consumption of a paper or board mill can be reduced by tightening the water system of the mill. This has the advantage that lower levels of suspended solids, suitable for paper raw material are discharged to drain. With less fresh water being introduced to the system, the temperature of the white water (the clarified process water recycled within the paper making process) rises, which makes it easier to remove water from the paper web, so that energy can be saved.

Increased tightening of the white water system, however, causes some proplems in paper and board mills, preventing total closure of the water circulation system. The accumulation of salts and organic compounds dissolved from the fibre raw material increases significantly, which causes problems

NATSURV 12

WATER AND WASTE-WATER MANAGEMENT IN THE PAPER AND PULP INDUSTRY

due to microbiological activity, corrosion and growth of slime, which must be controlled. White water from the paper and board machine may first be treated mechanically by flotation, sedimentation or filtration or a combination of processes.

The report says the pulp and paper industry utilises a wide range of technologies in the treatment of waste water. Most mills use primary methods of treatment such as screening and settling, while there are several secondary and tertiary methods that are also in use to various degrees. These include flotation, micro-straining activated carbon, steam or air stripping, polymeric resin treatment as well as biological treatment.

Forceful measures have been taken by the industry in recent years to reduce the water intake and pollution potential of pulp and paper mills and it is hoped that this report will further help to protect South Africa's scarce water resources.

Design Guide for Waste-water Treatment Plants in the Textile Industry

Two publications dealing with effluent management in textile mills, a final report on the treatment of scouring and bleaching effluents and a Guide for the design of textile waste-water treatment plants, have been released by the Water Research Commission.

Both publications emanate from a research project carried out by the Pollution Research Group at the University of Natal and contain full experimental details and analytical results together with theoretical aspects and design data relating to the treatment of bleach and scour effluents in the textile industry.

According to the publications textile processing plants utilise a wide variety of dyes and other chemicals such as acids, bases, salts, detergents, wetting agents, sizes and finishes. Of these, many are not retained in the final product and are discharged in the effluent. Textile effluents are in general relatively non-biodegradable hence presenting problems in terms of discharge both to sewage systems and the environment. Mills discharging to sewage works cause colour and chemical oxygen demand (COD) problems and those discharging to the environment need to remove very high percentages of colour, COD and mineral salts.

In 1983 the Pollution Research Group at the University of Natal was awarded a contract by the Water Research Commission to investigate water and effluent management in the textile industry with special reference to bleach and scour effluents.

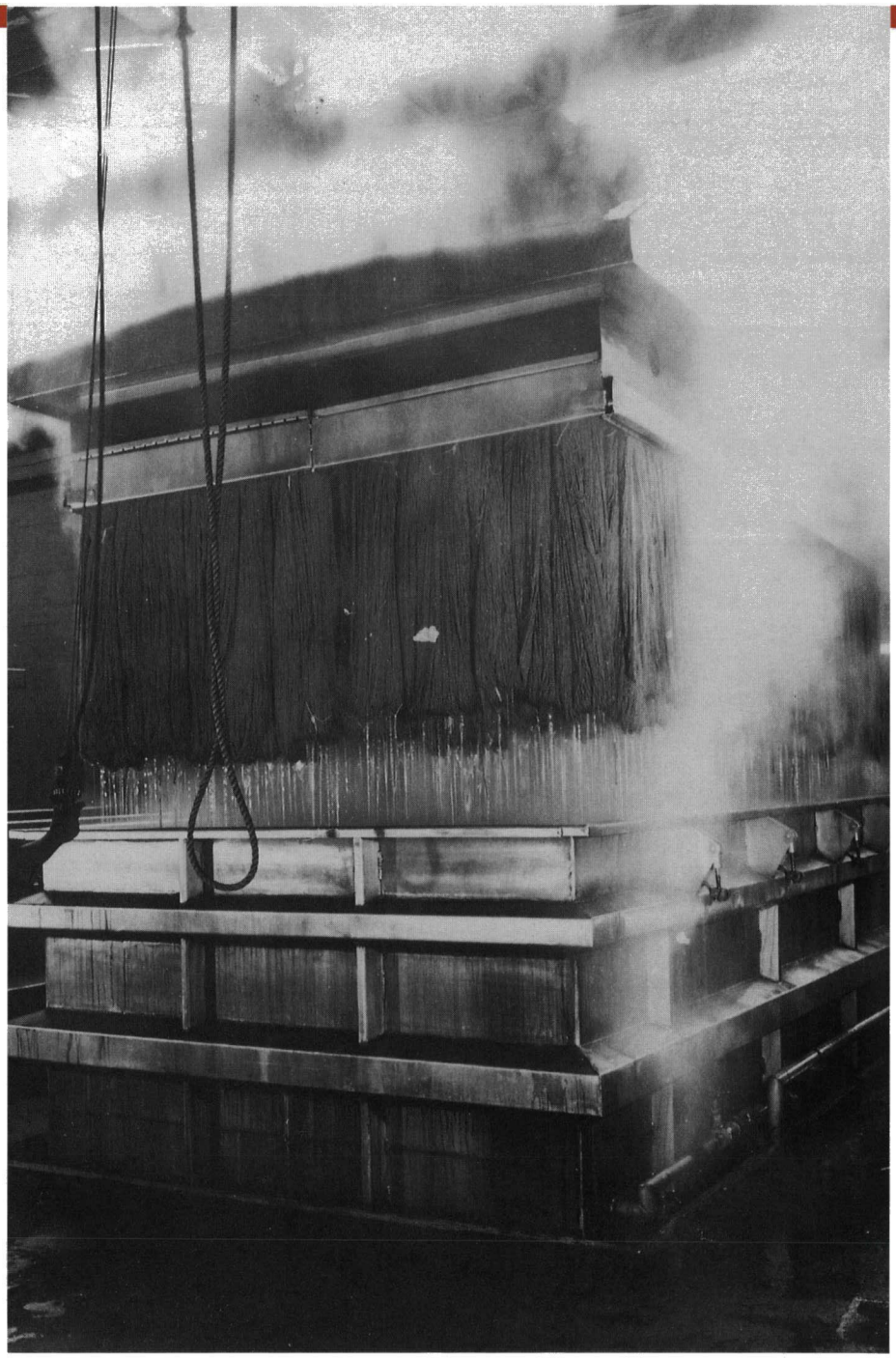
After a number of years of research the Group developed a four stage treatment sequence for the recovery and recycle of chemicals, heat energy and water from cotton scour effluents.

The treatment sequence was tested from the laboratory scale through to pilot plant scale and sufficient experimental data were obtained to enable the design of a full scale effluent treatment plant. The Water Research Commission has been granted and assigned a patent for the process in the Republic as well as overseas.

Copies of both reports, WRC report No 122/1/90 and the Guide for the design of waste-water treatment plants in the textile industry (Part 3), are available from the Executive Director, Water Research Commission, P O Box 824, Pretoria 0001.

The most serious water quality problem facing the Republic of South Africa is the increasing salinity of the country's water resources, particularly as the Republic is a water deficient country. Water of a quality suitable for various urban and industrial uses is the critical factor for continued economic and industrial growth.

Because of the water shortage, the return of industrial waste waters to the environment is necessary. It constitutes a considerable supplementary source of water yet adds significantly to the mineralisation process and deteriorating water quality. The control of industrial discharges and the encouragement of water recycling and reclamation by industry, form part of the Department of Water Affairs' strategy and policy towards the use of water for industrial purposes. At the same time, the development of processes for the treatment of effluents containing high levels of dissolved organics and inorganic impurities with the objective to re-use water and recover by-products has been initiated by the WRC. The publications released by the Water Research Commission are intended primarily to assist the textile industry to re-use, reduce and otherwise dispose of their effluents, with particular reference to scouring, bleaching and mercerising effluents. The Guide, in particular, provides the necessary information for the planning, design and implementation of various options for the treatment and recycle of textile scouring and bleaching effluents, in particular strong caustic scouring effluents. It will also be of value to policy makers of the textile industry and to assist design engineers, consultants and executive bodies.



Dyed hanks being removed from a dye vat

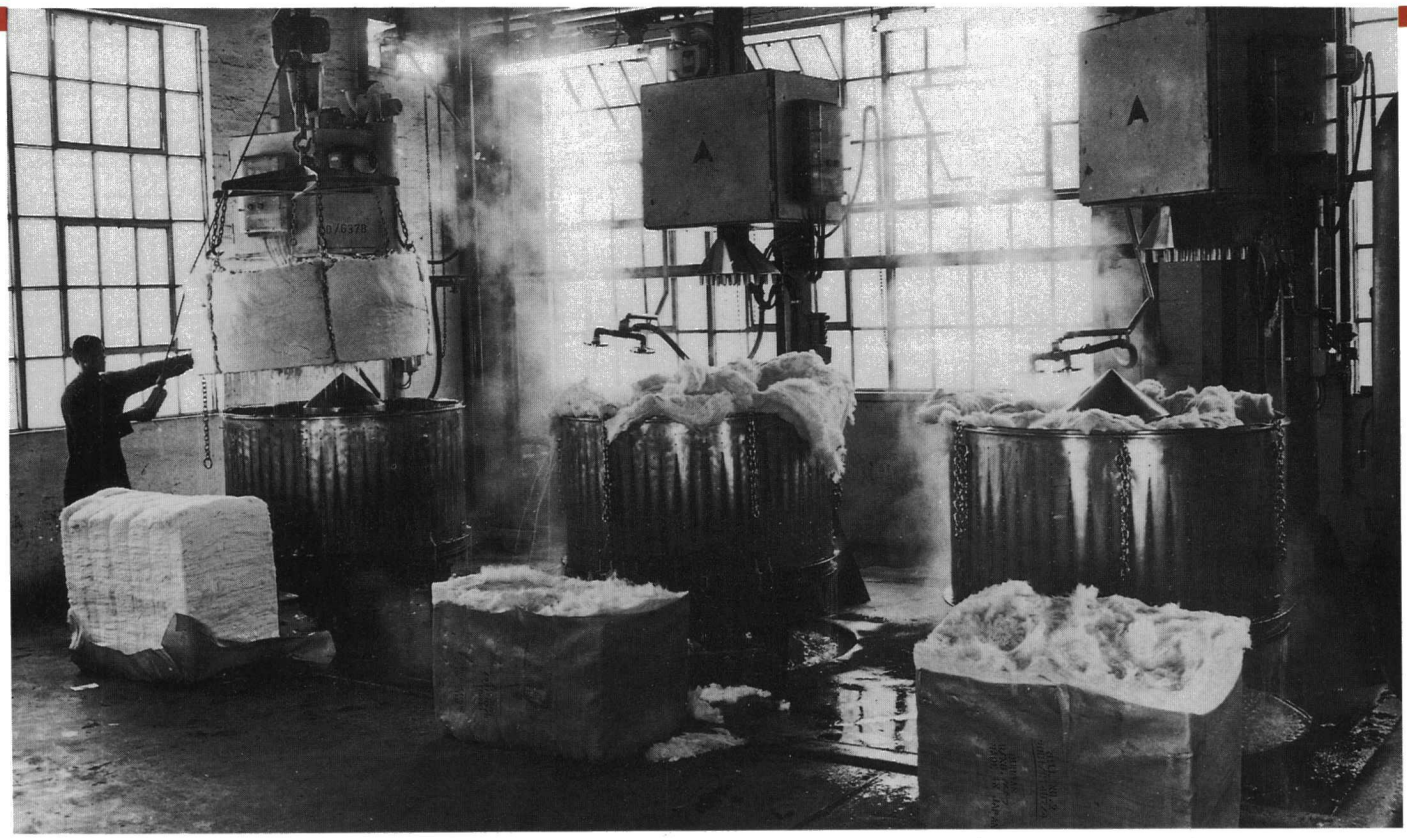
PREVIOUS GUIDES FOR THE TEXTILE INDUSTRY.

In the first part of the Guide entitled "Closed-loop Treatment/Recycle Systems for Textile Sizing/Desizing Effluents", published in 1983, it was shown how textile sizing chemicals could be recovered and re-used thereby saving one of the major cost items in textile processing. In a vertical plant (spinning, weaving, dyeing, printing and finishing) this could represent 15 per cent of total dyes and chemical cost. Recovering size and removing it from the desize effluent stream, also removes the main contributor to the COD load in that effluent.

The second part of the Guide which was called "Effluent Treatment/Water Recycle, Systems for Textile Dyeing and Printing Effluents" (published – 1987) showed how, by recycling and reclamation, reduction in the use of water and other valuable commodities, could be achieved.

In the third and current part of the Guide, a major section is devoted to the reduction of the water used in the washing and rinsing process. The reduction of specific water consumption increases the concentration of the chemicals contained in that water, hence facilitating the recovery of these chemicals or treatment of the effluent.

The philosophy of meeting effluent disposal requirements by dilution of the effluent is one that is becoming less acceptable – the total pollution load is not reduced and more fresh water is wasted. The opposite is becoming the modus operandi where specific effluent streams are being concentrated and polluting chemicals are being recovered from these streams, or treated to remove the pollution load at source.



Stamping loose stock fibre into cakes prior to dyeing

The high capital equipment and operational cost of "high-tech" treatment plants – ultrafiltration, hyperfiltration and electrochemical, as described in the three parts of the Guide, can be motivated by a return on the cost of chemicals and water which can be recovered.
In-house effluent management and process control systems can reduce the effluent volumes requiring treatment and therefore reduce the required size, making the treatment and recovery more feasible.

RESEARCH PROJECT

Scouring and bleaching effluents produced during textile processing are typical of a non-biodegradable mineral salt-rich waste water, of which the control is of prime importance to the authorities.

Recognising the need for development of general treatment methods for textile waste waters of the type described, the Water Research Commission contracted the Pollution Research Group at the University of Natal to investigate various process options which would enable the recycle and re-use of water, chemicals and energy from scouring and bleaching wastes.

The project consisted of several task areas:

- The characterisation of scouring and bleaching effluents from the processing of cotton, polyester and their blends, either in the form of stock or woven or knitted.
- The development of possible treatment options for each type of effluent concerned.
- Laboratory and pilot-scale assessment of the treatment systems.
- The development of basic design criteria for the implementation and installation of selected systems.

It is considered preferable by the researchers, to install productive equipment and systems within the factory to prevent or reduce the unnecessary loss of energy, water and chemicals, thus producing more consistent textile goods more effectively. At the same time the pollution load of the factory is reduced. The alternative would be the installation of non-productive effluent treatment equipment.

The basic procedure for ensuring proper water and chemical management in a factory is described in the publications. Examples of various factory surveys, which have resulted in significant chemical, water and energy savings, together with reduced effluent discharge costs are also cited. The emphasis is placed on the utilisation of minimum amounts of water and chemicals without sacrificing the quality of the end product. In this way effluents are produced at maximum concentration in minimum volumes.

The Guide discusses the results of the following laboratory and pilot-scale investigations:

- Low-temperature conventional ultrafiltration of weak polyester and polyester/cotton scouring effluents.
- High-temperature dynamic ultrafiltration of weak cotton and polyester/cotton scouring effluents.
- High-temperature dynamic ultrafiltration of strong cotton and polyester/cotton scouring effluents.
- Evaporation of strong cotton and polyester/cotton scouring effluents.
- Electro-oxidation of strong cotton and polyester/cotton scouring effluents.
- Electrochemical recovery of chemicals, water and energy from strong cotton and polyester/cotton scouring effluents.

Strong caustic effluents produced during the scouring of cotton and cotton blends were identified as the most problematic of the effluents examined in terms of pollutant type and loading. For this reason investigations were primarily channelled into the development of technologies of which the application would suitably alleviate discharge problems encountered with this

class of textile scouring effluent. The most effective solution to the strong caustic scouring effluent problem is an electrochemical system which enables the recovery and closed-loop recycle of sodium hydroxide, water and energy in the scouring process. The process sequence involves neutralisation of the effluent with acid gas, filtration through cross-flow microfiltration and nanofiltration membranes to remove suspended and soluble impurities and finally depletion of the sodium salt by an electrochemical membrane cell which generates acid gas for recycling, high quality sodium hydroxide of suitable concentration for direct reuse during scouring as well as re-usable wash water.

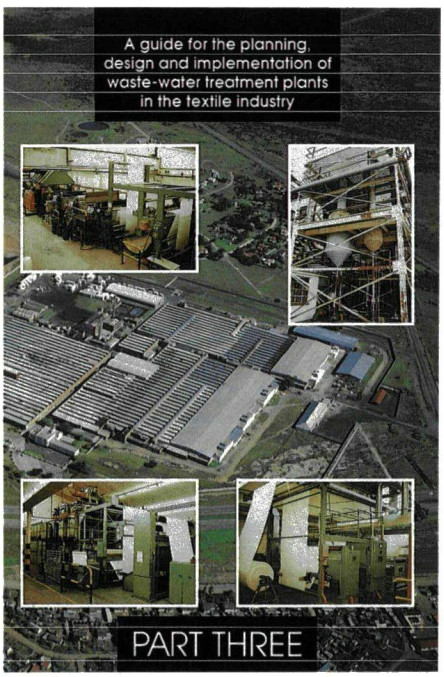
Good performance of the electrochemical unit is ensured by maintaining the conductivity of the effluent as high as possible. This is achieved by the implementation of an evaporative step to concentrate the effluent prior to treatment and maintaining a background sodium concentration in the recycled wash water and recovering only the sodium from the effluent which has been washed from the cloth after scouring.

The acidic gas used in the neutralisation stage may be either chlorine or carbon dioxide. At Smith & Nephew, Pinetown, where cotton is kiered as opposed to scoured, the chlorine system was used. On average, the pretreatment sequence of neutralisation, cross-flow microfiltration and nanofiltration removed all the colour, 60 per cent of the organics and the chemical oxygen demand, 85 per cent of the calcium and 25 per cent of the magnesium. Potassium hydroxide was recovered in the electrochemical unit at 90 per cent current efficiency.

The chlorine system was also used at David Whitehead & Sons, Tongaat, to recover sodium hydroxide from scour effluent. Electrolysis of the nanofiltrate produced sodium hydroxide at above 80 per cent current efficiency.

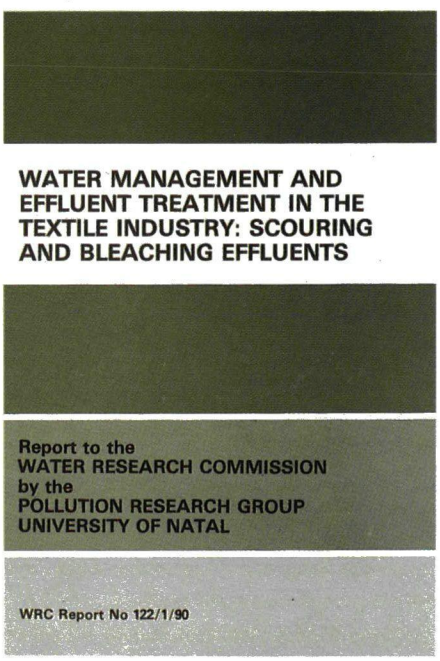
In both trials operational current density was strongly dependent on anolyte concentration, dropping sharply as anolyte sodium concentration decreased below 10 g/ℓ. This effectively made it uneconomical to remove more than 55 per cent of the sodium or potassium from the nanofiltrate.

The carbon dioxide system was used at Da Gama Textiles, King Williams Town to recover sodium hydroxide from scour liquor. The electrochemical stage of the pilot-plant trials recovered sodium



at an average current efficiency of 62 per cent. The recovered caustic stream was extremely pure and the depleted brine stream was of suitable quality for reuse in the scour wash process without pH adjustment. To overcome the drop in current density with decreasing anolyte sodium concentration, a background concentration closed loop recycle wash system was incorporated. Results showed that the operation of such a loop containing 10 to 30 g/ℓ sodium would decrease the required electromembrane area significantly.

Some problems were encountered with the operation of the electrochemical cell which resulted in a high power consumption. Polarisation with subsequent loss of current efficiency was shown to have occurred.



Although the efficiency of caustic production was higher and power consumption was lower when the chlorine system was used, the carbon dioxide system is preferred and the Pollution Research Group are confident that if the electrolyte flow distribution in the carbon dioxide system is optimised, then current efficiencies will be increased and power consumption decreased.

DESIGN

A detailed design of an electrochemically based treatment system has been presented in the Guide. The design is based on data obtained during the operation of pilot plant trials. Fouling and scaling of the cross-flow microfiltration, nanofiltration and electrochemical membranes are minimal and reversible. A long anode coating life is predicted. Current efficiencies for the recovery of sodium hydroxide are 75 to 80 per cent and the electrical power requirements of the electrochemical unit are 3 000 to 4 000 kWh/t of 100 per cent sodium hydroxide. Evaporation pilot plant trials indicated that no scaling of the heat exchanger surfaces occurs during the concentration of caustic scouring effluent. A detailed economic analysis of the electrochemical recovery system is presented. The effects of washing variables, processing temperatures, background wash-water concentration and evaporator concentration factors on the plant size requirements and capital costs are determined.

ADVANTAGES

The advantages of the recovery system applied to a strong caustic scouring line are as follows:

- Water consumption is reduced by 85 to 95 per cent.
- Sodium hydroxide consumption during scouring is reduced by 65 to 75 per cent.
- Effluent production is minimised and pollutant loading of discharges with respect to inorganics, in particular sodium, is reduced.
- The closed-loop recycle system provides for water savings, chemical savings, decrease in effluent discharge costs and energy savings. Thus the use of this technology at textile mills will have a significant impact on effluent discharge and will result in chemical and water savings.

Waterbenuttingsentrum by UP ingewy

Die Universiteit van Pretoria se Afdeling Waterbenutting het onlangs die inwyding van hul nuwe Waterbenuttingsgebou en laboratoriums met 'n skemeronthaal gevier.

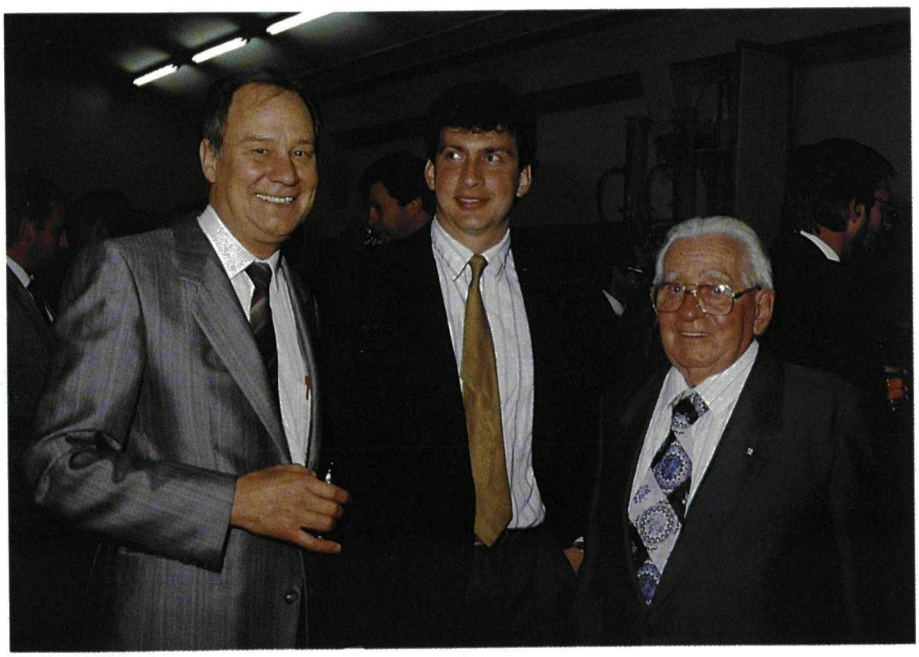
Tydens die geselligheid het die Suid-Afrikaanse Brouerye (SAB) en die Stellenbosch Boerewynmakery (SFW) navorsingstoerusting ter waarde van meer as R1 miljoen aan die Afdeling, wat deel uitmaak van die departement chemiese en omgewingsingenieurswese, oorhandig. Mnr Mike Short van die SAB het in sy oorhandigingstoespraak gesê goeie watergehalte is van die uiterste belang vir brouerye en die voedselverwerkingsnywerheid; veral die ysterinhoud en mikrobiologiese besoedeling van water kan vir brouerye probleme skep. Daarom beskou die SAB die toerusting wat hulle aan die universiteit skenk, twee osoongenerators met bybehore, as 'n bydrae tot navorsingswerk waaruit hulle ook voordeel sal kan trek.

Mnr Bennie Nell van SFW het gesê dat die navorsing wat prof Van Leeuwen en sy studente op die gebied van watersuiwering doen tot groot voordeel in die nywerheid aangewend kan word en dat hulle met graagte die osoongenerator, kontakkolomme en filters skenk om die navorsing te bevorder.

Die uitvoerende hoof van die Randwaterraad (RWR), mnr Vincent Bath, het in sy toespraak gesê die RWR ondersteun waterbenuttingsingenieurswese finansieel reeds die afgelope twee en twintig jaar aan die universiteit. Hy het gesê die geld is 'n belegging in mannekrag wat instansies soos die RWR kan help om die huidige fundamentele wetenskaplike uitdagings in die waterveld soos besoedeling en verstedeliking te bowe te kom.

Volgens prof Hans van Leeuwen word staatsondersteuning vir universiteite elke jaar minder. Dit beloop tans sowat 67 persent van die universiteit se inkomste teenoor die 80 persent van vroeër. Finansiering uit die gemeenskap word dus al hoe belangriker. Hy het instansies soos die WNK, SNO, Goldfields van SA, SASOL, Pretoria Munisipaliteit, ChemServe, Fedgas, Afrox, Air Products, Meiring en Barnard Becon Control, SAB en SFW geloof vir hulle finansiële bydraes en gesê dit stel die Afdeling in staat om met sy noodsaaklike opleiding en navorsingstaak voort te gaan.

Onder: Prof At Pretorius (Hoof : Waterbenuttingsingenieurswese), mnr Ruben Nasser – Ortigoza, 'n nagraadse student uit Paraguay en Dr Gerrie Stander, die eerste Uitvoerende Direkteur van die WNK, by die inwydingsgeselligheid.



RAINFALL PREDICTED WITH SEA TEMPERATURES

Anomalies in the temperature of the sea are being monitored to predict rainfall in the tropics.

According to Dr Stefan Hastenrath, with the Department of Meteorology at the University of Wisconsin, Madison, this allows the prediction of hydrological and, implicity, climate conditions with the results being useful in water resources and land use planning.

Hastenrath studied the general circulation mechanisms of extreme climate events in northern South America, using water discharge from eight river catchments as a measure of hydrometeorological conditions. Seasonal prediction methods were developed from the investigations.

Throughout the year, Hastenrath said, trade winds sweep over the Caribbean Sea into northern South America and across the Central American land bridge. In the eastern Pacific Ocean, the winds meet the cross-equatorial flow from the Southern Hemisphere in the intertropical convergence zone, where convective activity is concentrated. Much of the area's rainfall is a result of this activity. Hastenrath said rainfall variability shows a pronounced association with circulation disturbances in the equatorial convergence zone, called the southern oscillation.

Because existing rain-guage networks are difficult to maintain, river runoff is used to give an integral measure of hydrometeorological conditions in a catchment as a whole. Over time, runoff is the excess of rainfall over evaporation for the catchment. Hastenrath particularly considered the Essequibo River Catchment, which travels 965 km through Guyana and drains almost half of the country. The study showed that cooler-than-average sea surface temperatures in the eastern Pacific in September and October foretell higher-than-average temperatures foretell drier weather. Hastenrath said this prediction method has promise for certain regions of the topics.

WATER NEWSLETTER 30-11-90

AINSWORTH SECURES FIRST MAJOR EXPORT ORDER

Ainsworth Engineering (Pty) Ltd of Robertsham, Johannesburg, recently secured its first major export order comprising 24 large bore wedge gate valves of varying sizes.

The order, for valves ranging in size from 400 mm to 800 mm NB, was placed by Germany's largest supplier of water valves. Herbert Stehr, Managing Director of Ainsworth Engineering said "It is interesting to note that thirty years ago, the same manufacturer supplied South Africa with similar valves and is now importing products from South Africa to supplement its own range.

"In the main, European valve manufacturers have ceased to manufacture large gate valves for water applications and these valves have been replaced by butterfly valves. However, worldwide, a demand still exists for these robust conventional valves. Consequently, as these types of valves are still being manufactured to internationally recognised standards in South Africa, new export opportunities are opening up".

Manufactured from spheroidal graphite iron with stainless stell/gurnmetal trim, all the valves are gearbox operated and provided with integral bypass and are expoxy powder coated for corrosion protection.

The valves are manufactured in compliance with ISO 9000 (SABS 0157) code of practice for quality management systems.

Enquiries: Mr H Stehr, Ainsworth Engineering (Pty) Ltd, P O Box 1122, Southdale 2135. Tel: (011) 433-3968 Fax: (011) 433-3623.

Right: One of the two 1 200 mm Ring Needle valves being assembled at the Ainsworth factory.

UNDERGROUND WATER EXPLOITATION NEEDS LEGISLATION

Legislation governing the exploitation of underground water is urgently required in South Africa says Dr Brian Hambleton Jones of the Earth Environmental Technology Division of the Atomic Energy Corporation (AEC).

According to Dr Hambleton Jones this is the only way in which this valuable asset can be preserved for future generations.

However, he points out that in the interim period it is important that municipalities and other local authorities implement sound water management policies. "Water management does not merely involve the siting of a borehole. Rather it is the careful planning of water utilisation so as to strike a balance between recharge and extraction."

The key to any water management problem, he says, is an understanding of the nature and occurence of each particular underground supply. For a proper understanding it is essential to study the geology of the environment which effectively controls the distribution of the ground water. "Thus an artesian supply is very different to underground water occuring in sand stones, beach sands or major fractures."

Not only is the AEC able to clearly identify the geological factors relating to a particular resource but it can also advise on ground water utilisation. "Through the planning implementation and modelling of a particular underground resource we can provide for effective control of the process and allow for the prediction of the behaviour of the system, thereby reducing potential future problems."

The AEC was recently involved in a study with the Department of Water Affairs to characterise groundwater quality throughout South Africa. Besides being used to assess the suitability of groundwater for domestic, industrial and agricultural use the maps emanating from the study are also designed to help in developing an overall environmental strategy for controlling and protecting ground water.

GROEIENDE WATERBRON ONDERSTEUN UITBREIDINGS IN DIE BOSVELD

Die Magalies-Waterraad, gesetel te Rustenburg, het so pas die volgende kontrakte toegeken vir die verdubbeling van sy Vaalkop Watersuiweringsaanleg naby Beestekraal:

Siviele Werke: Concor Holdings (Edms) Bpk	R6 095 000
Hoogdruk pomp: Sulzer Bros	R500 000
Elektriese skakeltuig: SAEC Electrical (Edms) Bpk	R1 981 000
Meganiese werke: Turbo Projects B B	R2 922 000

Hierdie uitbreiding van R11,5 miljoen sal die aanleg in staat stel om teen 1992 'n maksimum van 120 000 m^3 gesuiwerde water per dag te lewer.

As gevolg van die ekonomiese bedrywighede in Bophuthatswana en die uitbreidings van die platinamyne in die Northam-omgewing, asook die aansluiting van die Stadsraad van Thabazimbi, ondervind die Magalies-Waterraad tans 'n ongekende groei in die vraag na gesuiwerde water vanaf sy Vaalkopskema. Die nuwe "Lost City" kompleks met sy beoogde "waterwêreld" wat op die oomblik by Sun City in aanbou is, sal die vraag verder verhoog.

Pyplyne wat wissel vanaf 450 mm tot 1 200 mm in deursnee word tans oor 'n totale lengte van 60 km gelê om die groter volume water na die gebruikers te vervoer. Die ontwerp en toesighouding oor die konstruksie van die pyplyne sowel as 'n reservoir word deur Liebenberg Jenkins en Vennote Ing hanteer. Twee reservoirs van 15 megaliter elk is reeds voltooi.

Die Magalies-Waterraad vier vanjaar sy 21ste bestaansjaar en het vinnig gegroei vanaf 1970 toe sy Vaalkopskema huishoudelike water aan die dorp Northam en die Swartklip Platinamyn voorsien het tot 'n organisasie wat water verskaf aan 'n gebied van ongeveer 7 000 km^2 – vanaf Hammanskraal ten noorde van Pretoria tot by Thabazimbi in die noordweste, vanaf Cullinan in die ooste tot by Sun City en die nywerhede te Mogwase in Bophuthatswana in die weste.

Die Voorsitter van die Raad, mnr Dawie Marx, sê sy Raad se beleid is om die voorsieningsgebied mettertyd verder uit te brei om uiteindelik, sover moontlik, die Pretoria Streekdiensteraad se gebiedsgrense en selfs Rustenburg in te sluit. Die Raad bedryf reeds drie watervoorsieningsaanlegte, naamlik dié by Vaalkop (die grootste) en twee kleinere aanlegte by Temba en Wallmannsthal.

Die kern van die projekspan vir die siviele deel van die uitbreiding van die Vaalkop aanleg maak reg vir sy eerste terreinvergadering. Van links na regs: Mnre Mike Stoop en John Venchiarutti van Concor Holdings, Pat van Heerden en Chris Warner van G F & J Raadgewende Ingenieurs, saam met mnr Nic Fenner, (Hoof Uitvoerende Beampte) en mnr Roelf Strydom, (Direkteur Tegnies) van die Magalies Waterraad.

Die Raad se Vaalkopskema ontvang sy rouwater vanuit twee bronne naamlik die Vaalkopdam by die skema self en die Krokodilrivier. Die Vaalkopdam word gevoed deur die Hex- en die Elandsriviere. Waar meeste Waterrade gemoeid is met die probleem van krimpende waterbronne, is die Magalies-Waterraad in die unieke posisie dat sy bron groei! Namate die groot nywerheidsmasjien en stedelike uitbreiding in die PWV-gebied groei, groei die uiteindelike afloop na die Hartebeespoortdam. Laer af in die Krokodilrivier vloei hierdie water in die Roodekopjesdam waarvandaan dit per kanaal na die Vaalkopdam oorgeplaas word.

Die kwaliteit van die water uit die Krokodilrivier verskil van dié uit die Vaalkopdam. Die Raad het sy Raadgewende Ingenieurs, Geustyn Forsyth & Joubert Ing (G F J Ing) versoek om die ontwerp van die nuwe deel so aan te pas dat die aanleg rouwater kan hanteer waarvan die kwaliteit wissel vanaf water met hoë troebelheid en lae organiese inhoud (vanuit die Vaalkopdam opvanggebied) tot hoogs eutrofiese water met lae troebelhede uit die Hartebeespoortdam. G F J was instrumenteel in die ontwikkeling van die opgeloste lugflottasie proses vir die behandeling van algryke waters. Hiervoor was verskeie eksperimente op loodskaal uitgevoer en deeglik gemonitor. Hierdie kennis het daartoe gelei dat die beginsel reeds by verskeie volskaalse aanlegte doeltreffend aangewend is.

Die ontwerp van die nuwe aanleg by die Vaalkopskema maak daarom voorsiening vir die volgende:

- Voorchlorinering
- Byvoeging van kalk vir pH-stabilisasie;
- Byvoeging van koagulante;
- Flokkulasie;
- Opgeloste lugflottasie;
- Sedimentasie;
- Snelsandfiltrasie;
- Na-stabilisasie; en
- Chlorinering.

Die Uitvoerende Hoof, mnr Nick Fenner, beklemtoon trots dat die Magalies-Waterraad oor die afgelope 21 jaar bewys het dat hy as leweransier 'n versekerde kwota gesuiwerde water van uitstekende kwaliteit vir huishoudelike en nywerheidsdoeleindes aan sy verbruikers teen die mees ekonomiese prys lewer. So byvoorbeeld word die flottasie- en ander eenheidsprosesse slegs ingevoer wanneer dit werklik nodig is. Daar word ook voorsien dat geaktiveerde koolstof in die toekoms aangewend sal moet word om smaak- en reukprobleme uit te skakel. Alhoewel geen probleme met die implimentering hiervan voorsien word nie, sal die kapitaalbesteding daarvoor so lank as moontlik uitgestel word.

Navrae: N J Fenner – Tel (0142) 29460

COMPRESSION FITTINGS FOR PIPES

A complete range of Plasson compression fittings for polypropylene and high density polyethylene pipe is available from Main Industries (Polyflow) of Midrand. Made in Israel, they come in all popular sizes from 16 mm to 110 mm diameter.

Plasson fittings are considered to be among the best on the South African market for harsh conditions in mining, civil engineering and municipal applications. They are suitable for use with the full range PP and HDPE pipe manufactured to SABS standards.

The body and nut of the fittings are made of high grade polypropylene copolymer, the split ring of acetal and the O-ring of nitrite rubber (NBR). The sealing achieved with the rubber O-ring ensures complete water tightness with straight or bent pipes and in high and low pressure applications.

Another major advantage of the Plasson range is that they contain a minimum number of loose small parts which prevents parts losses during installation. The pipes are simple to use and can be reused without having to cut of the pipe end.

Enquiries: Main Industries (Pty) Ltd, P O Box 2530, Halfway House, 1685. Tel: (011) 315-1844.

LARGEST RESERVOIR CONTROL VALVES MANUFACTURED LOCALLY

Ainsworth Engineering (Pty) Ltd has recently completed an order for the manufacture of two 1200mm NB inline reservoir control valves for the Glen Garry Reservoir near Cape Town. These valves are believed to be the largest inline flow control valves for water manufactured to date in South Africa.

The valves are of the ring needle/plunger type and are suitable for continuous in-line flow regulation, as the design minimises the effects of cavitation and vibration. Flow control is required between 30 and 350 Mℓ/d at a maximum static inlet pressure of 1.20 MPa.

In order to ensure that wear caused by throttling is kept to a minimum, the valves are provided with a replaceable stainless steel body set with an enlarged downstream area. The valve bodies are manufactured from spheroidal graphite iron and the piston or plunger of stainless steel. Drop-tight sealing is achieved by means of a resilient seal retained on the piston by a stainless steel retaining ring and the replaceable stainless steel body seat.

The plunger is driven by an internal crank drive. Actuation is achieved by means of a combined worm/spur gearbox which is totally enclosed and permanently lubricated and an electric actuator. The valves are internally and externally protected by fusion bonded epoxy which provides maximum corrosion protection.

Similar valves were already locally manufactured by Ainsworth some ten years ago and are still successfully in use at the Woodstock Dam's Natal outlet bypass and at the Jonkershoek Tunnel outlet near Stellenbosch.

The valves are manufactured in compliance with ISO 9000 (SABS 0157) code of practice for quality management systems.

Enquiries: Mr H Stehr, Ainsworth Engineering (Pty) Ltd, P O Box 1122, Southdale 2135. Tel: (011) 433-3968. Fax: (011) 433-3623

One of the two 1 200 mm Ring Needle valves being assembled at the Ainsworth factory.

KORTKURSUS OOR WATERSUIWERING BY U.P. 'N SUKSES

Mnr John Geldenhuis (Rand Waterraad) en Prof Hans van Leeuwen maak kursusgangers touwys tydens die kortkursus aangebied in Augustus.

Die Afdeling Waterbenutting in die Departement Chemiese en Omgewingsingenieurswese van die Universiteit van Pretoria, het in Augustus en September 'n weeklange kortkursus oor die beheer van drinkwatersuiweringsaanlegte aangebied. Die kursus was 'n groot sukses en is bygewoon deur werknemers van plaaslike owerhede, streeksdiensterade, staatsdepartemente, navorsingsinstansies, waterrade, raadgewers en die privaatsektor. Daar word beoog om dieselfde kursus in November vanjaar te herhaal weens die belang daarvan en om in die belangstelling te kan voldoen.

Die kursus is praktyk gerig en die helfte van die beskikbare tyd word in die laboratorium en agter die rekenaar deurgebring. 'n Wye verskeidenheid van onderwerpe word gedek, te wete:

- Die filosofie van watersuiwering
- Vermenging, koagulasie en flokkulasie
- Besinking, flottasie en filtrasie
- Ontsmetting en stabilisasie
- Vloeikarakterisering
- Rekenarisering van bedryfsrekords
- Aanlegbeheer en -bestuur
- Waterkwaliteitsbestuur
- Slykhantering

Omdat die kursus so prakties is met baie individuele aandag aan die kursusgangers, is die bywoningsyfer beperk tot 20 per week. Behalwe die dosente, proff At Pretorius, Johannes Haarhoff, Hans van Leeuwen (kursusorganiseerder), dr Chris Viljoen, mnre Johann Botha, Alwyn Husselman en John Geldenhuys is daar ook 3 ingenieurs en wetenskaplikes met die demonstrasies behulpsaam. Kursusgangers leer laboratoriumtegnieke aan wat nuttig is in die bedryfsituasie, hulle sien besonderhede van eenheidsprosesse wat nie op 'n volskaalse aanleg sigbaar is nie en leer die persoonlike rekenaar gebruik vir rekordhouding tesame met die jongste Stasoft-program vir versagting en stabilisasie. Die kursusgangers word oor elke onderwerp geëvalueer om 'n sertifikaat vir die suksesvolle voltooiing van die kursus te verwerf. Kursusgangers wat nie slaag nie ontvang 'n bywoningsertifikaat.

Die kortkursus is gerig op ingenieurs, wetenskaplikes en bedryfspersoneel wat in 'n toesighoudende hoedanigheid werk of wil werk. Daar is geen spesifieke toelatingsvereiste nie, maar ervaring van watersuiweringsaanlegbedryf en kennis van elementêre chemie en wiskunde is nodig om die kursusmateriaal te begryp.

Bywoningskoste bedra R1 000 per persoon wat etes, studiemateriaal, rekenaarskywe en sertifikate insluit. Persone wat belangstel om die kursus van 11 tot 15 November by te woon, kan hulle name, kwalifikasies, besonderhede oor ervaring en posisie beklee en werksadresse stuur aan:

Prof Hans van Leeuwen
Afdeling Waterbenutting
Departement Chemiese en
Omgewingsingenieurswese
Suid-kampus
Universiteit van Pretoria 0002

Tjeks kan uitgemaak word aan UP Waterkortkursus. Spoedige ontvangs van betaling verseker u plek by hierdie gewilde kursus. Kursusmateriaal en verdere besonderhede sal aangestuur word na ontvangs van betaling.

PROGRAMMABLE CONTROL OF WATER TREATMENT

B&R programmable controllers have been installed to provide automatic blower control to regulate sewage aeration at a major Transvaal municipality water treatment plant. B&R are represented in southern Africa by ProLoCon.

A TurboLink SCADA system on a PC is linked by modems with Modbus protocol to a B&R MIDICONTROL used as a cell controller. A plug-in communications coprocessor runs standard Modbus emulation software. Communication from the MIDICONTROL is via RS232 MINIMET master-slave protocol into an RS232/R485 converter to permit communication with separate blowers, each controlled by a separate MINICONTROL. The MINICONTROL/ blower circuitry is arranged in parallel so that any blower can be disconnected without disturbing the programmed operation of the others.

B&R products were chosen for this project because of their communications ability, local support, back-up and favourable costing. The PID algorithm is available for all B&R CPUs. Providing autonomy to each blower was also a factor which helped win this contract against strong competition.

ENQUIRIES TO:
ProLoCon (Andrew Ashton)
Tel (011) 455-5710
Fax (011) 455-5842

COMRO FOR COMPREHENSIVE WATER QUALITY SERVICES

The Chamber of Mines Research Organisation (COMRO) provides a unique range of services in the field of water quality, management and treatment, from detailed research and development projects to analysis of water samples. These include:

*** Water treatment process evaluation studies**

COMRO's water treatment test site provides a fully supported facility for the continuous (24 hour) evaluation of any water treatment process which has potential for application in the mining industry. Facilities at the test site also enable the evaluation of pilot plants with a throughput of up to 1,5 ℓ/s and sophisticated water treatment plant automation strategies.

*** Environmental studies**

Comprehensive environmental audits and environmental impact assessments are undertaken for existing and planned mining projects. Control, management and monitoring systems are provided to address the identified environmental problems. The specification and design of water reclamation strategies together with the associated cost and strategic benefit assessments are undertaken.

*** Field evaluations of water systems and water treatment processes**

Water quality surveys of various surface and underground water circuits by means of automated sampling campaigns or the installation of continuous monitoring and recording systems can be undertaken to satisfy a wide variety of water related needs.

*** Feasibility studies**

Feasibility studies and conceptual designs are undertaken for all water quality management systems and water reticulation systems, as well as modifications and upgrading of existing systems.

*** Analytical services**

The water analytical laboratory supplies comprehensive and confidential water, soil and general analytical services covering chemical, physical, microbiological and radiological parameters. A fully portable water laboratory is available for sample analysis in the the field.

COMRO
INNOVATION IN MINING

*** Detailed water engineering design of water treatment systems**

The team has the expertise to provide detailed engineering designs and drawings for equipment and systems as well as capital and operating cost assessments for a wide range of water treatment systems, such as neutralization systems, flocculation systems, settlers, filtration systems, water treatment control systems and desalination systems.

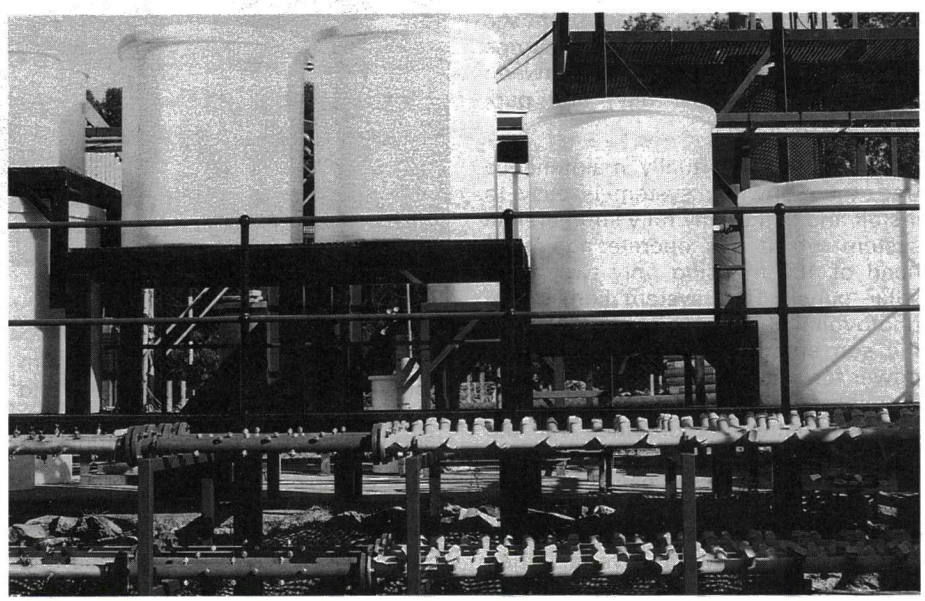
*** Research and development projects**

The expertise, facilities and successful track record of the water team enable them to undertake detailed research and development projects on any water-related issues for individual mines, mining groups or the mining industry as a whole.

The facilities include a comprehensively equipped water treatment test site for pilot plant investigations of all aspects of mine water treatment; a water analytical laboratory for water analysis; and the most extensive information centre in South Africa covering mine water quality data and mine water treatment technologies. All work undertaken is planned and managed using sophisticated computerised project management techniques. These services are manned by a team of experts with a combined total relevent experience of 80 years in water quality management.

The comprehensive facilities together with the expertise embodied in the staff, combine to place COMRO's water quality management team in a unique position for addressing the current and future water-related problems of individual mines and the mining industry as a whole.

Details on the services provided can be obtained from William Pulles or Denis Wymer, Underground Environment, COMRO, P O Box 91230, Auckland Park 2006. Tel: (011) 726-3020.



Water treatment test plant with corrosion monitoring and bio-fouling sections.

NAGRAADSE STUDIE IN WATERBENUTTING BY UP

Die Afdeling Waterbenutting van die Departement Chemiese en Omgewingsingenieurswese van die Universiteit van Pretoria bied reeds 22 jaar lank spesialiskursusse op honneursvlak aan en ken magister- en doktorsgrade toe vir gevorderde navorsing. Persone met BIng en BSc-grade (1e jaar Chemie en Wiskunde 'n vereiste) kan aansoek doen om toegelaat te word tot die deeltydse honneursstudie of vir 'n magistergraad met die bedoeling om voltyds navorsing te doen en deeltyds vakkursusse by te woon. Normaalweg word die M-graad egter na behaling van die honneurs-graad aangepak. Persone wat reeds 'n MIng of MSc graad het of 'n publikasierekord het wat op die vlak van 'n MIng of MSc geag word, kan na oorleg met die professore inskryf vir 'n PhD-graad.

Die vakkursusse vir die honneursgrade word op 'n blokweekbasis aangebied. Twee vakkursusse per semester word saam aangebied gedurende twee voltydse weke, in Januarie en Maart, en in Julie en September. Ekskursies, seminare en eksaminering word gedurende drie dae in elke semester afgehandel in Junie en November. Die agt vakkursusse wat gedurende die volgende twee jaar aangebied sal word, is Waterbenuttingstrategie, Waterchemie, Watermikrobiologie, Watersuiwering, Vasteafvaldisponering, Rioolwatersuiwering, Nywerheidswaterbestuur en Waterversorgingsondersoeke, vanaf die eerste semester in 1992.

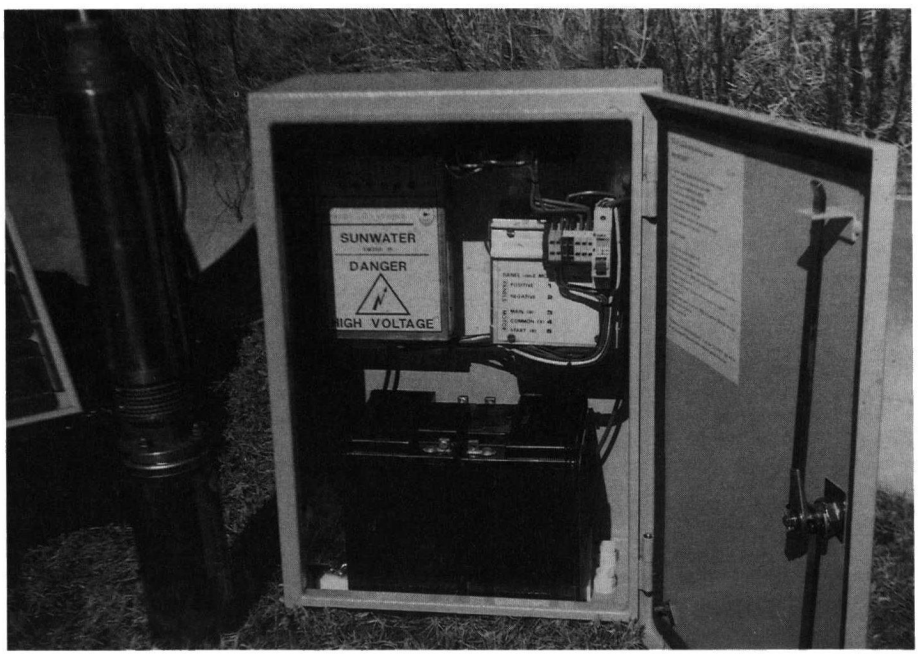
Die Afdeling bied navorsingsgeriewe en studentskappe (voltyds tydelike navorsingspos) van ordelik R30 000 per jaar aan goedgekeurde voltydse studente mits die projekvoorstelle vroegtydig geformuleer en voorgelê word vir befondsing. Daar bestaan ook moontlikhede om op 'n deeltydse basis navorsing vir M- en D-grade te doen veral as die projekte die steun van die kandidaat se werkgewers geniet. Die Afdeling se personeel kan behulpsaam wees om sulke projekte te formuleer en gedeeltelik ekstern befonds te kry.

Die aantal posisies is beperk en voornemende studente word aangeraai om spoedig navrae te doen by prof Hans van Leeuwen, Waterbenutting, Suidkampus, UP, 0083; Tel: (012) 420-3571, Faks: 43-6683 of om die poskaart in hierdie Bulletin in te vul.

UNIQUE SOLAR PUMPING SYSTEM FOR REMOTE AREAS

A locally designed and manufactured solar pumping system, which can deliver up to 1600 ℓ/h, provides a reliable water supply for locations remote from a domestic electrical supply. Known as the SUNWATER system, it is particularly suitable for game and stock watering where consumption requirements can exceed 45 litres per day; domestic water supplies for villages and camps where the requirements are between 30 and 50 litres per day; and park watering generally.

Designed to be virtually maintenance free, the Sunwater system is easy to install and is the only fully submersible system which can operate against a head of 180 m using only two 40 W solar panels. The system consists of photovoltaic (PV) panels which convert the sun energy to sufficient electrical power for a standard single phase submersible 220 VAC submersible pump. A 24 V battery is provided for the high-current start-up duty. It is not subjected to deep cycling because of the daily solar power source but serves as an energy accumulator for the 24 VDC to 220 VAC sine wave inverter when sunlight conditions are poor.



Inverter system with pump

The PV cells are regulated for optimum energy conversion and availability and water delivery can be increased at any stage by simply increasing the number of solar panels for increased power. No other changes to the system are necessary.

The Sunwater system is designed and manufactured by Pretoria based specialists, Tescon. Distributors around the country offer technical support and ensure availability of equipment and spares.

Enquires: Tescon (Pty) Ltd. (Lyon van der Merwe) Tel: (012) 663-3970 Fax: (012) 663-2012.

SOUTHERN AFRICA 1991

WASTE
NOVEMBER 4 – 6

A course on municipal waste engineering will be held at Stellenbosch University.
Enquiries: Prof A Rooseboom, Dept of Civil Engineering, P/Bag X5018, Stellenbosch 7600. Tel: (02231) 77-4353.

HYDROLOGY
NOVEMBER 7 – 8

The 5th national hydrological symposium will be held at Stellenbosch University.
Enquiries: Symposium Organisers, c/o Mrs P Daniel, P O Box 1347, Cape Town 8000. Tel: (021) 21-4610. Fax: (021) 25-1634.

WATER ANALYSES
NOVEMBER 25 – 29

A short course in chemical water analyses will be held at the Technicon, Pretoria.
Enquiries: Mr S Schwarzer, P/Bag X680, Pretoria 0001. Tel: (012) 28-3811 x 262. Fax: (012) 325-8529.

1992

MICROBIOLOGY
MARCH 30 – APRIL 1

The 7th biennial congress of the South African Society for Microbiology will take place in the Sand du Plessis Theatre in Bloemfontein.
Enquiries: Prof B A Prior, P O Box 4345, Bloemfontein 9300. Tel: and Fax: (051) 401-2425.

MEMBRANE TECHNOLOGY
MARCH 2 – 5 1992

An IAWPRC specialised conference on membrane technology in wastewater management will be held in Cape Town. Call for papers.
Enquiries: The Conference Secretariat, IAWPRC Conference on membrane Technology, P O Box 36815, Menlo Park 0102.

FLUVIAL GEOMORPHOLOGY
JULY 1 – 3

The Southern African Association of Geomorphologists will hold their biennial conference entitled "Geomorphology and land management" in Durban. Included will be a small group workshop on "Fluvial geomorphology in Southern Africa".
Enquiries: Dr G Garland, Conference Convenor, Geographical and Environmental Sciences, University of Natal, King George V Avenue, Durban 4001. Tel: (031) 816-2418 Fax: (031) 816-2214.

AQUATIC SCIENCE
JULY 7 – 10

The 29th annual congress of the SA Association of Aquatic Scientists will be held at the University of Cape Town. The theme: "Marine, estuarine and freshwater systems".
Enquiries: Dr J Day, Freshwater Research Unit, Zoology Dept, University of Cape Town, Rondebosch 7700.

ANAEROBIC DIGESTION
JULY 13 – 16

The 3rd anaerobic digestion symposium will be held at the University of Natal.
Enquiries: Prof T J Britz, Dept of Microbiology, UOFS, P O Box 339, Bloemfontein 9300. Tel: (051) 401-2676/2155 Fax: (015) 47-4152.

SA WATER WEEK
AUGUST 17 – 19

A water week conference will be held at the CSIR conference centre.
Enquiries: Mr P E Odendaal, Water Research Commission, P O Box 824, Pretoria 0001. Tel: (012) 330-0340 Fax (012) 70-5925.

AQUACULTURE
SEPTEMBER 9 – 11

A conference entitled Aquaculture '92 dealing with the commercialisation of aquaculture will be held at Rhodes University, Grahamstown. Call for participants.
Enquiries: Mrs L Coetzee, Dept of Ichthyology and Fisheries Science, Rhodes University, P O Box 94, Grahamstown 6140. Tel: (0461) 22023 x 415 Fax (0461) 22403.

OVERSEAS 1991

NITROGEN
NOVEMBER 26 – 27

A workshop on inorganic nitrogen compounds and water supply organised by the standing committee on water quality and treatment of the IWSA will be held in Hamburg, Germany.
Enquiries: Mr Pierre Schulhof, Compagnie Générale des Eaux, 52 rue d'Anjou, 75384 Paris Cedex 08, France. Call for papers.

LAKE MANAGEMENT
NOVEMBER 11 – 16

The North American Lake Management Society (NALMS) will hold its 11th international symposium in Denver, Colorado.
Enquiries: NALMS, P O Box 101294, Denver Colorado 80250. Fax (904) 462-2568

1992

ALUMINIUM
JANUARY 15 – 16

A two-day workshop on aluminium in drinking water organised by the International Watere Supply Association's standing committee on water quality and treatment will be held in Hong Kong. CALL FOR PAPERS.
Enquiries: Mr Jean-Pierre Duguet, IWSA, Laboratoire, Central Lyonnaise des Eaux-Dumez, 38 rue du President Wilson 78230 LE PERCQ, France. Fax: 33-1-34-80-09-01.

ENVITEC '92
MAY 25 – 29

The 7th international trade fair and congress on technology for environmental protection will be held in Düsseldorf, Germany.
Enquiries: South African-German Chamber of Commerce and Indsutry, P O Box 91004, Auckland Park 2006. Tel Annelie Jansen (011) 482-1080 Fax: (011) 726-1366.

WISA

Pollution of Surface and Subsurface Water in the OFS: Impact of the Mining Industry

WISA
MINE WATER TECHNICAL DIVISION

OPEN DAY

8 November 1991

Western Holdings Club, Alma Road, Welkom, OFS

PROVISIONAL PROGRAMME

10:00 Opening: Mr J L J v d Westhuizen (Director Water Pollution Department of Water Affairs).
10:10 WISA MWTD – Mission: Dr H N S Wiechers (Chairman WISA/MWTD)

SESSION I

10:20 "Assessment of Ground Water Pollution in the OFS Goldfields – Water Research Commission Study" – Prof F Hodgson – Inst. Ground Water Studies, University of the OFS.
11:00 Discussion.
11:30 TEA

SESSION II

11:45 "Water Quality Management in the Mining Industry: Implications for Water Pollution Control" – W Pulles, COMRO.
12:00 "The GYPSIX Process: As applied to OFS Mine Waters" – Dr D Everett, JCI.
12:15 "See page from Gold Mine Dumps" – Mr F Geldenhuys, SRK.
12:30 Discussion.
12:45 "Future Vision" – P E Odendaal, Water Research Commission and Immediate Past President of WISA.
13:00 LUNCH
14:30 Technical visit to Gold Plant.

Should you be interested in attending this open day please contact:

1. Mr Paul Forder (0171) 901-2121
2. Mr Jake Pressly (011) 835-3251
3. Mr Dave Dorling (011) 414-1606

Cost: R20 for Wisa Mine Water TD Members, R30 for Non-Members
Please make cheques payable to WISA-MWTD.