

MduP.

S4 waterbulletin

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BESPROEING

WNK stel verslag vry oor drupbesproeiing by tamaties

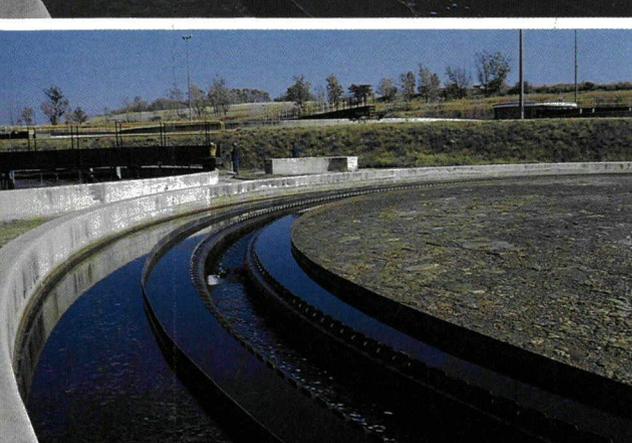
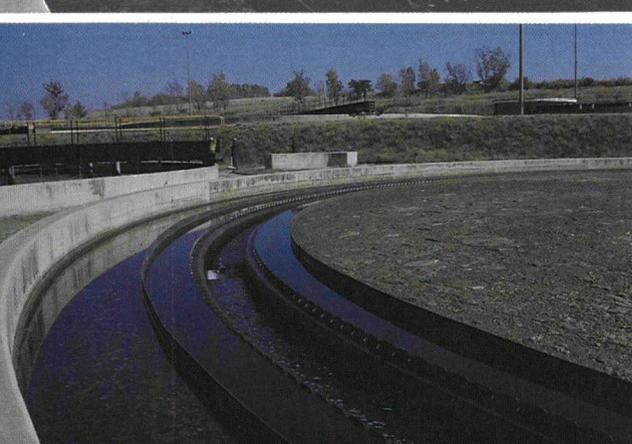
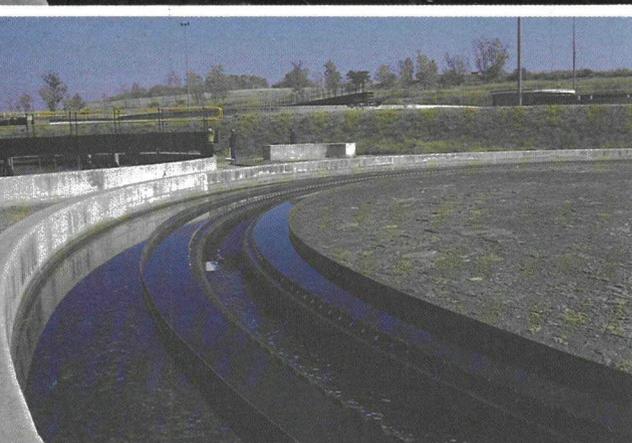
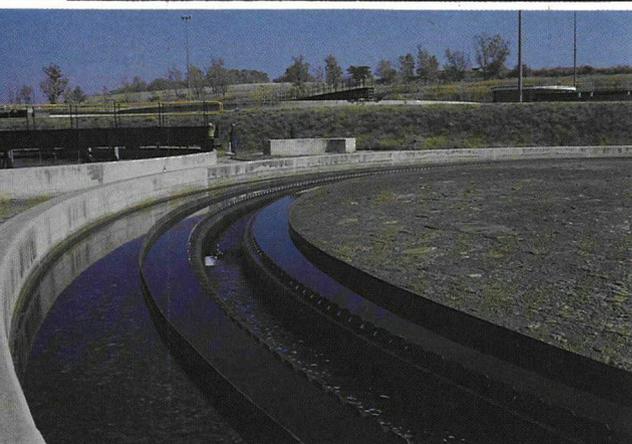
WATER RECLAMATION

Results available of Cape Flats project

WATER POLLUTION

Barium treatment for mining effluents

00010023



WISA



WISA

2nd Open Meeting

NUTRIENT REMOVAL TECHNICAL DIVISION

**SUBJECT: Sludge Bulking in Biological
Nutrient Removal Plants**

**DATE/TIME: 2 October 1991
Beginning at 13:00**

**SUBJECT: Bushkoppies WaterCare Works,
Johannesburg**

We would welcome the participation of all with an interest in bulking sludges and the problems they cause. Please bring any information, experience or problems on bulking that you would like to discuss.

Talks and discussion on Sludge Bulking will be followed by a tour of the Works.

Refreshments will be served after the meeting.

For further information contact:

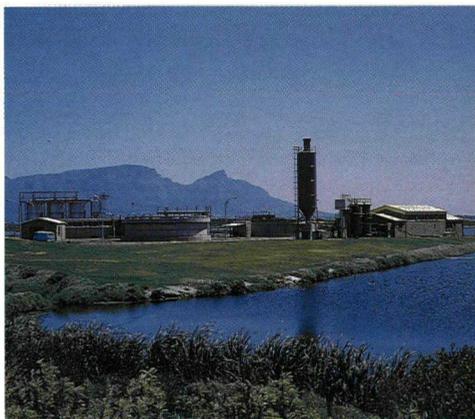
Dr S A Mitchell Water Research Commission,
P O Box 824,
Pretoria 0001.
Tel. (012) 3300340

Dr M C Wentzel Dept. of Civil Engineering,
University of Cape Town,
Rondebosch 7700.
Tel. (021) 650-2583.

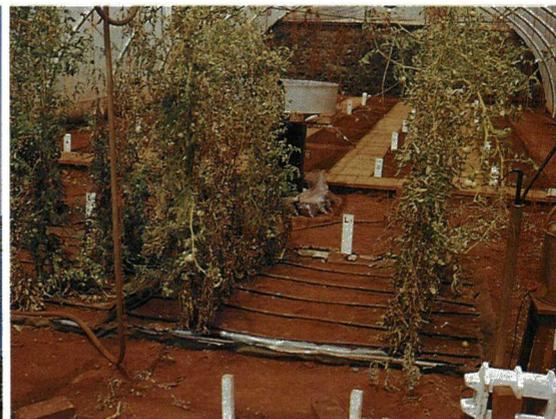
If you are interested in attending, please return the appropriate post card so we can send you a map.



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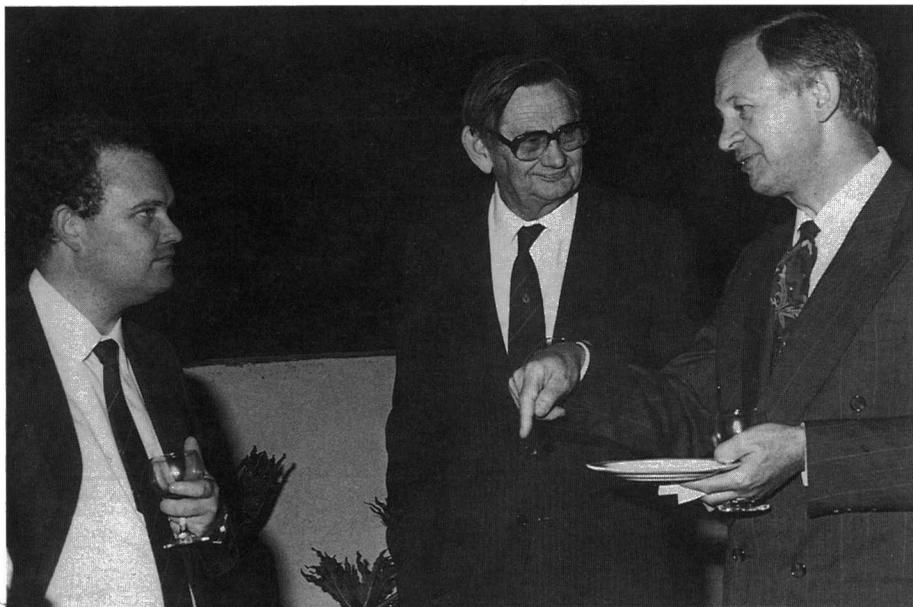
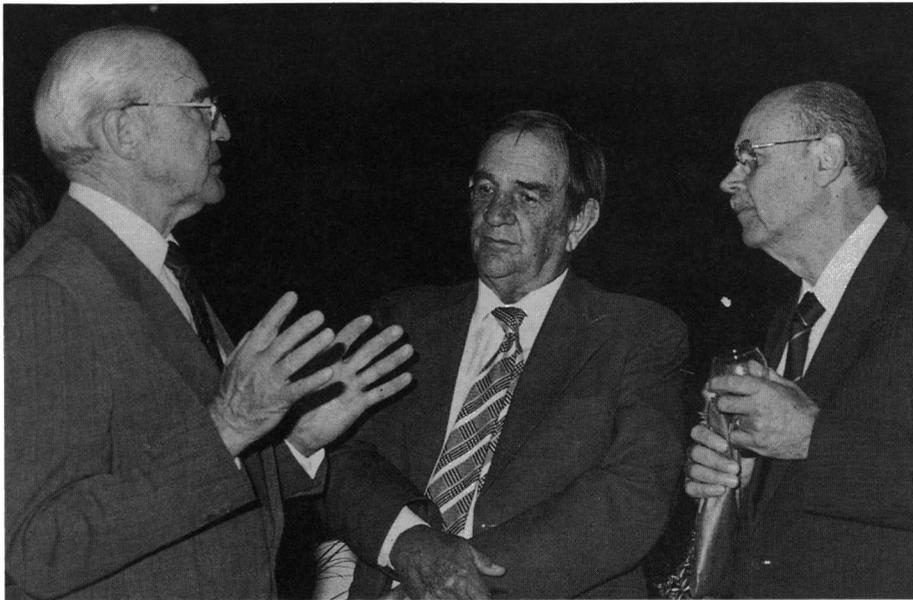
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Cover: Treatment of effluents protects the water environment. (Photo: André J du Plessis)

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.



WNK om navorsing

Die Waternavorsingskommissie be-
fonds tans 24 navorsingsprojekte ter
waarde van nagenoeg R6,25 miljoen
aan die Universiteit van Pretoria, het
mnr Piet Odendaal, uitvoerende di-
rekteur van die WNK, gesê tydens 'n
besoek van die WNK aan die Univer-
siteit van Pretoria. Die Waternavor-
singskommissie was onlangs die gaste
van die Universiteit vir die halfjaarlikse
WNK vergadering en 'n inligtingsessie
op die UP kampus. Na afloop van die
vergadering het die Universiteit die in-
ligtingsessie aangebied met voordragte
oor al die uiteenlopende navorsing wat
aan die Universiteit gedoen word met
die finansiële ondersteuning van die
Waternavorsingskommissie.

In sy openingswoorde by die inlig-
tingsessie het mnr Odendaal gesê dat
die WNK onlangs besluit het om jaarliks
so 'n inligtingsbesoek te bring aan een
van die sentra waar daar 'n konsen-
trasie van WNK projekte is. Die 24
projekte by die Universiteit van Pretoria
is oor 10 verskillende departemente
versprei in die fakulteite Wis- en
Natuurkunde, Ingenieurswese en Land-
bouwetenskappe.

*Bo: Mnr DH Marx (Kommissielid) in
gesprek met mnr AJ Raubenheimer
(Voorsitter, WNK) en prof DM Joubert
(Rektor, UP).*

*Middel: Prof JA G Malherbe (Dekaan,
Ingenieurswese) regs, bespreek 'n
gesprekspunt met prof WA Pretorius
(Chemiese Ingenieurswese) en mnr
G CD Claassens (Direkteur-generaal,
Waterwese).*

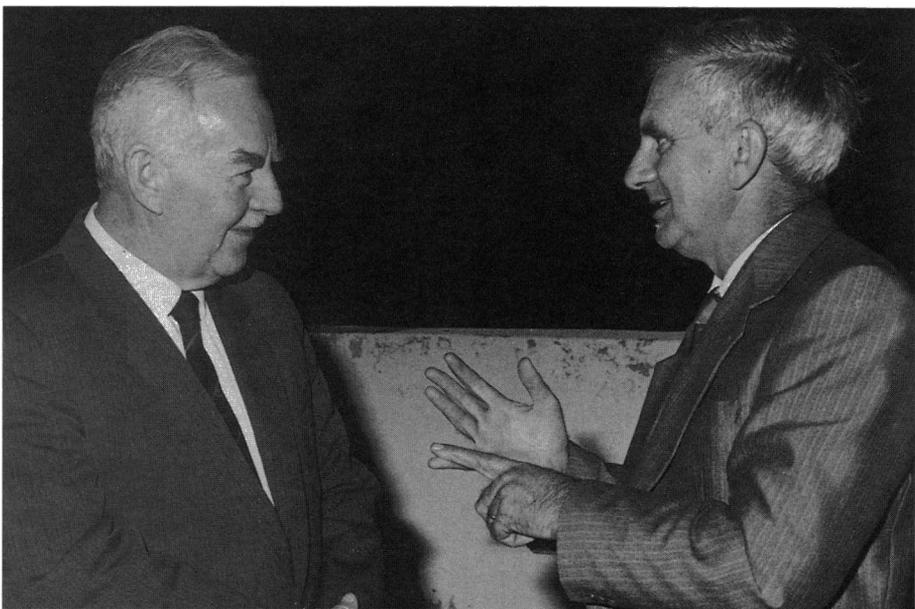
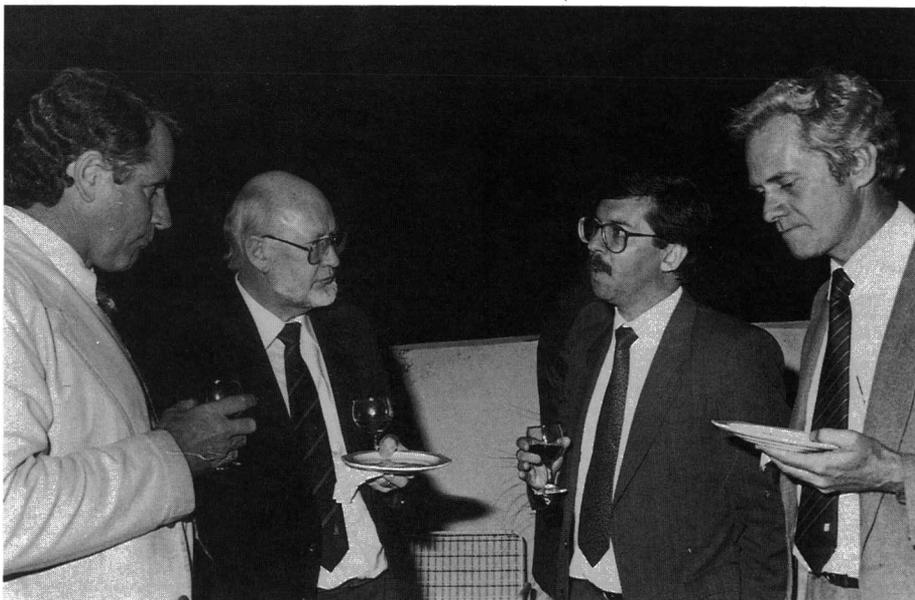
*Onder: Mnr M Erasmus (Adjunk direk-
teur-generaal, Waterwese) voer gesprek
met dr MJ Pieterse (WNK) en mnr
G Offringa (WNK).*

dersteun g aan UP

Mnr Odendaal het daarop gewys dat die WNK nie self navorsing doen nie, ten einde duplisering van duur navorsingsfasiliteite uit te skakel. Maar volgens statutêre opdrag ko-ordineer, befonds en bevorder die WNK waternavorsing wat van nasionale belang en praktiese of ontwikkelingswaarde is. Voorts is water so nou verweef met alle fasette van daaglikse lewe, landbou, nywerheid en die omgewing dat waternavorsing by uitstek multidissiplinêr is.

Navorsing by universiteite is volgens mnr Odendaal van besondere belang aangesien baie nagraadse studente daarby betrokke is, deur wie die kundigheid weer die praktyk ingedra word. Daarbenewens neem die dosente ook navorsingsbevindinge in hul leerplanne op en waar hul betrokke raak in konsultasiewerk vir buite- instansies vorm dit 'n uitstekende roete vir tegnologie-oordrag.

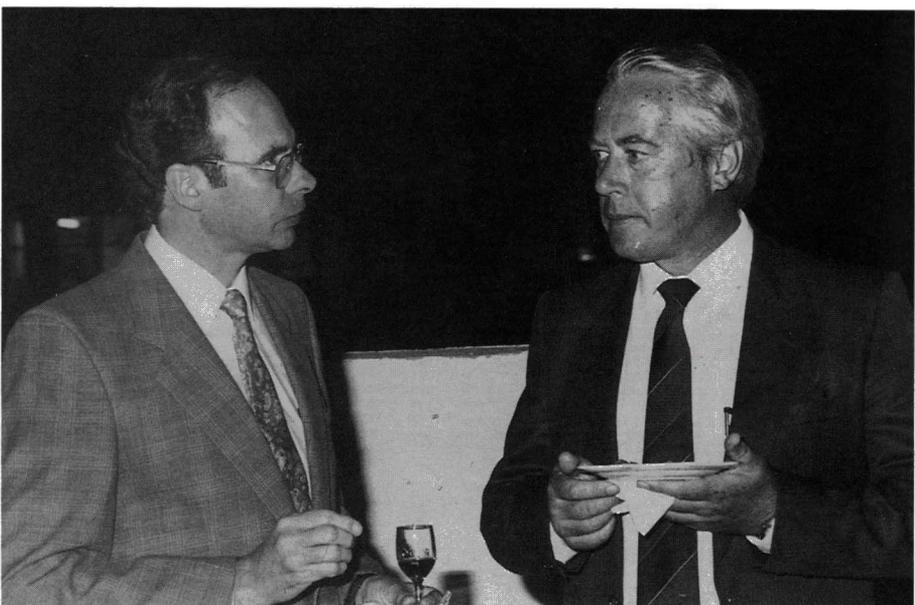
Na afloop van die eerste dag se verrigtinge was die WNK kommissielede en navorsingsbestuurders die gaste van die rektor, Prof D M Joubert, by 'n skemerkelkonthaal.



Bo: Kollegas in gesprek – proff W van Riet (Landskapargitektuur), A Eicker (Plantkunde), T E Cloete (Mikrobiologie) en J van Leeuwen (Chemiese Ingenieurswese) by die rektorsonthaal vir die WNK.

Middel: Prof W J van Biljon (Direkteur: Navorsing, UP) in 'n gemoedelike gesprek met prof M C Laker (Grondkunde).

Onder: Mnr M du Plessis (WNK) en prof W J Botha (Geologie) by die rektorsonthaal.



EPPIC 91 HIGH LIGHTS IN ENVIRONMENT MANA

Water was the central theme of the recent two day conference presented by Environmental Planning Professions Interdisciplinary Committee (EPPIC). Delegates from various research institutions, government departments, city councils, universities, consultants and private industry from all over South Africa attended the conference. The papers covered a wide range of topics including water management research, environment related water resource development and environmental impact management.

In the keynote address mr Rob Pullen, former president of SAICE, said "It is significant that themes and titles of papers in this conference on environmental issues have a strong connotation with development . . . any discussion of the relevance of water in the environment must take cognisance of

the prognosis for future development and of implications for all the interrelated aspects of the environment."

He said that there is an imperative demand for development as South Africa is experiencing dramatic demographic, social and economic as well as political changes, and that a tremendous responsibility rests on policy-makers, executive authorities, developers and the citizens of South Africa to ensure that environmental burn-out is avoided.

The concept of increasing development being sustained by an ecosystem maintained in its pristine condition is an unattainable objective, such is the view that prof J W R Alexander holds. He said that efforts have to be directed towards containing environmental degradation and promoting more efficient

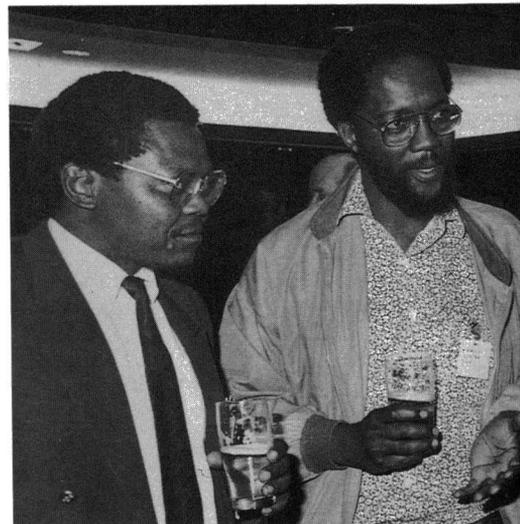
utilisation water resources in the face of increasing resource utilisation. Currently in South Africa there is an active, concerned limnological community and an experienced cadre of water resource planners but the weak link is the knowledge gap between the aquatic scientists and the planners and limited knowledge of the decision-making process, prof Alexander said.

Dr John Raimondo from the Environmental Evaluation Unit at UCT discussed the management and mismanagement of integrated environmental management (IEM) pointing out the benefits of proper management of the IEM process as well as the detrimental results of mismanagement.

Dr C J Breyer Menke from AECI gave a practical indication from the Modderfontein case study of how industry can



Dr. Andrew Jarvis (SASTECH) and Dr Peter Ashton (Watertek, CSIR) attended the EPPIC '91 conference.



Mr B Ndlovu (KwaZulu Government), Mr M Mayekiso and Mr N Nkoane (both from Fort Hare University) and Mr A

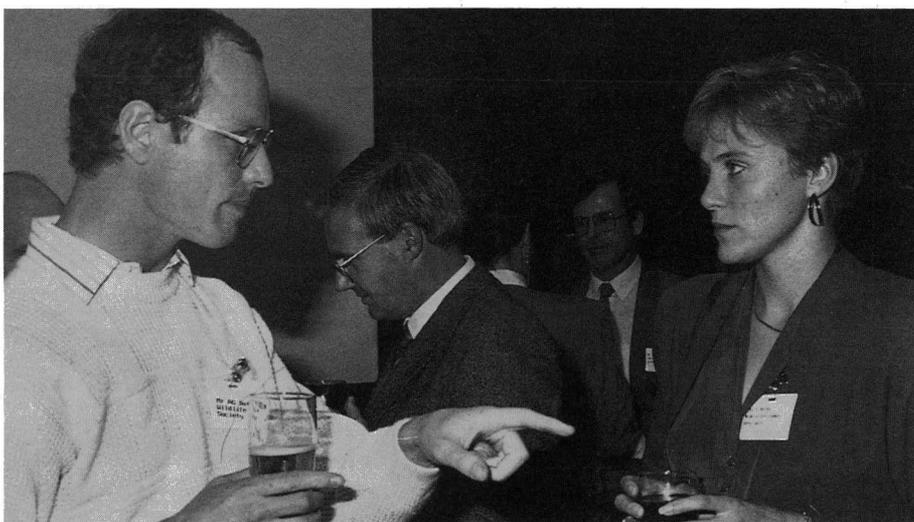
WATER MANAGEMENT

live in harmony with the urban community and the environment through environmental management based on a strong environmental ethic.

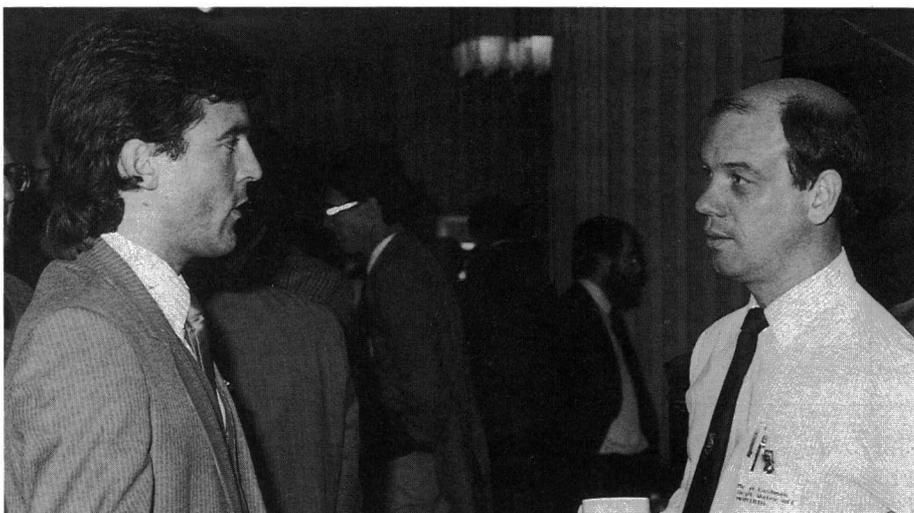
Some case studies from the implementation stage of IEM as applied by the Department of Water Affairs and Forestry was discussed by Mr Francois de Kock along with an illustrative slide show.

Mr Charel Bruwer from the Department of Water affairs highlighted the integrated use of water on the Phongolo floodplain which resulted in the successful management of water on the floodplain for the benefit of man and nature.

Copies of papers presented are available to interested persons. Please contact Dr Mark Chutter at tel. (012) 841-3173.



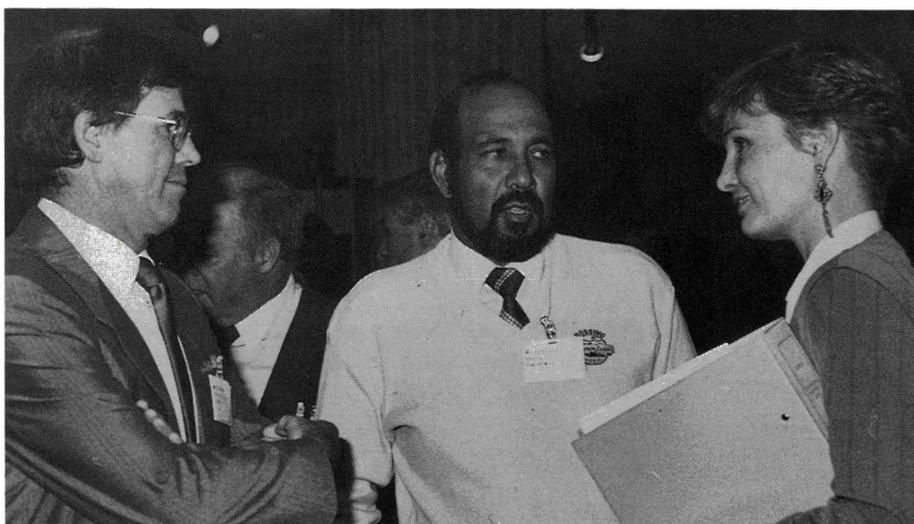
Mr Andrew Duthie (African Wildlife Society) discussing some point of interest with Ms Vicki Heins (Walmsley Environment Consultants).



Dr Andrew Bath (Ninham Shand Inc.) in conversation with Mr Adrian Cashman (Dept Water Affairs, Namibia).



Robertshaw (B S Berman & Partners) at the EPPIC '91 conference.



Mr C J Rodda (Van Niekerk, Kleyn & Edwards), Mr A Abrahams (Rössing Uranium Mines, Namibia) and Ms K Olivier (Geusteyn, Forsythe & Joubert) engaged in discussion.



CAPE FLATS WATER RECLAMATION PROJECT RESULTS AVAILABLE

The production of potable water from an activated sludge plant effluent is a viable source to supplement water supplies, but should only be used when all other economical aspects of water supplementation have been explored and implemented.

This is one of the conclusions contained in a report released by the Water Research Commission entitled "The construction and operation of the Cape Flats water reclamation plant and the surveillance of the reclaimed water quality (WRC Report No 75/1/90).

The report says the operational, maintenance and surveillance programmes at the Cape Flats plant have proved conclusively that larger local authorities are capable of owning, maintaining and running a water reclamation plant which consistently produces a water of potable quality.

Copies of this report are available free of charge from the Executive Director, Water Research Commission, P O Box 824, Pretoria 0001. Please note: Overseas orders will be charged a list price of \$20.

REPLY CARD

**Ms H Engelbrecht
Dept of Civil Engineering
University of Stellenbosch
Private Bag X5018
STELLENBOSCH
7600**

Insert to SA *Waterbulletin* June/July 1991

REGISTRATION FORM

Short Course on Municipal Water Engineering

4-6 NOVEMBER 1991

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Attached please find my Deposit (R100) /Course fees

Please tick appropriate box

Nutrient Removal Technical Division

2nd OPEN MEETING — 2 OCTOBER 1991

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**Dr S A Mitchell
Water Research Commission
PO Box 824
PRETORIA
0001**

Insert to *SA Waterbulletin* June/July 1991

REGISTRASIEVORM

Die volgende persoon/persone sal die simposium oor
Die rol van 'n wetenskap- en tegnologiebeleid op 22/23 Oktober 1991 bywoon

Titel, Van en Voorletters

Lid

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**Mev A van Wyk
SA Akademie vir Wetenskap en Kuns
Posbus 538
PRETORIA
0001**

REPLY FORM

GROUND WATER QUALITY AND POLLUTION

TECHNICAL SYMPOSIUM

21-23 AUGUST 1991

**ESKOM COLLEGE
MIDRAND**



First Biennial Ground Water Convention of
The Ground Water Division of the
Geological Society of South Africa and
The Borehole Water Association of South Africa



Please complete and return to the Symposium Secretary:

P O Box 2178 SOUTHDALE 2135.
Tel: (011) 942-1123 or (011) 942-1402

Name _____

Organisation _____

Postal Address _____

Telefax _____

Telex _____

Telephone _____

Tick whichever is applicable:

● I wish to attend the technical sessions of the symposium @ R500

● I will take part in the field excursion which is included in the registration fee _____

● I wish to attend the banquet _____

● I would like information on hotel accommodation _____

Although the indirect reuse of treated waste waters is well established in Southern Africa, especially in the inland areas, direct reuse, which is the planned and deliberate use of a treated waste water, has only been used to a limited extent in Windhoek, Namibia.

Growing water shortages, however may well force direct reclamation before the turn of the century, especially in coastal centres where indirect reuse is generally not desirable.

Cape Town is one of the coastal cities in Southern Africa which can no longer be assured of unlimited supplies of fresh water.

During the seventies it was estimated that the water supply to Cape Town and environs from the Steenbras and Wemmershoek dams, the minor reservoirs on Table Mountain and the allocations of water by the Department of Water Affairs from the Voëlvlei and Theewaterskloof dams would within the next two decades be insufficient to meet demands. Future fresh water supplies will have to come from phases 1 and 2 of the Palmiet Scheme, the augmentation of water in the Theewaterskloof dam through the Elands River and Klein Drakenstein dam project and the extraction of ground water.

Against this background an investigatory pilot plant programme for the reclamation of treated sewage effluent was initiated in the Western Cape. This included the design, construction and operation of the 1,6 million m³/a Cape Flats pilot water reclamation plant located adjacent to the waste water treatment plant. The plant was commissioned during May 1982 and operated until December 1986. The construction of the plant and the programme for the surveillance of the reclaimed water was funded by the Water Research Commission while the Cape Town City Council provided the necessary personnel and facilities and carried out the working programmes.

COST

The total cost of producing reclaimed water was about 88c/m³ which is much higher than the cost of about 20c/m³ of producing fresh water in the Cape Town Area (1986 costs). Approximately 33 per cent of the total cost was associated with the activated carbon process, according to the report.

"Ozonation prior to activated carbon treatment was found to increase the life of the carbon by about 40 per cent. Therefore, it is envisaged that the use of ozone and on site carbon regeneration would significantly reduce the production cost of a full scale plant. The costs of fresh and reclaimed waters will also tend to converge in future."

FEED WATER

The waste-water treatment works supplying the feed water to the Cape Flats reclamation plant is a nutrient removal plant of the five stage Bardenpho type and the process configuration of the reclamation plant was specifically selected for this type of effluent.

H G BEEKMAN
D N KLOPPER
K S FAWCETT
P H NOVELLA

CONSTRUCTION AND OPERATION OF THE CAPE FLATS WATER RECLAMATION PLANT AND THE SURVEILLANCE OF THE RECLAIMED WATER QUALITY

Report to the
WATER RESEARCH COMMISSION
by the
CITY ENGINEER'S DEPARTMENT
CAPE TOWN CITY COUNCIL

WRC Report No 75/1/90

The report says it is essential that the waste-water treatment works supplying the feed water to the reclamation process is properly optimised, operated and controlled. This would ensure that the quality of the feed water to the reclamation process would be free from major fluctuations in quality and the consistent supply of an acceptable feed water would always be available. During periods when the quality is unacceptable this feed water should bypass the reclamation process. The inclusion of a feed water quality equalisation and buffer pond is also essential to prevent water of fluctuating quality from being supplied to the reclamation plant. According to the report the provision of backup or standby mechanical equipment is necessary to maintain the uninterrupted production of a potable water supply.

VIROLOGICAL STUDIES

A comprehensive virological study of the reclaimed water was conducted during the surveillance period. All the samples examined during this time were clear and no viruses or coliphages were detected. By virological standards the reclaimed water was perfectly potable, while the chemical quality conformed to the recommended limits for drinking water.

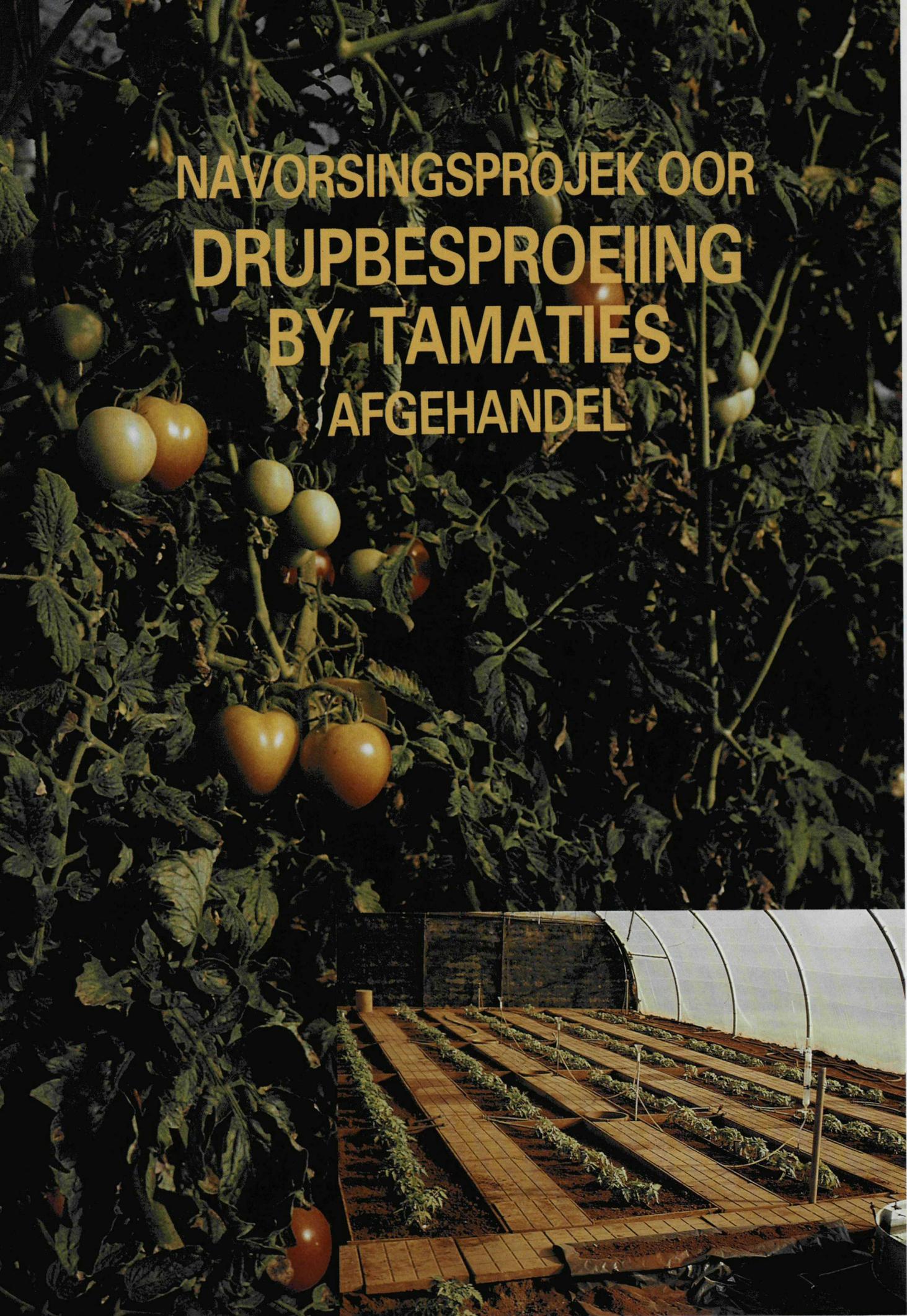
The report says that bacteriological examination of the reclaimed water during the intensive surveillance period indicated that, except the standard plate count, the quality of the reclaimed water was well within generally accepted limits for drinking water. The occasional high standard plate count does not necessarily constitute a health risk but it does reflect occasional inadequate final disinfection. The trihalomethane (THM) results showed that the quality of the reclaimed water was also well within the USEPA criterion of 100 µg/l for drinking water. The report says an increase in the THM values over the last three weeks of the surveillance period indicated that the activated carbon had become saturated with respect to the absorption of THMs. Consistently low dissolved organic carbon (DOC) concentrations were obtained throughout the surveillance period.

The report says the ongoing surveillance programmes which will be used in a full scale application will have to be intensive and will require more detailed analyses than for fresh water plants. "It is essential that automatic surveillance equipment is provided." Aluminium sulphate, ferric chloride and ferric sulphate were all successful as flocculants. Ferric sulphate, however, was used predominantly, while polyelectrolytes aided the flocculation process when added in low dosages.

According to the report the combined use of ferric sulphate and chlorine together with the poorly buffered feed water produced a corrosive water with a depressed pH value. Calcium hydroxide was used to stabilise this water to a pH value of about 9.

"This, however, resulted in the precipitation of relatively small quantities of calcium carbonate in the reclaimed water. This precipitate did not affect the final disinfection process as final chlorination preceded final stabilisation."

NAVORSINGSPROJEK OOR DRUPBESPROEING BY TAMATIES (AFGEHANDEL)



Die toepassing van korrekte waterbestuur by tamatieverbouing kan boere moontlik help om die groei- en produksieperiode van tamatieplante te beïnvloed.

Wetenskaplikes aan die Universiteit van Pretoria sê navorsing toon boere kan met die regte besproeiingsbestuur vrugte vinniger markklaar kry of aan die ander kant tamaties oor 'n langer periode oes. Die navorsers, HH Fischer en PC Nel van die Departement Plantproduksie aan die Universiteit van Pretoria, sê in 'n finale navorsingsverslag oor drupbesproeiing by tamaties, hulle het bevind dat supplementêre groei dalk aangewend kan word om tamaties se oesperiode te verleng deur byvoorbeeld 'n gedeelte van die aangeplante tamaties minder water te gee en so-doende selektief te strem. Alternatiewelik kan beheerde stremming gedurende die rypwordingsfase ook gebruik word om vrugte vinniger markklaar te kry.

Die navorsingsprojek is met die finansiële steun van die Waternavorsingskommissie uitgevoer en het vier jaar geduur. In die verslag word aanbevelings oor besproeiingskedulering by tamaties gemaak wat aansienlik van die bestaande voorskrifte verskil. Die navorser sê hulle hoop hierdie pas ontwikkelde norme sal in die nabye toekoms op sekere plase uitgetoets kan word om te bepaal of die resultate in die verslag toepaslik is in die praktyk.

Die belangrikste bevindings van die navorsers kan as volg opgesom word:

GROEISTADIA

Groeistudies het getoon dat die groeiseisoen van *Flora Dade* tafeltamaties gekenmerk word deur 'n periode van vinnige groei vanaf 30 dae na plant tot 90 dae na plant gevolg deur 'n rypwording- en oesfase vanaf ongeveer 90 tot 140 dae na plant. Oestyd gaan gepaard met 'n vinnige afname in blaaroppervlakte en droë materiaal namate pluksels verwyder word en die plant verouder.

Waterbehoefte volg dieselfde patroon en bereik 'n hoogtepunt tussen 60 tot 100 dae na plant. Op grond hiervan is die groeiseisoen in die volgende vier groeifases verdeel:

- Vestiging (1 tot 30 dae na plant), waartydens die pas geplante plantjies vestig en begin groei;
- Vegetatiewe stadium (30 tot 60 dae na plant) wat die aanvanklike vegeta-

tiewe groei (30 tot 50 dae na plant) en vroeë vruggroei (50 tot 60 dae na plant) insluit;

- Vruggroei (60 tot 90 dae na plant) waartydens oorblywende vegetatiewe groei, vrugontwikkeling en die rypwording van die eerste tros voorkom; en
- Rypwording (90 tot 140 dae na plant), wat vruggroei en die rypwording van die tweede en latere vrugtrousse insluit.

H H FISCHER
P C NEL

DRUPBESPROEIING BY TAMATIES

Verslag aan die
WATERNAVORSINGSKOMMISSIE
deur die
DEPARTEMENT PLANTPRODUKSIE
UNIVERSITEIT VAN PRETORIA

WNK Verslag No 185/1/90

GRONDSOORTE

Die plantbeskikbare waterkapasiteit van die boonste 1,6 m sandleem, sandklei en swartkleigronde was onderskeidelik 88 mm, 129 mm en 165 mm.

Tamaties onder suboptimale besproeiing was in staat om grondwater in al drie grondtipes tot 2,7 m diep te onttrek. Die toename in wateronttrekking met diepte was vinniger in die ligter as in die swaarder gronde. Die laer beskikbaarheid van die water in die dieper grondlae het by die ligter grondsoorte egter soms tot hoër plantwaterstremming en laer opbrengste as op die swaarder grondsoorte by dieselfde suboptimale besproeiingspeil gelei. Die hoër grondvrugbaarheid van die swaarder grondsoorte het dikwels weliger groei en hoër waterverbruik tot gevolg gehad. In die praktyk, waar die grondtepte dikwels beperkend is, sal grondtekstuur van groter belang wees aangesien dit dan die totale plantbeskikbare waterkapasiteit van die grond sal bepaal.

Die navorsers sê in die ondersoek na die invloed van die persentasie plantbeskikbare wateronttrekking op die plantwaterstatus is gevind dat hierdie verwantskap nie wesentlik deur grondtekstuur beïnvloed is nie. Die plantwaterstatus van tamaties is dus op al drie grondsoorte ewe veel deur 'n verandering in die persentasie plantbeskikbare wateronttrekking beïnvloed.

SUBOPTIMALE BESPROEIING

'n Wesenlike verlaging in die opbrengs van die plante kon vermy word deur die suboptimale druphoeveelhede te vermeerder sodra al die plantbeskikbare water uit die boonste 1,6 m van die grond onttrek is, of deur selektiewe staking van besproeiing gedurende sekere groeistadia. Dit het getoon dat deur korrekte besproeiingsbestuur die potensiële skade van suboptimale besproeiing verminder of heeltemal uitgeskakel kan word.

Die navorsers sê 'n verlaging in vrugopbrengs as gevolg van waterstremming was gewoonlik aan die produksie van kleiner vrugte en nie aan swakker vrugset te wyte nie. Dit hou verband met die groeistadium waartydens eerste wesenlike waterstremming ondervind is asook die besondere gevoeligheid van selvergroting vir waterstremming.

Besproeiingsintervalle het van 'n halwe dag tot 'n week onder drupbesproeiing gevarieer. Hoe langer die besproeiingsinterval en die gepaardgaande stremmingsperiode was, hoe groter was die potensiële skade aan die opbrengs. Kort hoë frekwensie stremmingsiklusse, soos by hoë frekwensie drupbesproeiing, het blaargroei minder nadelig beïnvloed as wat langer besproeiingsintervalle met dieselfde hoeveelheid water gedoen het. Hierdie gedrag is tipies vir 'n gewas wat in staat is om osmoties by die laer blaarwaterpotensiaal aan te pas om turgor te handhaaf. Die benutting van hierdie eienskap in die besproeiingsbestuur by tamaties is egter nog nie ondersoek nie.

WATERSTREMMING

Die staking van besproeiing gedurende die vegetatiewe, vruggroei of rypwordingsfase totdat stremming duidelik sigbaar was, het nie die totale vrugopbrengs betekenisvol benadeel nie.

Stremming gedurende die vegetatiewe en vruggroei asook die verlenging van die groeiperiode tot gevolg gehad. Stremming gedurende vruggroei het kleiner vrugte veroorsaak. Tamaties wat gedurende rypwording gestrem is se groeiperiode is verkort en was visueel die gevoeligste. Dit word toegeskryf aan verlaagde wortelaktiwiteit by die verouderende tamatieplant. Suboptimale groei by tamaties kan moontlik aangewend word om die oesperiode te verleng deur, byvoorbeeld, 'n gedeelte van die aangeplante tamaties selektief te strem. Sodoende kan met behulp van korrekte bestuurspraktyke oor 'n langer periode geoes word. Alternatiewelik kan beheerde stremming gedurende rypwording toegepas word om vrugte vinniger markklaar te kry. Dit kan, afhangende van die klimaat en bemarkingstoestande die winsgewendheid beïnvloed.

WORTELGROEI

Suboptimale drupbesproeiing moedig diep wortelgroei aan. Sodoende kan toenemend dieper grondwater onttrek word om suboptimale besproeiing aan te vul. Wateronttrekking uit die dieper grondlae veroorsaak dat die blaarwaterpotensiaal van die plante verlaag indien water nie aan die vlakker wortelstelsel voorsien word nie. Vlakker tamatiwortels kan water baie doeltreffend opneem, selfs na 'n lang droë tydperk. Dit vul suboptimale wateronttrekking uit die dieper grondlae baie doeltreffend aan en verklaar waarom langer besproeiingsintervalle groei en opbrengs nadeliger beïnvloed het as wanneer korter besproeiingsintervalle aangewend is.

FISIOLOGIESE GEVOLGE

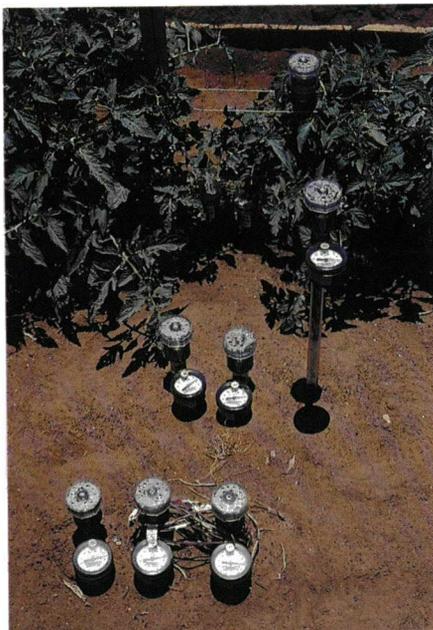
Huidmondjiesluiting en fotosintese by tamaties (en waarskynlik ander fisiologiese reaksies wat van huidmondjietoestand en gaswisseling afhanklik is) word eers benadeel by 'n blaarwaterpotensiaal van -1,3 MPa. Die navorsers sê egter dat onder sekere omgewingstoestande tamaties se huidmondjies reeds by -1 MPa kan begin sluit.

MORFOLOGIESE GEVOLGE

Blaar- en vruggroei het sensitief op stremming by suboptimale besproeiing gereageer. Resultate toon egter dat verminderde blaargroei weens suboptimale besproeiing nie noodwendig 'n nadelige uitwerking op vrugopbrengs behoort te hê nie.

VRUGGEHALTE

Die raklewe van vrugte is deur lang besproeiingsintervalle, veral gedurende rypwording, verbeter. Die kommersiële graad is nie konsekwent hierdeur beïnvloed nie. Stremming gedurende die vegetatiewe en die vroeë vruggroei stadium het die persentasie vrugte, (volgens massa) wat vrugbaarste vertoon het, verhoog en dié met katbakkies verlaag. Tamatieplante wat gedurende die vroeë groeistadia gestrem was, het na besproeiing hergroei, maar het 'n groot aantal kleiner vrugte opgelewer. Dit het die persentasie ondergraadvrug-massa verhoog.



WATERVERBRUIK

Waterverbruik is beïnvloed deur besproeiingspeil, grondsoort, groeistadium en klimaatstoestand. Totale waterverbruik by hoë frekwensie optimale en suboptimale besproeiing was onderskeidelik 77 persent en 64 persent van die kumulatiewe panverdampingswaarde. Dit was gewoonlik hoër in die swaarder as in die ligter grondsoorte, maar die wisselwerking met die besproeiingspeil was nie betekenisvol nie. Onder suboptimale besproeiing het die waterverbruik gedurende die vegetatiewe, vruggroei- en rypwordingstadia onderskeidelik tussen 65 en 89 persent, 62 en 82 persent en 25 en 41 persent van die kumulatiewe panverdampingswaarde gevarieer, afhangende van die strafheid van waterstremming en omgewingstoestande. Onder optimale besproeiing was die waterverbruik gedurende dieselfde groeistadia onderskeidelik 102, 105 en 47 persent van

die kumulatiewe panverdampingswaarde. Huidige aanbevelings van die Departement van Landbou en Watervoorsiening maak voorsiening vir heelwat laer waterverbruik gedurende die vegetatiewe en vruggroeistadia, maar vir hoër waterverbruik gedurende rypwording en oes.

Die navorsers sê wateropbrengskrommes het getoon dat die maksimum vrugopbrengs nie baie sensitief op totale waterverbruik tussen 400 en 700 mm reageer nie. Gunstige grond- en klimaatstoestande, doeltreffende besproeiingskedulering, goeie siekte- en pesbeheer, asook gesonde produksiebestuurspraktyke sal 'n groter bydrae tot hoër vrugproduksie lewer.

BESPROEIINGSKEDULERING

Besproeiingskedulering kan volgens 'n vaste of variërende program toegepas word. Op grond van waterverbruik, soos in hierdie ondersoek bepaal, word die volgende skedule deur die navorsers vir optimale tamatieproduksie aanbeveel:

0 tot 30 dae na plant:

30 persent van die panverdampingswaarde

30 tot 90 dae na plant:

100 persent van die panverdampingswaarde

90 tot 120 dae na plant:

60 persent van die panverdampingswaarde

vanaf 120 dae na plant:

40 persent van die panverdampingswaarde.

'n Effektiewe worteldiepte van 0,8 m en 'n maksimum plantbeskikbare wateronttrekking van 70 persent word in die verslag aanbeveel. Hierdie aanbevelings verskil aansienlik van bestaande voorskrifte. Hoër toedienings word aanbeveel gedurende die vegetatiewe en vruggroeistadia (30 tot 90 dae na plant) en laer toedienings gedurende rypwording (90 tot 140 dae na plant). 'n Dieper effektiewe worteldiepte en 'n hoër peil van plantbeskikbare wateronttrekking word in die verslag aanbeveel om diep grondwater meer volledig te benut.

Onder suboptimale hoë frekwensie drupbesproeiing op diep gronde kan teen die volgende skedule besproei word:

0 tot 30 dae na plant:

30 persent van die panverdampingswaarde

30 tot 90 dae na plant:

60 persent van die panverdampingswaarde

90 tot 140 dae na plant:

40 persent van die panverdampingswaarde

Reënvaldoeltreffendheid behoort vir skeduleringsdoeleindes in berekening gebring te word. In veldproewe is reënvaldoeltreffendheid aansienlik oorskat.

Suboptimale besproeiing steun op die doeltreffende benutting van natuurlike reën. Daar word dus na die handhawing van 'n grondwaterreserwekapasiteit deur maksimum grondwateronttrekking (gepaard met die minimum opbrengingsverlaging) gestreef.

WATERVERBRUIK

Die gemiddelde waterverbruiksdoeltreffendheid in kilogram tamatievrugte per hektaar per millimeter water, soos in hierdie ondersoek onder reënkerms verkry is, het gewissel van ongeveer 200 tot 250 kg/ha/mm. Groeitoestande gedurende 'n betrokke seisoene het 'n belangrike invloed op waterverbruiksdoeltreffendheid gehad met die gevolg dat waterverbruiksdoeltreffendheid tussen seisoene meer verskil het as tussen besproeiingspeile. Daar was meestal 'n tendens tot verhoogde waterverbruiksdoeltreffendheid onder suboptimale besproeiing. Die rede hiervoor was dat 'n verlaging in die besproeiingshoeveelheid gewoonlik gepaard gegaan het met 'n proporsioneel kleiner verlaging in die vrugopbrengs.

TOEDIENING VAN WATER

Behalwe op die lisimeters, waar herhalings nie moontlik was nie, is gelokaliseerde (drup) en breedwerpige (mikro) toediening van water nie direk met mekaar vergelyk nie. Hierdie twee metodes van watertoediening se relatiewe doeltreffendheid in 'n stelsel van suboptimale besproeiing hou verband met die frekwensie en posisie van watertoediening. Hoë frekwensie drup in die plantry skep gunstige toestande vir osmotiese aanpassing. Deur hoë frekwensie drup gedurende die dag toe te pas, kan plantwaterstremming (wat deur diep wateronttrekking veroorsaak word) vermy word. Hiermee kan hoë vrugopbrengste (140 ton per hektaar) geoes word ten spyte van die 1200 persent plantbeskikbare wateronttrekking in die boonste 1,6 m gedurende die vroeë oesstadium vanaf 100 tot 126 dae na plant. Die droër sones tussen die drupsones kan in die ope as reserwe grondwaterstoorruimte vir natuurlike reënval dien.



Navorsing met tamaties onder drupbesproeiing is op die Universiteit van Pretoria se proefplaas gedoen.

GRONDBENATTINGSPATROON

Grondbenutting onder druppers volg 'n halfbolvormige patroon. Gedurende die eerste uur nadat drupbesproeiing op droë grond 'n aanvang geneem het (soos in hoë frekwensie tekortdrupbesproeiing) vind vinniger sywaartse as afwaartse beweging tot ongeveer 0,25 tot 0,3 m vanaf die benattingsbrøn plaas. Daarna vind vinniger afwaartse beweging van die sferiese benattingsfront plaas totdat drup staak. Die

navorsers sê grondtekstuurverskille het relatief min invloed op sywaartse waterbeweging gehad. Afwaartse beweging was vinniger in die ligter sandleemgrond. Plasing van die drupperlyn in 1,5 m tamatierye op sandkleigrond het vrugopbrengs nie betekenisvol beïnvloed nie.

Afskrifte van die verslag *Drupbesproeiing by tamaties* deur HH Fischer en PC Nel (WNK verslag nr 185/1/90) is gratis verkrygbaar vanaf die Waternavorsingskommissie, Posbus 824, Pretoria 0001.

GUIDE FOR LAUNDRY INDUSTRY RELEASED

A guide for water and waste-water management in the laundry industry (NATSURV 8) has been released by the Water Research Commission (WRC). The guide stems from the WRC's national industrial water and waste-water survey which has been carried out by a firm of consulting engineers Steffen, Robertson and Kirsten in collaboration with the Department of Water Affairs.

Detailed surveys were carried out at 16 separate laundries in an effort to try and establish norms for water intake and waste-water disposal in the laundry industry.

According to the guide laundries in South Africa use an estimated 3 million m³ of water per annum and 95 per cent of this is discharged as waste water, the remainder being lost in drying.

The weighted average specific water intake (SWI) was found to be 15,1 ℓ/kg of laundry washed with a range of values of 8,0 to 58,4 ℓ/kg encountered. Laundries employing rinse water recycle had an SWI of about 30ℓ/kg. A target SWI of 8 ℓ/kg is proposed in the guide for laundries employing rinse water recycle and 20 ℓ/kg for those not recycling rinse water. No evidence was found that size of laundry or type of articles to be washed had any influence on SWI.

The guide recommends that those laundries which do not recycle rinse water should seriously consider implementing a rinse water recycle system.

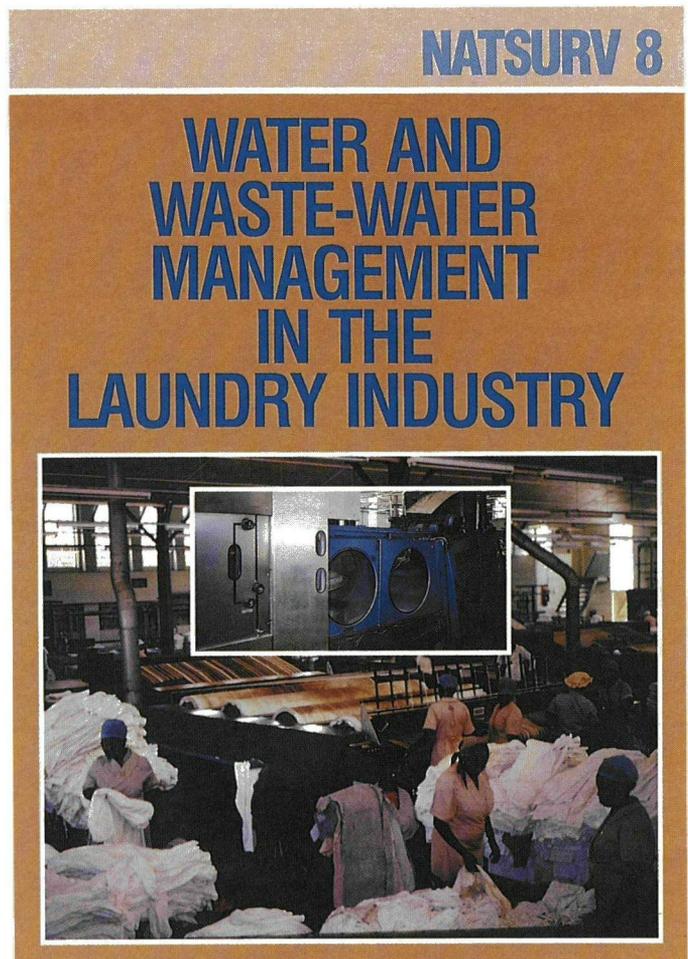
Waste water from a laundry will usually contain the following contaminants: starch, phosphorous compounds, nitrogenous compounds, suspended matter and oils and greases. The waste water can contain a high organic load as well as considerable quantities of dissolved salts.

The weighted average specific pollution load (SPL) was found to be 8,8 g COD/kg, 19,8 g TDS/kg, 2,6 g suspended solids/kg and 0,7 g PO-P/kg. Target figures corresponding to industry averages are proposed in the guide for TDS and PO-P. No targets are proposed for COD and suspended solids as these are largely a function of the nature of the laundry to be washed.

The guide suggests that waste-water treatment can be aimed at either treating waste water for disposal to sewer or elsewhere or for treating waste water to a quality suitable for reuse.

Recommendations in the guide for reducing water intake in laundries include the following:

- Optimising water recycle systems to make the best use of higher quality waters;
- Treatment of rinse waters to render them of higher quality and therefore of greater potential for reuse;
- Designing any new equipment (both washers and rinsers) to ensure efficient water use;
- Optimising operation of boilers by minimising unnecessary blowdown;



- Installing water meters at all key areas of the laundry process line;
- Monitoring and taking action on water meter figures;
- Ensuring that staff are trained to appreciate the need for water conservation in the laundry;
- Ensuring that equipment automatically switches off when loads of washing are being transferred from one stage to another;
- Floor washing hoses should be equipped with automatic shut-off mechanisms; and
- Maintaining equipment in good order to minimise leaks.

It is expected that this guide will be of value to the laundry industry as well as to other interested parties such as municipalities, administrators, researchers and consultants in the water and waste-water fields.

Copies of the guide are available from the Executive Director, P O Box 824, Pretoria 0001.

DIE ROL VAN 'N WETENSKAP- EN TEGNOLOGIEBELEID IN DIE TOEKOMSTIGE SUID-AFRIKA

Simposium aangebied deur die
Suid-Afrikaanse Akademie vir Wetenskap en Kuns

22 – 23 Oktober 1991
WNNR-konferensiesentrum, Pretoria

DOEL

- Bespreking van die belang van wetenskap en tegnologie in die skepping van werkgeleenthede en welvaart in Suid-Afrika.
- Bespreking van die rol van 'n wetenskap- en tegnologiebeleid, asook die toepassing daarvan in Suid-Afrika.
- Daarstelling van 'n taakgroep vir die implementering van die aanbevelings van die simposium.

VOORLOPIGE PROGRAM

DAG 1: 22 OKTOBER

08:00 Registrasie en tee/koffie

SESSIE 1

Sessievoorsitter – Dr. L. Alberts
(Voorsitter, SA Akademie vir Wetenskap en Kuns)

09:00 **Openingsrede – Staatspresident F.W. de Klerk**

09:40 **Benaderings wêreldwyd tot wetenskap- en tegnologiebeleidvoering** – Dr. C.F. Garbers, Voorsitter, Stigting vir Navorsingsontwikkelingsraad

10:20 Bespreking
10:30 Sal later gefinaliseer word
10:50 Bespreking
11:00 Tee

SESSIE 2

Status quo, probleemstelling, knelpunte en analise

Sessievoorsitter –
Prof. W.J. van Biljon
(Direkteur: Navorsing,
Universiteit van Pretoria)

11:30 **Beleidvoering** – Dr. J.G. Garbers, Direkteur-generaal, Departement Nasionale Opvoeding
Bespreking

11:50 **Tersiêre opleiding: Universiteitswese** – Prof. P. Smit, Aangewese Rektor, Universiteit van Pretoria

12:20 Bespreking
12:30 **Technikons en tegniese kolleges** – Dr. D.J. Janse van Rensburg, Rektor, Technikon Pretoria

12:50 Bespreking
13:00 **Ete**

14:00 **Navorsing en ontwikkeling** – Dr. J.B. Clark, President, WNNR

Bespreking

14:30 **Owerheidsektor (Staatsdepartemente)** – Dr. C. Frick, Hoofdirekteur, Geologiese Opname

Bespreking

15:00 **Nywerheidsektor (Bedryf)** – Mnr. W.C. van der Merwe, Besturende Direkteur, Nywerheid-ontwikkelingskorporasie Beperk

Bespreking

15:20 **Landbouwetenskappe** – Prof. T. Erasmus, Viserektor, Universiteit van Pretoria

Bespreking

16:20 **Geneeskundige wetenskappe** – Prof. J.V. van der Merwe, Dekaan, Mediese Fakulteit, Universiteit van Pretoria

Bespreking

17:30 **ONTHAAL**

DAG 2: 23 OKTOBER 1991

08:30 **Tee / koffie**

SESSIE 3

Vooruitskouing en behoeftes

Sessievoorsitter –
Dr. J.W.L. de Villiers

09:00 **Mannekrag/werkgeleenthede** – Dr. R.R. Arndt, President, Stigting vir Navorsingsontwikkeling

Bespreking

09:30 **Swaarnywerheid** – Mnr. D. Mostert, Groep-uitvoerende Bestuurshoof, Dorbyl

Bespreking

09:50 **Hoëtegnologiesnywerheid** – Mnr. J.H. van der Walt, Uitvoerende Voorsitter, SA Druggist Beperk

Bespreking

10:20 **Tee**

10:30 **Energievoorsiening** – Dr. D.C. Neethling, Adjunk-direkteur-generaal, Departement Minerale- en Energiesake

11:20 Bespreking
11:30 **Environmental Affairs** – Prof. R.A. Preston-Whyte, Dean, Faculty of Social Science, University of Natal

Bespreking

12:00 **Vervoertegnologie** – Mnr. B.J. Lessing, President, Instituut van Vervoer in Suid-Afrika

Bespreking

12:50 **Ete**

SESSIE 4

Riglyne vir beleidvoering

Sessievoorsitter –
Prof. H.J. Potgieter

(Dekaan, Natuurwetenskappe,
Universiteit van die Oranje-Vrystaat)

14:00 **Eie tegnologie teenoor ingevoerde tegnologie** – Dr. J.L. Steyn, Groep Uitvoerende Direkteur, Altec Elektroniese Stelsels

Bespreking

14:20 **Tegnologie as 'n dimensie van nywerheidsbeleid** – Dr. H.J. Smith, Hoofdirekteur, Tegnologie- en nywerheidsstrategie, Departement Handel en Nywerheid

Bespreking

15:00 **BESPREKING MET SPREKERS AS PANEEL**

15:30 **Samevatting en konsepplan** – Dr. L. Alberts

16:00 **Tee / koffie**

KOSTE

R250 vir lede en R300 vir nie-lede. 'n Addisionele R50 per persoon sal vir laatregistrasie gehef word. (Sluit middagetes en 'n skemeronthaal op 22 Oktober in).

Tjeks moet betaalbaar gemaak word aan Die Suid-Afrikaanse Akademie vir Wetenskap en Kuns en aan Posbus 538, Pretoria gestuur word.

Reis- en verblyfpreëlings moet deur simposiumgangers self getref word.

NAVRAE

Mev. A. van Wyk
Suid-Afrikaanse Akademie vir Wetenskap en Kuns
Posbus 538
Pretoria 0001
Tel: (012) 28-5082
Faks: (012) 28-5091

**SLUITINGSDATUM VIR REGISTRASIE:
30 SEPTEMBER 1991**

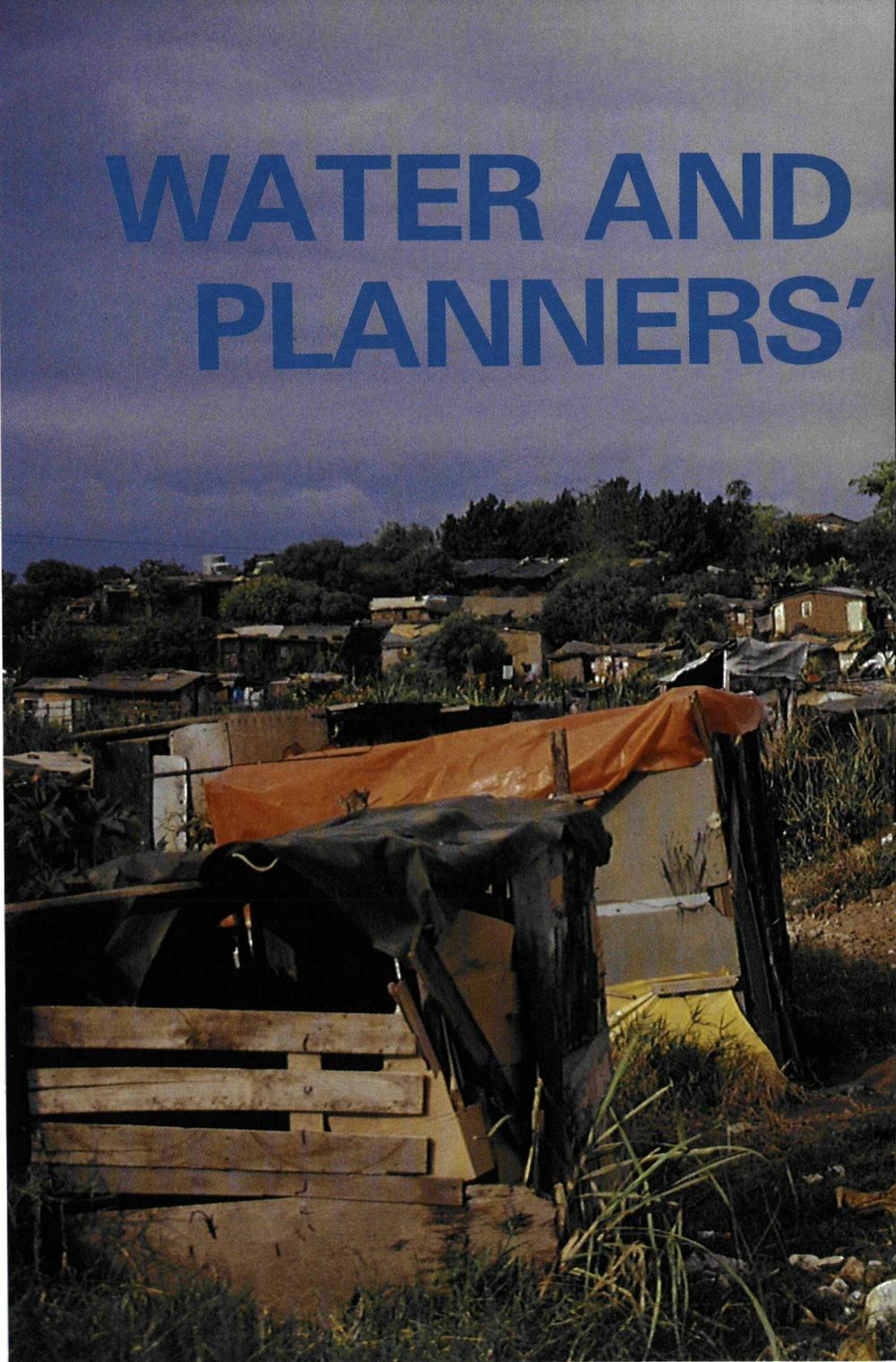
WATER AND PLANNERS'

Three problems have been identified as the major stumbling blocks professionals have to face in providing services to lower income communities. They are:

- *The exclusive use of economics as the ultimate decision making tool,*
- *Poor communication, and*
- *The fact that professionals regard service provision as the supply of a "product" and not as a social process.*

In a paper on the social impact of service provisions on low income communities delivered at the recent WISA conference two researchers, J Abbott of Development Mediation Service and B Russel of Social Surveys CC, pointed out that infrastructure provision could bring about profound changes in a society.

"These changes are often viewed by professionals as being improvements, e.g. improved sanitation leads to improved health. However, when seen in a broader context service provisions make far more fundamental changes affecting the fabric of the society upon which they are, very often, imposed and these changes are not always beneficial."



Therefore, they said, it was becoming increasingly important to recognise and take account of the wider impact, if the services installed were to provide optimum benefits.

The researchers carried out surveys in KwaThandeka (Amsterdam) in the Eastern Transvaal as well as in Natal to identify needs, perceptions and aspirations in various low income communities.

"From the survey in KwaThandeka two important factors emerged," they said.

"The first was the perception of the value of services already installed, particularly water and sanitation. Here water was supplied via communal

standpipes while sanitation provision utilised the bucket system. Neither system worked well, mainly due to insufficient capacity through underestimation of the population.

DIFFERENT PERCEPTIONS

"The Authorities' perception of their services was predominantly an economic one. Services had been provided and the cost of installing and operating those services had to be recovered. The services were subsidised so that the cost recovery from residents was relatively low. The Authorities therefore deemed it 'reasonable' that residents should pay this cost.

SANITATION: HEADACHE



"The residents' viewpoint, on the other hand, was totally different. The water supply was intermittent, necessitating the use of polluted river water as a supplementary source (thereby negating any benefits obtained from a potable supply, whilst the buckets provided were totally inadequate for the quantity of faecal matter generated. As a result user perceptions were that these services had very little, if any, 'value' when judged from a health and wider social perspective. This inability to recognise different value systems led to rent boycotts and deteriorating relationships between the Authorities and residents," the researchers said.

They said that when upgrading of services was considered in KwaThandeka,

planners decided to reduce plot sizes from approximately 2 000 m² to 350 m², primarily to optimise the capital cost of service provision.

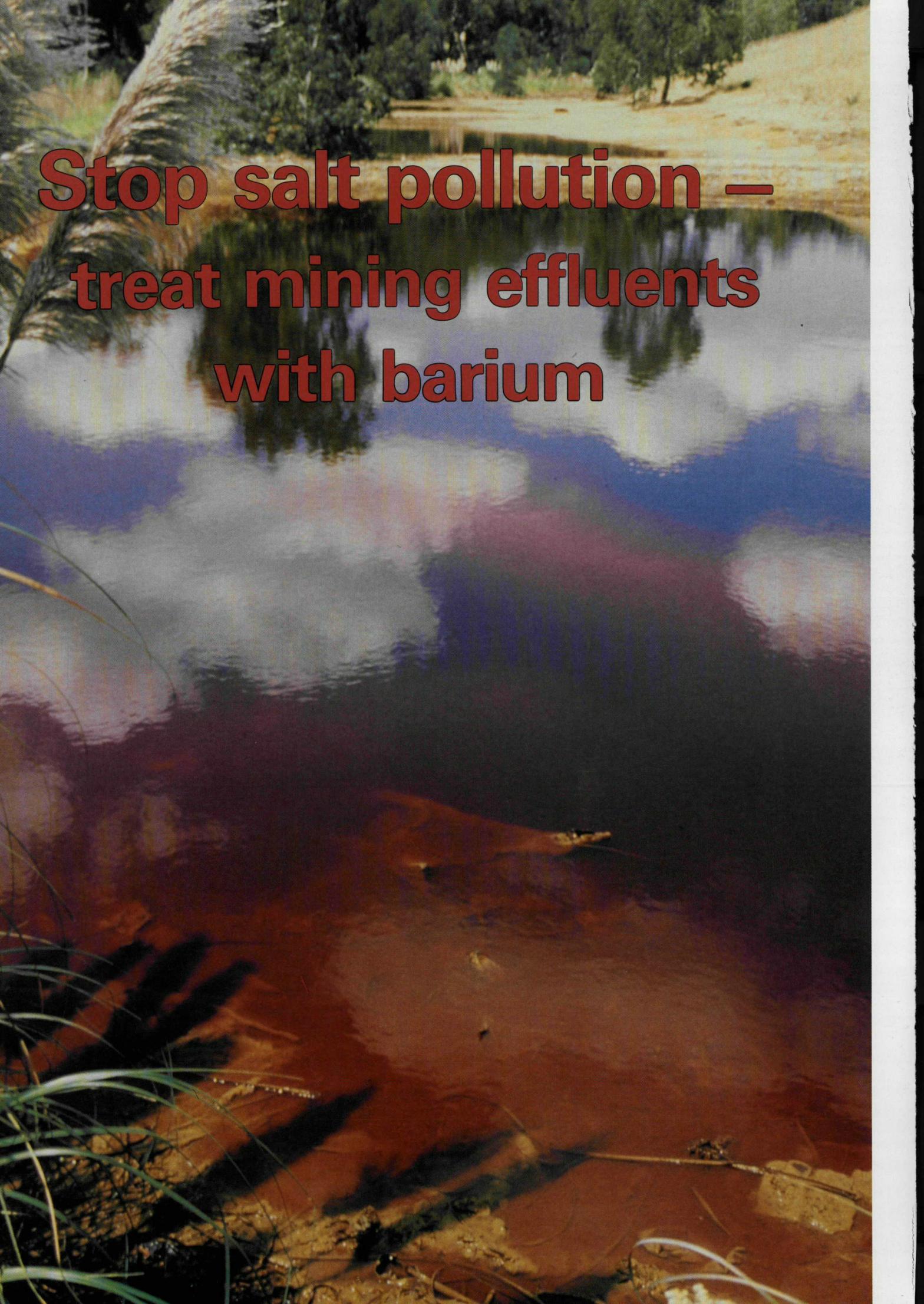
NEGATIVE IMPACT

"The socio-economic survey indicated not only that the income levels of the residents could not support improved services of the type and level proposed, but also that the plot reduction would have a negative impact upon home-grown food production. This in turn would take away food growing capacity from families who used this food source as a necessary dietary supplement and further reduce household income."

The researchers said this highlighted the fact that the original intent, when the services were planned and designed by professionals, was to provide what appeared superficially to be the most favourable solution for the residents, whereas in practice, when the impact in wider social terms was considered fully, the outcome was often detrimental.

They said the alternative was to view service provision as a social process in which the technical "hardware" represented only one component of the wider solution.

For further information please contact Mr J Abbott, Tel (011) 339-2124 or (0331) 421-666, Fax (0331) 941-820.



**Stop salt pollution –
treat mining effluents
with barium**

The use of a simple and well-known water treatment process to reduce mineral salt pollution from mine effluents in the PWVS region is proposed in a report released by the Water Research Commission (WRC). The report entitled *The chemical removal of sulphates (WRC Report No 203/1/90)* was compiled by researchers at the Pollution Research Group of the University of Natal with financial support from the Water Research Commission.

The report proposes the use of barium carbonate to treat high sulphate mine effluents. The sulphates in the effluents are captured in the form of a concentrated hydrogen sulphide stream which is amenable to further processing into valuable sulphur products. The barium salts may effectively be recycled with minimum make-up being required.

The report says all the unit operations are ideally suited to a mining environment and there are no solids or brine disposal problems. The final product, a high quality water, could possibly be sold to industrial users in the region.

The final recommendations of the report are:

- A chemical speciation program similar to the WRC's STASOFT be prepared in order to aid the design of the treatment process.
- A detailed cost benefit study be carried out to aid decision makers in the evaluation of the process.
- A firm of engineering contractors should assess the process technically and economically.

The steadily increasing salt concentration in the Vaal River drainage system is becoming a serious problem due to the large scale recirculation of water and the fact that conventional water treatment processes do not significantly reduce inorganic pollutants. According to the WRC report the Klip River contributes almost 55 per cent of the total dissolved solids (TDS) load to the Vaal Barrage. Three mines, East Rand Gold and Uranium Organisation (ERGP) were found to contribute 55 per cent of the total TDS load to the Klip River (or 30 per cent to the Vaal system) while their contribution to the flow of the Klip River is only 17 per cent.

quired but the process is not suitable for high volume applications.

- Electrodialysis which has been tested on mine and power station cooling waters but found to be too expensive for large scale operation.
- Seeded slurry reverse osmosis a variant of the established technology, designed to operate on waters where insoluble material such as gypsum will precipitate on concentration.
- Biological processes which have received extensive investigation by the CSIR. These also involve complex flow sheets and do not appear to be economically viable at this stage.

Mines	Flow Mℓ/a	Present TDS ton/a	Removable* TDS ton/a	TDS in treated effluent ton/a
ERPM	15 150	54 900	50 000	4 900
ERGO	11 700	41 000	34 400	6 600
DRD	4 100	13 800	12 800	1 000
Total	30 950	108 700	97 200	12 500
* If the effluent were treated with barium carbonate and lime.				

The report says a laboratory investigation has shown that these effluents can be desalinated by treatment with barium carbonate and lime. Table 1 indicates that by treating the three effluent sources with this process, 42 per cent of the point source effluent TDS and 18 per cent of the total mineral load to the Vaal Barrage can be removed.

The ease with which TDS can be removed from the recirculating water depends greatly on the nature of the inorganic constituents. Sodium (Na⁺) and chlorides (Cl⁻) are intractable constituents for which no economic technology exists in this context while calcium (Ca²⁺), magnesium (Mg²⁺) and sulphates (SO₄²⁻) are by comparison removed easily. Fortunately the main constituents of the TDS load entering the Vaal system are in the latter category and the prospects for economic control of TDS are correspondingly increased, the report says.

It says a number of technologies for the removal of TDS from water of composition corresponding to those entering the Vaal system are either already commercially available or under development in South Africa. These include:

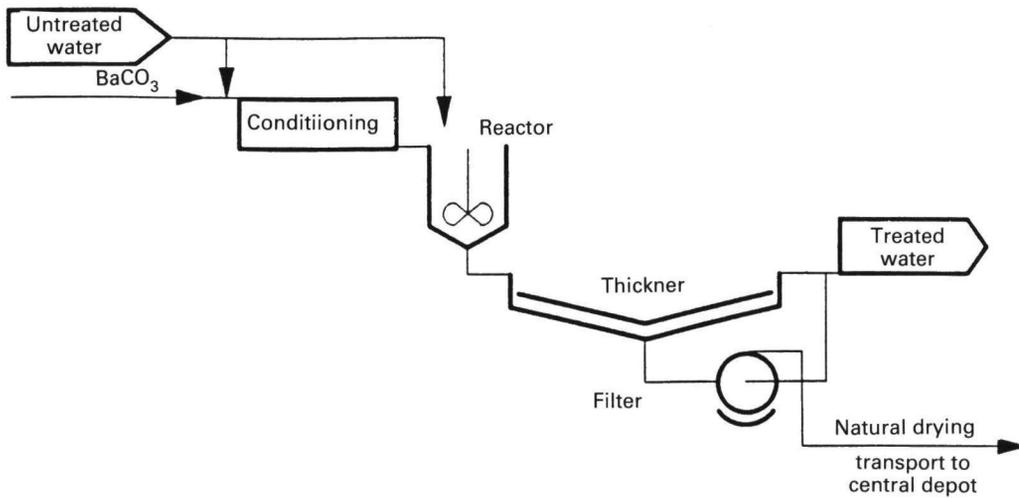
- Ion exchange which is used where a particularly high quality water is re-

The disadvantages of these technologies have led a number of workers in South Africa to propose the use of the simple and well-known chemical precipitation route, using a barium salt to remove sulphate, simultaneously converting calcium (Ca²⁺) and magnesium (Mg²⁺) into insoluble components. The principal advantage of the technique is its simplicity which is compatible with large scale applications on unsophisticated plants.

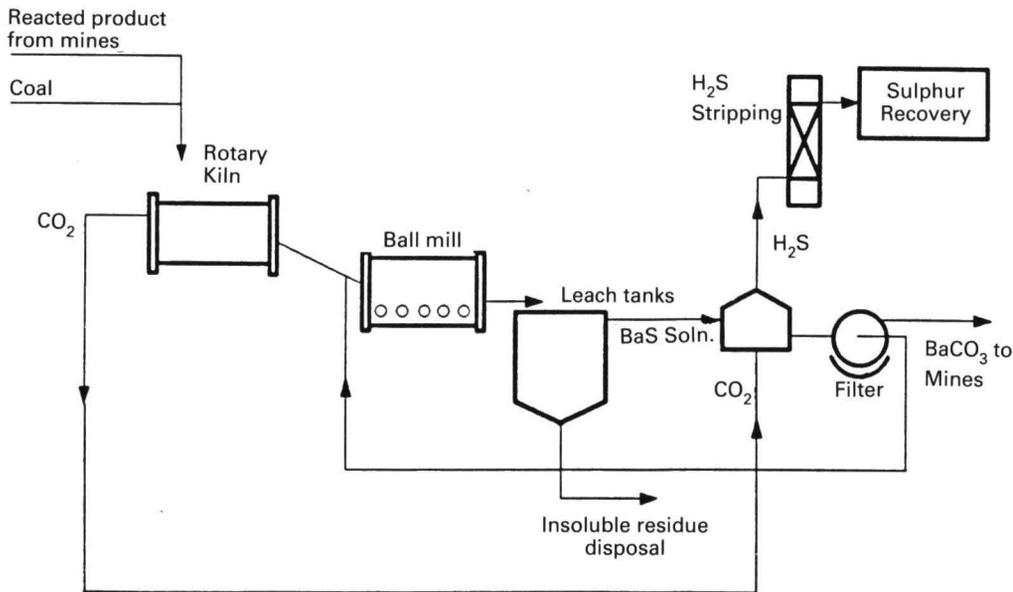
According to the report this application is however complicated by a number of factors among which are the high cost of suitable barium compounds and the high toxicity of soluble barium salts. "In our view, the second factor rules out the use of compounds such as barium sulphide. No matter what safeguards are built in, the risk of overdosing in the context of a large, unsophisticated treatment facility is simply too great."

The report says this problem can be overcome by using a barium salt of very limited solubility, such as barium carbonate (BaCO₃) so that even large dosing errors could not result in an acute toxicity problem.

The barium is reused, hence saving the most expensive component. Input of



•• Process flow diagram for the treatment of sulphate rich water with barium carbonate



•• Process flow diagram for the regeneration of barium carbonate and the recovery of sulphur

raw material is in the form of barytes and coal. Coal is a cheap and readily available source of energy as well as reducing carbon, while barytes deposits occur in numerous places in South Africa, the largest of which is 50 km west of Pofadder in the north western Cape. Reserves are calculated as 2 767 000 tons. Numerous smaller deposits such as those in the Pietersburg area and along the Swaziland border could possibly be exploited for make-up

purposes. No pretreatment is necessary to remove the suspended solids present in the mining effluent. Most of the solids will be removed in the settler.

The sulphurous product in the form of hydrogen sulphide is produced in a small concentrated stream which is amenable to further processing such as sulphur production.

"The regeneration process involves the

thermal decomposition of barium sulphate ($BaSO_4$) under reducing conditions to form barium sulphide (BaS). This is highly soluble in water but is easily decomposed by carbon dioxide (CO_2) to precipitate barium carbonate ($BaCO_3$), forming a by-product of hydrogen sulphide (H_2S). Hydrogen sulphide (H_2S) can then be converted into elemental sulphur by several commercial processes and this is a convenient and valuable by-product."



Mine water, both runoff and effluent, needs to be treated in order to reduce pollution of streams, rivers and dams.

The end result of a combined TDS removal and barium recycle process, the report says, is thus the formation of a purified water stream with sulphur and a slaked lime sludge as by-products. Coal is the only reagent consumed in the process.

The report says the water product from such installations would be of a high quality, "better in fact than that supplied by the Rand Water Board to industrial consumers in the region".

"It would be wasteful to allow this water to simply drain back into the Vaal Dam when it could be supplied to consumers requiring high quality water."

POWER STATIONS

According to the report there are a number of such potential consumers in the region; some of the most important are the directly cooled power stations. These require large volumes of high quality cooling water. The water is evaporated and in order to contain

corrosion and scaling problems a low TDS in the make-up water is required and therefore considerable capital has to be invested to control TDS build-up. The report says minewater treated by barium carbonate would be well-suited to this application.

It says the integration of this desalination scheme with a power station would have a number of subsidiary advantages:

- Power stations are substantial consumers of sulphur, a major by-product of the process. This is converted to sulphite (SO₃) which is used to increase the conductivity of the stack gas and thus increase the efficiency of electrostatic precipitation of fly-ash.

- Many of the facilities required for the barium carbonate regeneration process are located on site at power stations. These include coal handling facilities, steam and power, well-equipped laboratories, well-designed sludge disposal facilities, etc.

THE CHEMICAL REMOVAL OF SULPHATES

Report to the
WATER RESEARCH COMMISSION
by the
POLLUTION RESEARCH GROUP
UNIVERSITY OF NATAL

WRC Report No 203/1/90

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

REEDBEDS:

An Effective Waste Water Treatment Option



Widespread research, both internationally and within South Africa, is demonstrating that constructed reedbed systems can form an effective and adaptable waste-water treatment option with potential to treat a range of domestic, industrial, mine and agricultural effluent and run-off situations.

This is the view of Dr Andrew Wood of the Johannesburg firm Steffen, Robertson & Kirsten who has been involved with the development of artificial reedbed systems for the past few years.

In a paper delivered at the recent WISA conference Dr Wood has said, however, that the inability of a number of the recently installed systems to perform as well as intended, tends to inhibit the wide scale acceptance of the technology at this time. The majority of the problems that have developed with reedbed systems can be directly related

to the lack of understanding of the mechanisms by which a reedbed functions, he says.

In essence, the constructed reedbeds can either mimic natural reedbeds, in the sense that waste water flows over the surface of the bed and is filtered through dense stands of artificially established aquatic plants; or they can be designed to promote subsurface flow of effluent through the shallow (400 - 600 mm) permeable soil and gravel or ash substratum in which the plants are established.

According to Dr Wood the design of a reedbed system for the treatment of waste water should be based on the sound understanding of factors such as treatment objectives, applicable design criteria, operational requirements as well as cost facilities.

• Treatment objectives. Theoretically,

the constructed reedbed may be designed to achieve the treatment objectives of conventional biological trickling filter and activated sludge systems, principally constrained by large scale economics, practicalities and demonstrable reliability.

- Design criteria. Design basis for the South African situation has not been defined. Although pilot studies have indicated potentially high loading rates, in general terms, for domestic sewage 20 to 40 ℓ/m per day and 1200 ℓ/m per day for polishing of pond or secondary effluents, appears reasonable as a basis for refining in relation to site and pretreatment specifics.

The reedbed system can operate as a single unit or as a combination of units operating in parallel, in series or intermittently, in plug flow, step feed or recirculation mode.



An adequate stand of reeds can be expected to develop within six to twelve months after planting though it may take three to four years for the stand to become fully capable of achieving secondary discharge standard. If seepage loss is considered to be undesirable a sealant of clay, bentonite, synthetic fabric or asphalt is required at a significant cost component to the reedbed.

- Operational requirements. The operational requirements of reedbed systems are principally related to the community load being treated, hence the size of the system, the treatment required and the configuration being utilised. These should, whenever possible, be so designed as to complement and enhance the natural reedbed process to accomplish the desired result.

- Cost. It has been estimated that the cost of the simpler reedbed systems may be as low as 30 per cent of conventional systems designed to meet comparable effluent standards. However, more complicated and particularly larger systems constructed from scratch on a virgin site are estimated to cost within the range for conventional plants, particularly if imported substrata is required.

FULL-SCALE SYSTEMS

Dr Wood says at present there are approximately forty systems either in operation, under construction or in the planning stages. A number of these reedbeds have been constructed and planned for timeshare developments, hotels, small communities and hospital applications where the flows are irregular and mechanical systems have been perceived to be both more expensive

and unreliable. In addition to these there are an increasing number of reedbed applications where the flow to be treated is considerable, the more recent is at Bethlehem where old oxidation ponds have been converted into reedbeds to polish 4,5 ml/d biofilter effluent, ideally to a special standard. Much of the information contained in Dr Wood's WISA paper has been extracted from the Water Research Commission's report *Artificial Wetland Use for Waste-water Treatment, Theory, Practice and Economic Review* which is due to be published in full shortly.

For further information contact Dr Andrew Wood at Steffen, Robertson and Kirsten, P O Box 55291, Northlands 2116. Tel (011) 441-1111 Fax (011) 880-8086.

NEW TURBIDITY TRANSMITTERS

The optical effect of solid particles suspended in a liquid is defined as turbidity in ISO standard 7027. The MET series turbidity transmitters and its line of speciality sensors was developed for in-line turbidity measurement in a range from a few ppm/FTU/NTU up to 4 000 ppm FTU/NTU.

All the electronics are menu-driven and provide easy programming to establish the measuring range alarms and output as well as calibration and visualisation of measured values by digital display. All the sensors operate using the scattered light measurement principle as defined by ISO 7027. In addition they compensate for ambient light, have a self-cleaning device or compensate for fouling and aging. Isolated input/output supply circuits and a standard 0/4 - 20 mA signal are standard features.

MODELS

The first model is the MET-3000. This instrument is designed for low to medium turbidities. Two versions are available. One for the 0-200 FTU/NTU range. This model is programmable for ranges 0-10-20, 0-50, 0-100 and 0-200. The second is for use in the 0-100, 0-200, 0-500 FTU/NTU ranges.

The second model is the MET-3010. It is designed to work with three different sensor types which provide a very wide range of applications in water, wastewater treatment and process industries in which turbidity is a significant parameter. Easy programmability to the user's selection of measuring unit and parameters is the primary benefit of this model.

SENSORS

Three sensor types are available. The WP-302 wiper sensor is for immersion in tanks, basins and open channels or can be inserted into process pipes. This sensor is utilised primarily in municipal or industrial wastewater treatment plants.

The WP-302HT sensor is made to withstand process temperatures of up to 100°C.

The third sensor developed for the MET-3010 is the process sensor, PP-301. It is made of stainless steel and withstands temperatures of -40 to 200°C and pressures of 10 to 150 psi. This sensor works reliable in aggressive

media and can be inserted into fermenters and reactors.

MET-3001 system also allows simultaneous use of multiple sensors. Using the PE-301 extension module, the user can connect up to eight sensors to a single base module. Each extension is individually programmable from the base module for measuring range, limit values, output range and measuring units for each sensor installed.

PORTABILITY

The MET-P is a portable unit which is ideal for periodic spot-checking where continuous measurement is not required or to confirm lab results for calibration purposes. The MET-P has a measuring range of 0-200 FTU/NTU and automatic compensation for ambient light and suppression of electric disturbances.

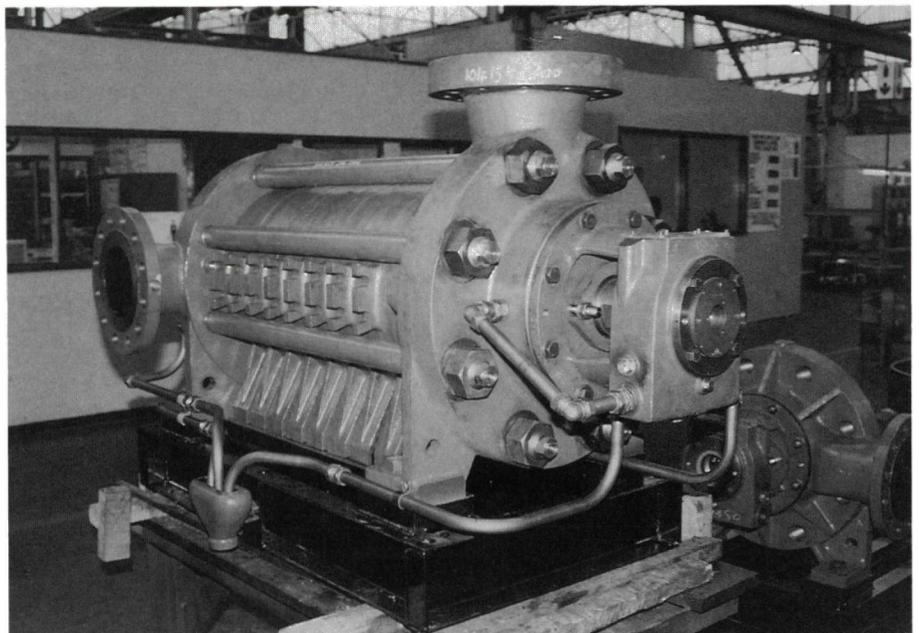
Enquiries: Euro-Technology, 83 Eight Avenue, Northcliff, Johannesburg 2195. Tel (011) 678-0611.

SULZER'S HPH RANGE EXTENDED

HPH pumps are robust, high-pressure, multi-stage units specifically designed for underground mine dewatering. With the recent introduction of three additional sizes to the range, HPH pumps can now move up to 300 l of water a second at heads of more than 1 700 m.

The pumps, in standard construction made of spheroidal graphite cast iron with bronze and steel internals, offer long lasting solutions to the most arduous pumping applications. Although initially developed for mine dewatering, they have been used successfully in many other applications, including public water-supply schemes and, running in reverse, as power recovery turbines.

For further information contact Sulzer Bros, P O Box 28, Bedfordview 2008.



A complete HPH 33 pump in the workshop at Sulzer's Elandsfontein Works

REPLY CARD

WISA — MTD MINI-SYMPOSIUM
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Membrane Applications in RSA Industry

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Mini-symposium Tour I Tour II Tour III

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AFVALBESTUUR IN SA ONDERSOEK

Die WNNR het pas 'n verslag vrygestel waarin inligting rondom afvalbestuur en die beheer van besoedeling in Suid-Afrika saamgevat word.

Die verslag spruit voort uit 'n opdrag wat die WNNR in Maart 1990 van die Departement van Omgewingsake ontvang het om ondersoek in te stel na die toestand van afvalbestuur in die land asook die beheer van besoedeling, die organisasies betrokke by afvalbestuur en hul huidige optrede en verantwoordelikhede. Die WNNR is voorts gevra om te kyk na wetgewing, wetstoepassing en regspleging wat op afvalbestuur en die beheer van besoedeling betrekking het. Gebreke op die terreine moet geïdentifiseer en regstellende maatreëls voorgestel word. Die verslag van 420 bladsye, aangevul met 'n dokumentêre databasis van meer as 700 bladsye, is vroeg in Januarie 1991 aan die Departement voorgelê. Die lywige verslag, wat 'n massa tegniese en ander inligting insluit, kan 'n leser se geduld ietwat beproef. Daarom het die WNNR 'n brosjure van 12 bladsye in nie-tegniese taal opgestel waarin die belangrikste bevindinge van die hoofverslag in verkorte vorm saamgevat is.

Enkele van die belangrike bevindinge was volgens die brosjure:

* Suid-Afrika het ingewikkelde, oorvleuelende omgewingswetgewing wat ekonomiese ontwikkeling kan strem en in die pad staan van goeie omgewingsbewaring.

* Strawwe vir omgewingsoortredings wissel aansienlik. Maksimumboetes vir sekere oortredings word beskou as ontoereikend in verhouding tot die omvang van omgewingskade wat aangerig kan word.

* Toegang tot inligting is in baie gevalle moeilik en word soms wetlik beperk.

Die brosjure getiteld *Die omstandighede van afvalbestuur en die beheer van besoedeling in Suid-Afrika - 'n bestuursopsomming*, is gratis in Afrikaans of Engels beskikbaar. Dit kan bestel word vanaf Tina James, telefoon (012) 841-2174, of van die WNNR-program vir die Omgewing, Posbus 395, Pretoria 0001. Die volledige verslag is ook te koop.

WETLANDS

A nationwide survey in America indicates increasing use of constructed wetlands for wastewater treatments.

According to Water Newsletter, Sherwood Reed, a consultant to the Environmental Protection Agency's Risk Reduction Laboratory in Cincinnati, Ohio, is conducting the survey for the agency and has identified nearly 150 communities that are utilising or are planning to utilise constructed wetlands as part of their wastewater treatment process.

The survey revealed the greatest concentration of these systems in Louisiana, Mississippi, Tennessee and South Dakota. The size of constructed wetlands currently in use varies from 37 850 ℓ/day in E1 Dorado, Mexico to as large as 76 million litres/day in Orlando, Florida.

LOW COST

According to Reed the primary reasons for the widespread use of constructed wetlands are their low cost, simplicity of operation and rapid public support for natural systems.

Of the 154 municipal constructed wetlands found in the preliminary survey, 56 are free water surface wetlands, while 98 are subsurface flow wetlands; 12 communities are utilising both systems in series.

Free water surface wetlands are shallow, open ponds with emergent vegetation rooted in the pond bottom and a free water surface open to the atmosphere. Subsurface flow wetlands are shallow beds filled with permeable rock, gravel or sand media. All wastewater flows through the permeable media several centimetres below the surface. According to the survey data, the average free water surface constructed wetland is approximately 71 ha in size and treats 15 million ℓ/day. It was constructed at a cost of 25 cents per litre of capacity. Treatment capacity varies from 22 000 to 76 million ℓ/day. In contrast the average subsurface flow wetland is approximately 1,2 ha in size and treats 1,8 million ℓ/day. It was built at a cost of 52 cents per litre of capacity. Treatment capacity is between 38 000 to 13,2 million ℓ/day.

Reed said that epa's survey represents the first step in developing a national consensus on effective approaches to the design of constructed wetlands. Texas recently issued interim design guidelines for constructed wetlands for municipal wastewater treatment. In Arkansas, an experimental system design programme has been established to determine if individual onsite constructed wetlands can provide sufficient additional treatment to allow for the surface discharge of septic tank effluent.

Water Newsletter 30-11-90

QUALITY COUNTS IN SPARES TOO

The minimum quality offered with each Sulzer product is set by the SABS 0157 code and the standards prescribed by the Sulzer group's parent company in Switzerland. Many pumps leaving Sulzer's works in Elandsfontein are manufactured to even stricter requirements, determined by the customer or the application.

However, a spokesman for Sulzer South Africa says customers are meticulous when writing out specifications for their new equipment, but they are often not as careful when obtaining spare parts. For example, the water authorities of a Southern African country recently experienced serious problems with their 18 HPL 42-22 1/2 Sulzer pumps. One of the pumps seized after only 1 200 of the expected 25 000 running hours, and four were running at well below their rated efficiencies, despite a recent overhaul. Analysis of parts taken from the seized pump showed that non-Sulzer parts had been fitted; dimensions as well as materials used, were not according to Sulzer specifications. The water authorities now face the costs of a second, unscheduled overhaul of their pumps and an electricity bill for excess energy consumed by pumps working at below their specified efficiencies.

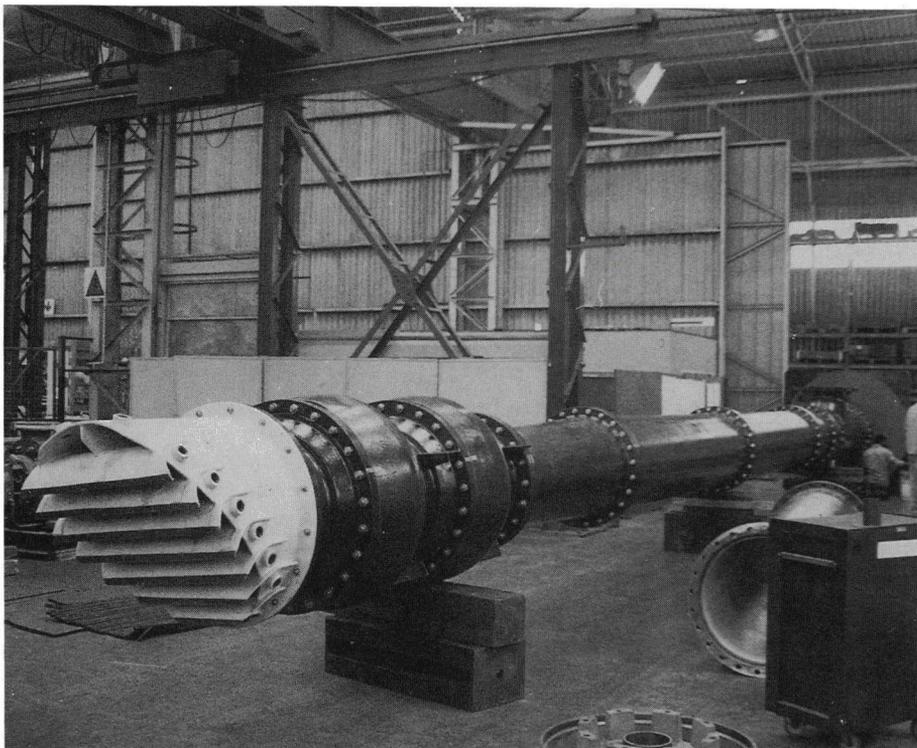
The spokesman says Sulzer pumps will maintain Sulzer levels of quality for life, provided they are properly maintained and worn parts are replaced with genuine Sulzer spares. A pump is only as good as the parts used to refurbish it.

CALEDON-MODDER WATER SCHEME

The first of four vertical pumps for the Caledon-Modder River Water Scheme has been completed. The scheme commissioned by the Department of Water Affairs will provide off-channel storage from the Caledon River, augment the capacity of the Welbedacht Dam and transfer water from the Caledon to the upper reaches of the Modder River.

Tienfontein Pump Station on the Caledon River, will transport water from the river to the Knellpoort Storage Dam.

Sulzer Bros (South Africa) is supplying four two-stage vertical mixed-flow pumps of the type BKn 680-2s/022 with a capacity of 1 m³/s each at a main duty head of 59 m. Each pump has an overall vertical length of 16 m and weighs, without motor, 12 599 kg. At operating speed (743 RPM) pump efficiency is rated at 82,02 per cent with a power consumption of 678,2 kW per pump.



One of the four BKn 680-2s vertical pumps in Sulzer's workshop at Elandsfontein

ENVIRONMENTAL TAXES LOOK PROMISING

Environmental taxes offer an efficient way to correct for the failure of the market place to value what the environment provides. According to the Water Newsletter (1631991) the Worldwatch Institute in Washington suggests in a publication called "State of the World 1991" that the two per cent of total economic output that many industrial nations spend on pollution control can be considered a failure to encourage practices that would limit pollution at its source.

While continuing use of regulations will become increasingly costly and cumbersome, the publication says environmental taxes are among the most promising tools governments can use to reorient behaviour. Such taxation would adjust prices and let the market do the rest. If taxes on activities such as the use of virgin materials, the generation of toxic waste, and the over-pumping of groundwater were phased in over a ten-year period, the economic effects would be eased. It is likely that

income taxes would have to be adjusted for the poorest members of society, since the cost of living would rise with an environmental tax code. However, the report says, shifting the tax base away from income and toward environmentally damaging activities would allow governments to reflect new public priorities without increasing the total tax burden.

Such changes would enable policymakers to make sustainability their central goal, whereby meeting needs and wants without destroying the resource base would take precedence over growth for its own sake. However, the report concludes that achieving an environmentally sustainable global economy is not possible unless the fortunate limit their consumption so the poor can increase theirs.

Order the report for \$10.95 from Worldwatch Institute, 1776 Massachusetts Ave. N.W., Washington DC 20036. Telephone 202/452-1999.

TIRES USED IN ANAEROBIC SYSTEM

An anaerobic system using shredded automobile tires to clean up the waste water from food processing plants is under evaluation at Georgia Institute of Technology (Atlanta). The technique involves an anaerobic packed-bed reactor, which uses microbes to degrade the wastes into combustible gases. The tires would replace the more costly plastic media normally used to fill waste-water treatment vessels. If successful, the process could significantly lower the capital investment costs for a variety of waste-treatment facilities. Although the tires represent a substantial cost advantage over plastic media, there are some disadvantages. The tires are heavier and would therefore require more support structure. In addition there is concern about the chemicals and the oils that may leach out of the tires.

Water Newsletter 28291

FLOW CONTROL SYSTEMS FOR SA MINES

Elgro Flow Systems has been awarded two major contracts totalling 2,8 million for the design, manufacture, supply and commissioning of integrated pressure reducing and water flow control stations at two South African mines.

According to a spokesman for the company, work has commenced on 12 service water stations and 13 portable water pressure reducing stations which will be used to control the pressure of underground service water and potable water on all levels down to shaft bottom at a major new platinum mine near Northam in the Northern Transvaal. In the Orange Free State seven service water stations operating from levels 52 to 66 will be supplied to Freddie's no 1 shaft in Welkom. The stations to be supplied to both mines consist of a

primary run and an emergency standby or parallel run each of which has both a pneumatically actuated Grove ball valve and a manual Ainsworth parallel slide gate valve. If the primary run pressure reducing valve fails then the relief valve will flow.

The most important piece of equipment in the system is perhaps the Grove Flex-flo control valve which is manufactured under licence to Grove of the USA by Ainsworth Engineering in South Africa. These are radial flow, expandable-tube type regulators which are ideally suited to the highly abrasive water found in South African mining conditions.

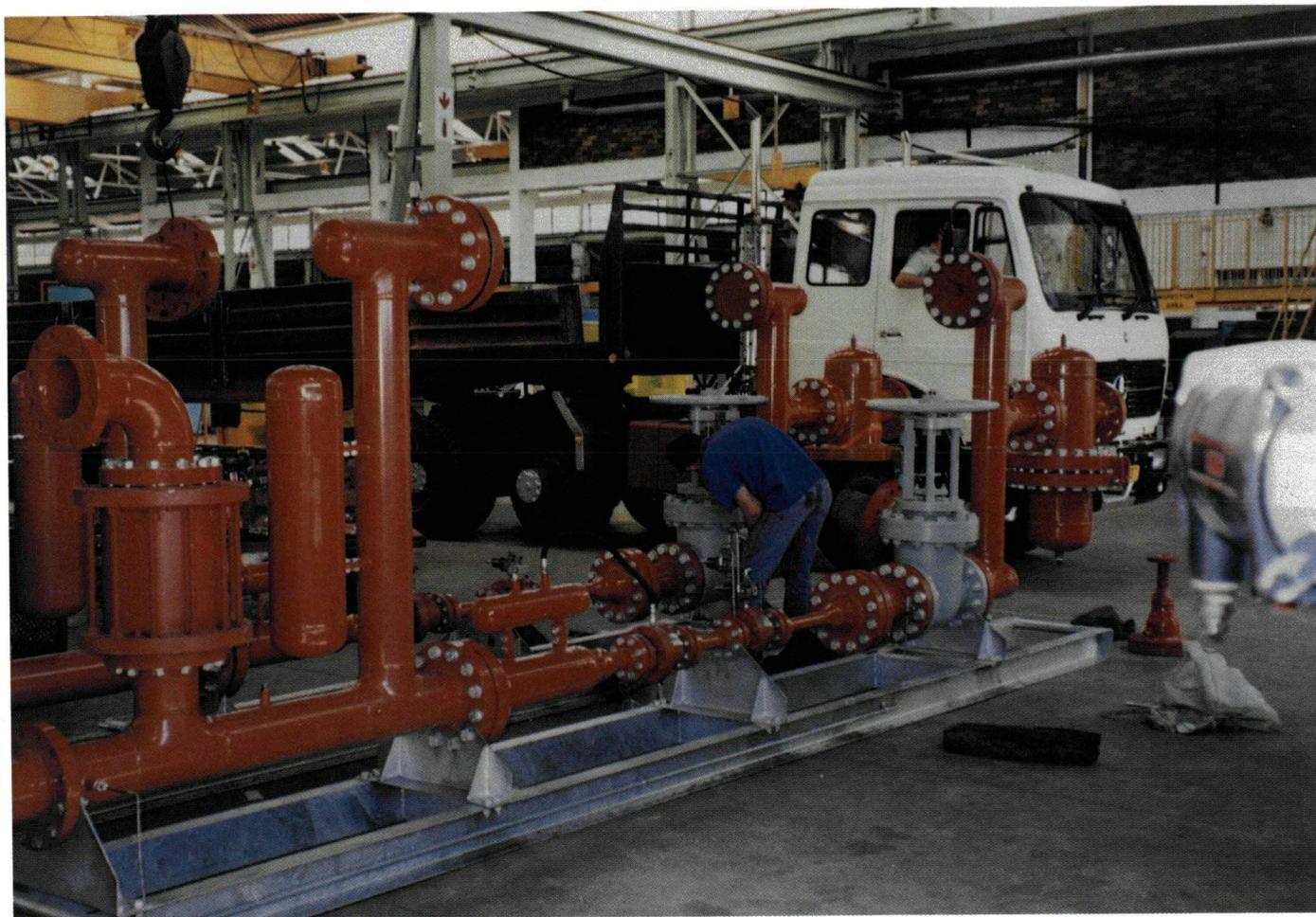
Enquiries: Elgro Flow Systems, P O Box 1122, Southdale 2135. Tel. (011) 433-3968.

FILTER IN A STRAW

A Water filtration and purification system in a straw has been developed by a firm in Portland Oregon, USA. The Accufilter is said to be able to screen out 98 per cent of 151 pollutants such as chlorine, pesticides, gasoline, organic poisons and detergents. According to *New Scientist* (12/22 - 29/90), the first stage of the system uses a membrane to trap large particles and sediments. An activated carbon medium impregnated with silver then absorbs contaminants and kills bacteria. A final scrubbing stage filters particles to 0,04 micrometers. The filters on the straw, which can treat up to 160 litres of water, create enough resistance that using it is like drinking a thick milk shake.

Water Newsletter 17191

Below: Elgro Pressure and Flow Control Systems



WATER DECADE REVIEWED

A symposium on safe water and sanitation for the 1990s reviewed accomplishments of the drinking water decade and looked at the difficulties ahead.

According to Water Newsletter representatives from 115 nations convened in September last year in New Delhi for the symposium: Safe Water 2000.

During the UN International Drinking water supply and Sanitation Decade, 1980 – 1990, an additional 1.3 billion people were provided with safe drinking water. However, figures from the World Health Organisation indicate that 1,2 billion people in developing countries (243 million in urban areas and 989 million in rural areas) are still without safe water. More than 1.7 billion people have no sanitation facilities.

About 80 countries, supporting 40 per cent of the global population, suffer from serious water shortages. In 1975, 19 developing countries

were without adequate renewable water resources for domestic and irrigation use. By 2025, 37 nations are expected to have severe scarcities. Researchers with UNICEF'S Water and Environmental Sanitation Section, calculated the investment required to attain safe water for all by the year 2000. For a 100 per cent coverage of water and sanitation service in both urban and rural areas, about 36 billion US dollars a year will be needed – three and a half times more than the average annual investments made during the 1980s. Funding now tends to be allocated at 80 per cent for high-cost technologies in urban areas and 20 per cent for low-cost technologies for rural and peri-urban areas. If the focus were put on the latter areas, 30 per cent of the total cost could take care of 80 per cent of the unserved – 11 billion US dollars a year could reach more than 2 billion people with sanitation and provide 1,6 billion people with water.

Water Newsletter 30-11-90

OCEAN DUMPING NO!

Further prohibitions on ocean dumping were established at the London Dumping Convention in November last year.

A global ban on disposing of industrial wastes at sea was approved by a consensus of 43 nations. The measure, which is legally binding on all 64 nations that have signed the 20-year-old treaty, will be phased in by 1995.

In addition, areas suffering the worst dumping will be identified, and member countries are expected to prosecute their own flag ships that violate the ban. The measure encourages nations to promote waste minimization.

The Convention also imposed a ban on the disposal of nuclear waste under the seabed from ships or platforms. The prohibition was approved over opposition from France, Britain, the US and the USSR. Countries still can build tunnels from the shore to dump nuclear waste under the seabed.

Water Newsletter 30-11-90

VISCOSITY TRANSMITTERS

A range of in-line viscometers for every measuring task is available from the manufacturers BTG. The models include viscosity transmitters with rotating sensors as well as moving blade meters. Different designs and principle of measurement are available for liquids of newtonian and non-newtonian behaviour and viscosities, from 10 to 100 000 cP. Liquids measured include all mineral and fuel oils, starches and coating compounds, glues and gelatine, cosmetics and liquid detergents, sugar massecuite, and also extremely abrasive or contaminated liquids such as black liquor, drilling mud and coal suspensions.

For detailed information please contact Euro-Technology, 83 Eight Avenue, Northcliff, Johannesburg 2195.



VISC-2000
In-line Viscosity Transmitter



Visc 2000 In-line Viscosity Transmitter

Hydrological Cycle: not what it used to be

The following report on global climate change has been received from the SANCHIAS news desk:

According to initial research conducted by the Hydrology Research Group at the Department of Agricultural Engineering of the Natal University, global climate change predicted within the next 60 years is likely to be on a scale with changes that would ordinarily have occurred over a period of 10 000 years.

The research has revealed that the carbon dioxide content of the atmosphere could double by the middle of the next century, causing a substantial rise in temperature and significantly altering South Africa's environmental system. Substantial changes are likely to register in agriculture, agricultural belts, water resources, the availability and quality of water, to name but a few.

Working closely with the International Geosphere Biosphere Programme (IGBP), the research group has been assessing the impacts of increases in carbon-dioxide and temperature, using global circulation models to make prognoses into the future.

Professor Roland Schulze, project leader of the group, said: "The changes that are already being observed in the climate and which we are projecting for the next 50 to 60 years are of such a scale – due largely to human intervention and the use of fossil fuels – that the pace of temperature change is being forced."

Schulze, who recently attended an IGBP workshop in Sweden, said: "We were trying, with experts in different fields, to get off the ground an international computer simulation model which would facilitate better projections on the impacts of global climate change."

The main cause of global climate change is the anticipated doubling of carbon dioxide in the atmosphere, which is associated with an increase in temperature. According to Schulze, the

temperature in South Africa is expected to rise by between one and 3,5 degrees, if not higher. Elsewhere the temperature will vary from virtually no changes around the equator to an increase of up to five degrees towards the Poles. What these climatic alterations will do to rainfall is currently the least understood aspect of global warming.



NEW GROUND

While the University research group is primarily concerned with water resources in South Africa, Schulze said they were breaking new ground with his focus on global climate change and were assessing the impact of all the factors involved.

Initial runs with the computing model have indicated that in 50 to 60 years time the *Eucalyptus grandis* (gum tree) belt in Natal is likely to shift about 100 kilometres inland toward the Drakensberg. "Our research shows that the North Coast, where there is currently a lot of planting, may be too hot in summer for this species to grow optimally and that moving further inland would have better potential for the growth of these trees."

He said it was important for industries with investments in afforestation – which should be planning between 20 and 30 years ahead – to look at the possible future climates of the areas of the areas in which they were investing.

For some species of tree there will be an increase in optimal growing areas, while for others there could be very

little change. In the case of *Pinus patula* (pine trees), there will in the future be fewer areas in Natal where they can be grown successfully.

POSITIVE SPIN-OFF?

Global change can, however, bring a measure of positive spin-off for some areas in South Africa. Preliminary research has shown that the interaction of carbon dioxide (which increases water-use efficiency) with temperature and rainfall changes could result in an agricultural improvement in some areas. Natal, particularly the Midlands, and the Transvaal are likely to develop a better potential for maize production, whereas the North Eastern Cape and the Southern Free State will possibly be worse off in the future.

Schulze's attendance at the workshop in Sweden, at which he was invited to give one of the keynote addresses, was part of the second phase of the IGB Programme. The first phase was initiated in 1986, after which a series of conferences on global climate change took place.

OPPORTUNITIES

Departmental research into global climate change began in earnest after an international conference of southern hemisphere scientists was held in Swaziland in 1988. Schulze said the Swaziland conference had afforded the South African delegates a good opportunity to hear what their colleagues overseas were doing in their assessments of global climate change.

"They are working with huge government budgets whereas we are not. We obviously have other priorities in this country, budget-wise, but in some respects some other countries really are several years ahead of us."

Schulze said that more funding for this type of research was necessary.

SOUTHERN AFRICA 1991

GROUNDWATER

AUGUST 21 – 23

The first biennial groundwater convention of the Groundwater Division of the Geological Society of South Africa and the Borehole Water Association of Southern Africa will be held at Eskom College in Midrand. The theme for this technical symposium is groundwater quality and pollution.

Enquiries: The Symposium Secretary, P O Box 2178, Southdale 2135.

OCEANOGRAPHIC ECOLOGY

SEPTEMBER 8 – 12

A symposium on the Benguela trophic functioning entitled Resource Utilisation from an Ecosystem Perspective, will be held at the University of Cape Town.

Enquiries: The Symposium Secretariat, Oceanography Department, University of Cape Town, Rondebosch 7700. Tel: (021) 650-2681.

MEMBRANE TECHNOLOGY

OCTOBER 22

A one day mini-symposium and technical visit will be held at ESKOM, Rosherville. The symposium will deal with membrane applications in energy related industries and delegates will visit the Lethabo power station.

Enquiries: Dennis Aspen (011) 800-4659, Herman Wiechers (011) 800-4270 or Gerrit Lok (011) 626-3440.

WASTE MANAGEMENT

OCTOBER 22 – 24

An international seminar, workshop and equipment exhibition on environmental waste management technology will be held at the national exhibition centre (NASREC) in Johannesburg.

Enquiries: Seminar Co-ordinators, P O Box 93395, Yeoville 2143. Tel: (011) 648-1322/3. Fax: (011) 648-1387.

Keep us posted

SA Waterbulletin welcomes news and information of relevant conferences and symposia for this page. Please send details of such events to: The Editor, SA Waterbulletin, P O Box 824, PRETORIA, 0001

OVERSEAS 1991

ECONOMICS

SEPTEMBER – DECEMBER

A three months course on economics and management for the water industry will be held by the Developing Countries Unit at the Strathclyde Business School of the University of Strathclyde, Scotland. Tuition and accommodation fees: £6 800.

Enquiries: Dr J Love, DCRU, Department of Economics, Strathclyde Business School, University of Strathclyde, 100 Cathedral Street, Glasgow G4 0GE Scotland, UK.

POLLUTION

SEPTEMBER 10 – 12

The University of Bradford's Silver Jubilee Celebration Conference with the theme The Changing Face of Europe: disaster, pollution and the environment will be held in Bradford, Yorkshire.

Enquiries: Dr Z Keller, University of Bradford, Bradford West, Yorkshire BD7 1DP.

ACID DRAINAGE

SEPTEMBER 16 – 18

The second international conference on the abatement of acidic drainage will be held in Montreal Canada.

Enquiries: Pamela Friedrich, Centre de Recherches Minerales, 1665 Boulevard Hamel, Edifice 2, First Floor, Quebec, Canada G1N3 Y7.

WASTEWATER

SEPTEMBER 24 – 26

An international symposium on wastewater reclamation and reuse will be held in Castell Platja d'Aro, Costa Brava, Spain.

Enquiries: Prof Rafael Mujeriego, Universidad Politecnica de Cataluna, ETS de Ingenieros de Caminos, Gran Capitan S/N, 08034, Barcelona Spain.

GROUNDWATER

OCTOBER 8 – 9

A two-day international conference on groundwater protection will be held in Paris.

Enquiries: Mrs Lavinia Gittins, IWEM, 15 John Street, London, WC1 N2 EB.

WATER DISTRIBUTION

OCTOBER 21 – 22

The European specialised conference on managing water distribution systems will be held at the "Centro Affari" in Florence, Italy.

Enquiries: The IWSA Secretariat, 1 Queen Anne's Gate, London, SW1 H9 BT, Great Britain.

PIPELINES

OCTOBER 27 – 31

The third international conference on pipeline construction will be held at the Congress Centrum, Hamburg, Germany. Enquiries: No-Dig '91, Leitungsbau '91, c/o Hamburg Messe and Congress GmbH, Congress Organisation, P O Box 302480, D-200 Hamburg 36, Germany.

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.

1992

ALUMINIUM

JANUARY 15 – 16

A two-day workshop on aluminium in drinking water organised by the International Water 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 PECQ, 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.



SHORT COURSE

MUNICIPAL WATER ENGINEERING

presented by the

UNIVERSITY OF STELLENBOSCH

in collaboration with the

SOUTH AFRICAN INSTITUTION OF CIVIL ENGINEERS

DIVISION OF WATER ENGINEERING

VENUE

Department of Civil Engineering,
University of Stellenbosch.

DATE

4 to 6 November 1991

PURPOSE

This course, covering water supply, stormwater and coastal hydraulics as well as water and wastewater technology, will serve as a refresher course for those with an interest in municipal water engineering. Professional engineers and technologists should derive benefit from this course.

In order to accommodate participants from neighbouring countries all lectures will be in English. The course precedes the National Hydrological Symposium which is to be held at the same venue.

COURSE FEES

R550 (3 days) or R200 per day will provide for notes, lunches and teas.

ATTENDANCE

The course attendance will be limited to 100 persons and as hotel accommodation in Stellenbosch is limited, you are urged to register and book accommodation early.

ACCOMMODATION

Please arrange your own accommodation at one of the following:

D'Ouwe Werf	Tel 71608
Stellenbosch Hotel	Tel 73644
Devon Valley	Tel 70211
Coetzenburg Hotel	Tel 72930
University Conference Centre (outside Stellenbosch)	Tel 774352

ENQUIRIES

Ms H Engelbrecht	Tel 02231 - 774352
Prof A Rooseboom	Tel 02231 - 774353
Dr B H Sinske	Tel 02231 - 774358

Should you be interested in attending this course please complete the applicable post card in this Bulletin and post it along with your deposit or course fees.

MEMBRANE TECHNICAL DIVISION



WISA



presents a

ONE DAY MINI-SYMPOSIUM

MEMBRANE APPLICATIONS IN RSA INDUSTRY

22 October 1991 at Eskom, Rosherville

Provisional Programme

- 07:30 Registration and Tea
- 08:00 Opening : MTD – History and Present Activities (Dr O Hart, WRC)
- 08:15 Keynote Speaker : Membrane Applications in the RSA Industry – Overview of the Present Situation (G Botha, SS & O)
- 08:30 **SESSION I : POWER INDUSTRY** (Chairman – D J Aspden, Eskom)
- EDR at Tutuka Power Station (J v Noordwyk and D Swanepoel, Eskom)
TRO at Lethabo Power station (D Hanekom and G Lee, Eskom)
Selection Criteria for EDR and TRO (A Goosen, Eskom)
Carbon Dioxide Membrane Separation (G Lok, Eskom)
DISCUSSION
- 09:30 **SESSION II : INDUSTRIAL APPLICATIONS** (Chairman – G Lok, Eskom)
- Electrolytic Chlorine and Caustic Soda Generation (R Jones and A Viljoen, Keyplan)
Treatment of Colliery Waste Water by RO (ALR da C Carvalho and D du Plessis, Sasol)
West Coast Sea Water Desalination : UF/RO Pilot Plant Experience (P Metcalfe, de Beers)
Ten Years Successful Spiral Wrap RO Application at Vierfontein Power Station (D Aspden, Eskom)
DISCUSSION
- 10:30 Tea
- 11:00 **SESSION III: RESEARCH ORGANIZATIONS AND SUPPLIERS** (Chairman – H Wiechers, Eskom)
- A Review of Industrial Applications of Nanofiltration Membranes (S Wadley, University of Natal)
Low Cut-off Ultrafiltration Membranes: Technology Transfer and New Availability in the RSA (Dr E Jacobs, University of Stellenbosch)
Application of Liquid/Liquid Membranes (Prof J Smit, Potchefstroom University)
Membrane Fouling (J Schoeman, WATER/CSIR)
DISCUSSION
- 12:00 **CLOSING ADDRESS** : Membrane Applications in the RSA – The Way Ahead (P E Odendaal, WRC)
- 12:15 **CLOSURE** : WISA President (Dr D F Toerien)
- 12:30 Lunch
- 13:30 **DEPART FOR TECHNICAL TOURS**
- Tour I: Visit to Eskom's Engineering Investigation Laboratories and Facilities (13:45 – 15:15)
- Tour II: Visit to Lethabo Power Station Water Management System (including the 9 Mℓ/d TRO Plant) (14:30 – 16:00)
- Tour III: Visit to Tutuka Power Station Water Management System (including the 11,5 Mℓ/d EDR Plant) (23 October 1991)
- Enquiries:** Dr Herman Wiechers Tel: (011) 800-4270
Mr Denis Aspden Tel: (011) 800-4659
Mr Gerrie Lok Tel: (011) 626-3440

Should you be interested in attending this Mini-symposium please complete the applicable post card in this bulletin. Attendance fees are R35 for WISA-MID members and R55 for non-members (includes automatic membership of WISA-MID). Please make cheques payable to WISA-MID.