SA waterbulletin

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WATERSUIWERING
Unieke proses in SA ontwikkel

WATER MANAGEMENT
New report spells out Department's policy

WEATHER MODIFICATION
Clouds studied from Carolina

recently published recently published recently published recently published recently published

Wastewater treatment and pollution control

by KA Murray

A comprehensive study of wastewater treatment and pollution control in South Africa.

This book will be of assistance to all persons who are concerned with the disposal of sewage and industrial wastes and the prevention of pollution of the water environment.

CONTENTS

Historical Introduction/History of Sewage Purification Methods from 1986 onwards/Historical Development of Sewage Disposal Methods in South Africa/Chemical and Bacteriological Aspects of Sewage and Sewage Purification Processes-Treatment /South African Organizations Dealing with Wastewater Problems/Overseas Organizations/South African Contribution to the Developing Field of Wastewater Purification/Problems Encountered in the Mining Industry in South Africa in Relation to Sewage Disposal/Practical Aspects of Wastewater Treatment and Pollution Control in South Africa/Water Rights/Provincial and Local Authorities: Responsibilities and Authority/Discharge of Purified Effluents into Watercourses/Analytical Methods/River Water Usage: Adverse Effects Caused by Sewage Effluent, Industrial Seepage, Runoff and Atmospheric Discharge/The Hierarchical Use of Water in South Africa: Portents for the Future/Control of Pollution from Industrial Effluents/Major Water-using Industries/Disposal of Solid, Toxic and Hazardous Wastes/Marine Pipelines for Disposal of Sewage and Intractable Industrial Wastes/The Use of Land for the Disposal of Intractable or Poor Quality Effluents/Treatments of Sewage and Disposal of Effluent from Small Communities, Caravan Parks, Seaside Resorts, Hostels, etc./Water Boards and their Functions.

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WRC

Clouds over the Transvaal Highveld. The new weather modification radar site at Carolina will enable researchers to study clouds over a wider area. See report on page 14.

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inhoud

SA Waterbulletin is a two-monthly magazine on water and water research published by the South African Water Research Commission (WRC), a statutory organization established in 1971 by Act of Parliament.

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SA Waterbulletin is 'n tweemaandelikse tydskrif oor water en waternavorsing wat uitgegee word deur die Suid-Afrikaanse Waternavorsingskommissie (WNK), 'n statutêre organisasie wat in 1971 by Wet gestig is.

Intekening is gratis. Stof in dié publikasie weerspieël nie noodwendig die oorwoë menings van lede van die WNK nie, en mag hergebruik word met erkenning van die bron.

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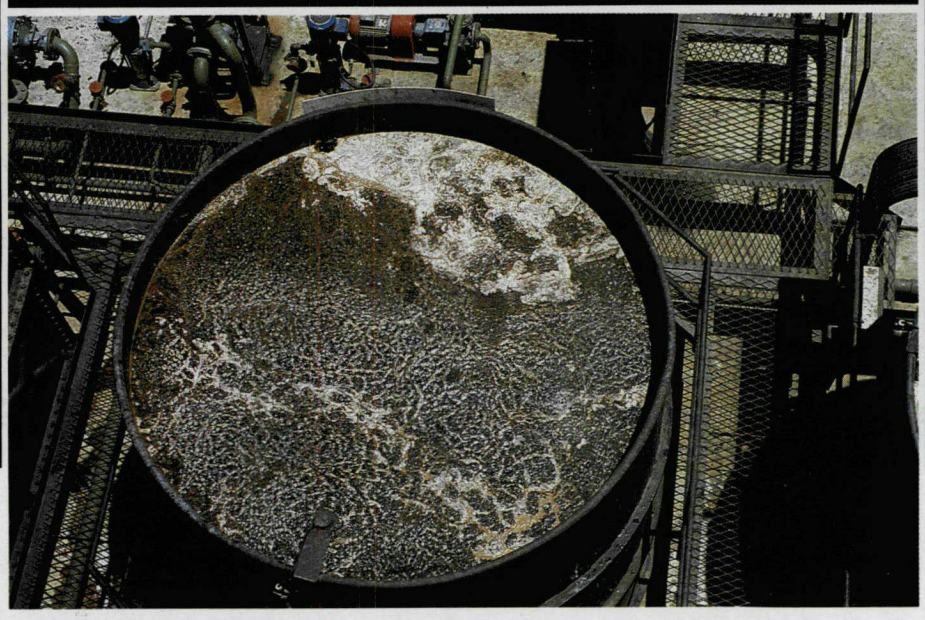
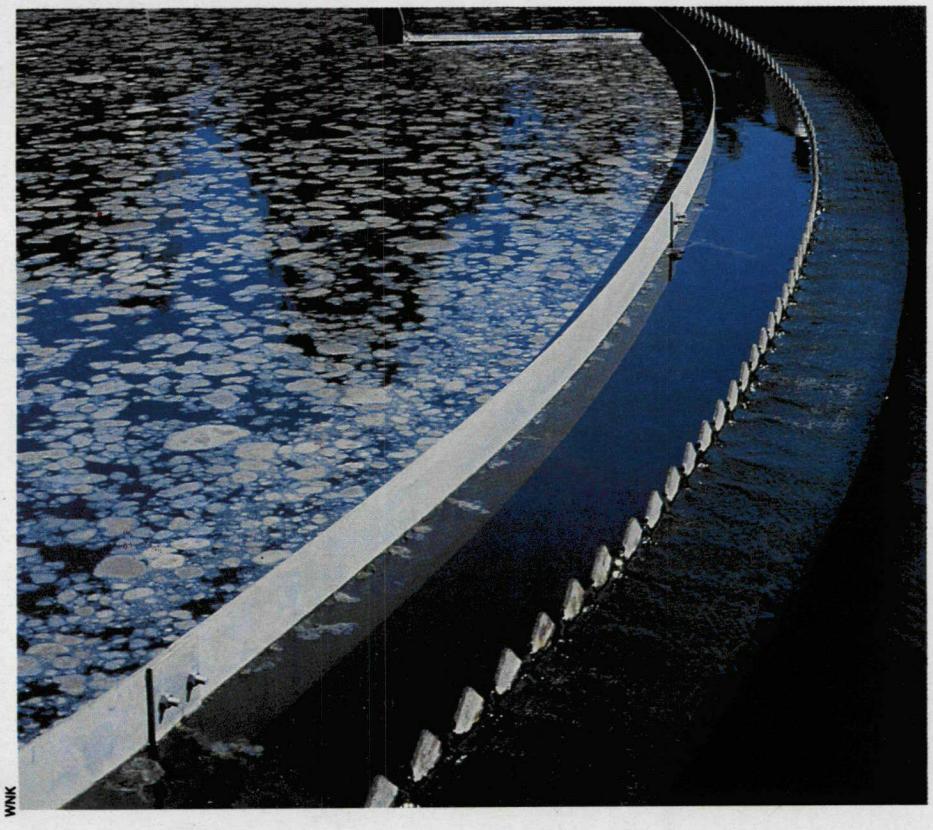
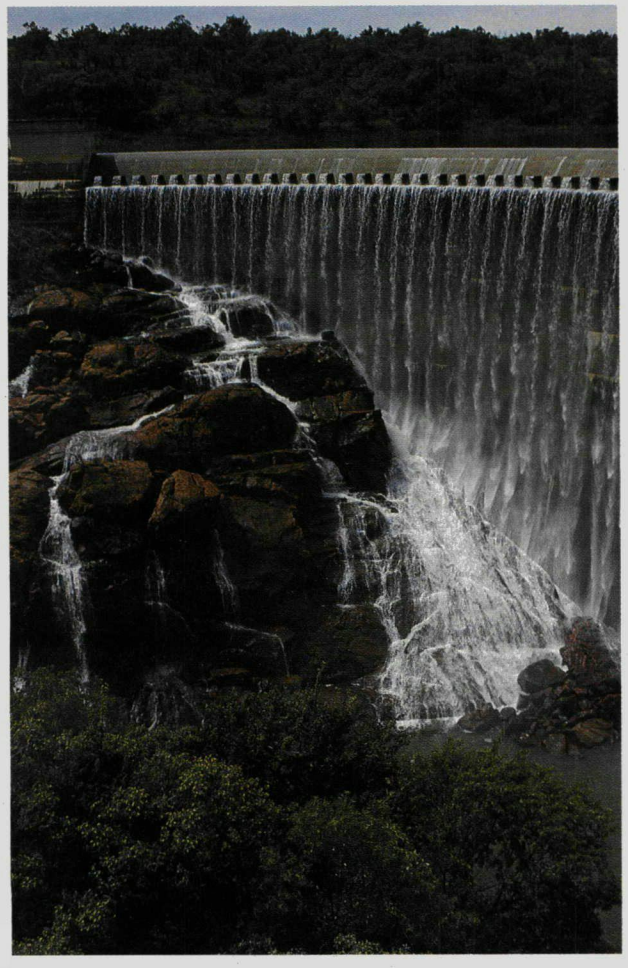




WNK

WNK finansier talle nuwe projekte



Die Waternavorsingskommissie het op sy jongste vergadering in Pretoria 87 nuwe voorstelle vir navorsingsprojekte oorweeg en altesaam 44 van dié projekte ter waarde van meer as R3,5 miljoen is goedgekeur vir finansiële ondersteuning in 1988. Op die gebied van rioolwatersuiwering is agt nuwe projekte goedgekeur, terwyl in die werksvelde oppervlakhidrologie en besproeiingsnavorsing elk ses projekte goedgekeur is en ten opsigte van watergehalte vyf. Die ander projekte handel oor navorsing op die gebiede van nywerheidswater (4), grondwater, ontsouting en droë verkoeling (elk 3), weermodifikasie (2), versouting (2) en hidrometeorologie en waterbesparing elkeen een.

Die onderwerp, doelstellings en kontraktante van die reeds goedgekeurde navorsingsvoorstelle is as volg:

DIE ONTWIKKELING VAN 'N HANDLEIDING VIR GEBRUIK MET DIE REKENAAR-PROGRAMME VIR DIE ONTWERP VAN BESPROEIINGSTELSELS – MURRAY, BIESENBACH EN BADENHORST (MBB)

MBB het in 'n voorafgaande WNK-projek rekenaarprogramme ontwikkel wat vir die ontwerp van sprinkel-, drup- of mikrospuitbesproeiingstelsels gebruik kan word. Om die gebruik van hierdie programme te bevorder het die Kommissie in oorleg met MBB besluit om dit te kommersialiseer. Alvorens egter tot 'n bemarkingsaksie oorgegaan kan word, moet die pakket afgerond word deur 'n handleiding te ontwikkel wat gebruikers in staat sal stel om die programme oordeelkundig te gebruik.

THE INVESTIGATION OF THE HYDROLOGICAL RESPONSE TO THIRD WORLD SETTLEMENTS IN PERI-URBAN AREAS OF NATAL/KWAZULU – THE UNIVERSITY OF ZULULAND

Extensive peri-urban areas surrounding the large metropolitan areas in South Africa are experiencing a rapidly increasing population density. These settlements are affecting the environment for example through denudation and degradation of the vegetation. These changes will in turn affect the hydrological response and could lead to increased pollution of the water resources in such areas. There is a need to determine the influence of these settlements on the hydrology and to

develop appropriate management strategies for their control.

DIE ONTWIKKELING VAN 'N STELSELMODEL VIR DIE MGENI-OPVANG-GEBIED – UNIVERSITEIT VAN NATAL

'n Behoefte bestaan tans om die Mgeni-rivierstelsel te simuleer. Om dié simulering te kan doen, beide wat die kwaliteit en kwantiteit van die water betref, moet 'n toepaslike stelselmodel ontwikkel word.

Die Departement van Landbouingenieurswese aan die Universiteit van Natal is 'n geruime tyd al besig met die ontwikkeling van 'n hidrologiese model wat klaarblyklik aangepas en vir die Mgeni-stelsel gebruik kan word. Die werk sal ook die ontwikkeling van 'n ni-verspreide, seltipe reënval-afloopmodel, wat sensitief is vir veranderings in landgebruik, insluit.

HYDROLOGICAL MODELLING STUDIES IN THE EASTERN CAPE – RHODES UNIVERSITY

The supply of water to the Lower Fish irrigation scheme and Grahamstown has necessitated the establishment of new research catchments in a semi-arid region of South Arica. This is due to the fact that the Department of Water Affairs is constructing an off-channel storage reservoir in the present research catchments which effectively ends the possibility of the continued research in that area.

The new catchments, called the Bedford catchments, were specifically chosen to provide data which is typical of semi-arid areas of South Africa.

The objectives of the project are the establishment of the new catchments and the quantification of the physical characteristics (such as soils, topography and land-use) of the area; to investigate methods of improving hydrological models, by moving towards more physically-based approaches but without neglecting the later application needs of such models and to improve the model drainage components, especially from the root zone to the deeper sub-surface regions of the soil.

DIE ONTWIKKELING VAN 'N MODEL OM VLOEI VAN ALLUVIALE RIVIERE TE SIMULEER – BRUINETTE, KRUGER EN STOFFBERG

Dié rekenaarmodel sal help om die effek van vloede op rivierstelsels asook die ontwikkeling van waterbronne en die afvoer van sediment in riviere te bepaal.

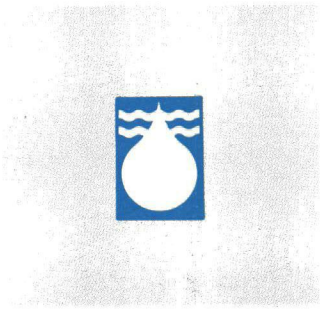
RECONSTRUCTION OF THE CLIMATIC HISTORY OF THE LAST 2 000 YEARS IN THE SUMMER RAINFALL REGION OF SOUTHERN AFRICA – THE SOUTH AFRICAN MUSEUM, CAPE TOWN

In order to improve the existing knowledge of the annual variability of rainfall, several attempts have been made in South Africa and abroad, to relate annual rainfall to tree rings (dendrochronology) from trees that are several hundred years old. These attempts have had limited success.

A new approach is being pioneered by the South African Museum involving the study of the relationship between annual rainfall and many other characteristics of wood anatomy that have been shown to be far more sensitive to variation in rainfall. The wood anatomy approach is therefore complementary to dendrochronology and the objective of the proposed research programme is to investigate the potential of wood anatomy analysis. It therefore takes the nature of an initial feasibility study for a relatively new concept that may well have far-reaching benefits.

GEOHIDROLOGIESE ONDERSOEK EN EVALUASIE VAN DIE ZOELOELAND KUSAKWIFEER – WNNR

Die Zoeloelandse kusvlakte is die mees uitgestrekte kusakwifeer langs die Suid-Afrikaanse kus. Hierdie gebied kan, vanuit 'n geohidrologiese oogpunt, beskou word as 'n uitgestrekte, grootliks



onbenutte en onbekende primêre akwifeer wat deel uitmaak van'n delikate ekosisteem langs die Noord-Natalse kus. Verskeie binnelandse mere, byvoorbeeld St Lucia, Kosi en Sibayi, vorm deel van hierdie ekosisteem. Groot uitbreiding en stedelike ontwikkeling van die groeipunt rondom Richardsbaai oor die afgelope ongeveer een dekade vind plaas in die opvanggebied van die Mzingazimeer wat uiteindelik besoedeling en ook vermindering van aanvulling van die meer tot gevolg kan hê. In die gebied ten noorde van Sibayimeer word tans ondersoeke gedoen na die moontlikheid van grootskaalse rysverbouing wat ook besoedelingsgevare vir die meersisteme in die gebied inhou. Die mate waartoe die uitgebreide bosbouplantasies wat in groot dele van die kusvlakte aangeplant is, die waterbalans van die kusvlakte (byvoorbeeld deur evapotranspirasie en invloed op die aanvulling) beïnvloed, is grootliks onbekend. Daar is dus groot leemtes in die huidige stand van kennis aangaande die geohidrologiese en verwante eienskappe van die kusvlakte en die uitwerking wat enige verandering van die grondwatertoestande op die binnelandse mere en die ekosisteem as geheel sal kan hê.

Die navorsingsprogram sal hierdie basiese tekort aan inligting verminder en antwoorde verskaf wat vir die toekomstige beplanning en ontwikkeling van die gebied noodsaaklik is.

PRECIPITATION OF AIRFLOW IN CUMULUS CLOUDS – CSIR

The project is designed to use the capabilities of the CSIR's triple doppler radar system for establishing the relationship between:

- ☐ the spatial distribution of precipitation within clouds and the internal airflow patterns of the clouds,
- ☐ the surface precipitation (rain and hail) patterns and the three dimensional air flow in clouds, and
- ☐ the rainfall intensities as measured by rain gauges and the reflectivity recorded by radar.

THE DEVELOPMENT OF TECHNIQUES FOR THE EVALUATION AND EFFECTIVE MANAGEMENT OF SURFACE AND GROUND-WATER CONTAMINATION IN THE ORANGE FREE STATE GOLD FIELDS – UNIVERSITY OF THE ORANGE FREE STATE (UOFS)

The aims of the research programme will include the following:

- ☐ Determine the source of possible pollutants to the ground-water regime.
- ☐ Quantify the contribution of the different sources.
- ☐ Study the migration rate of pollutants through the aquifers.
- ☐ Determine chemical alterations to the pollutants while on surface and in the aquifer.
- ☐ Model local and regional movement of pollutants through the aquifer and predict future water qualities.
- ☐ Enter information into the ground-water data base.
- ☐ Suggest management strategies whereby the influence of disposal can be minimized.

DIE BEVORDERING VAN DIE NASIONALE GRONDWATER-DATABASIS – UOVS

Die Instituut vir Grondwaterstudies (IGS) aan die UOVS het in die tydperk 1984 tot 1987 die basiese struktuur vir 'n Nasionale Grondwaterdatabasis kragtens 'n WNK-kontrak ontwikkel. Dié databasis is op die hoofraamrekenaar van die Departement van Waterwese geplaas. Dié nuwe projek sal gemik wees op die ontwikkeling van 'n tegnologie-oordragprogram vir potensiële gebruikers van die databasis.

TECHNOLOGY TRANSFER OF ACTIVATED SLUDGE AND WATER CHEMISTRY RESEARCH – THE UNIVERSITY OF CAPE TOWN

The project will be aimed at the production of a number of technology transfer information documents and publications for the water and waste water treatment industry.

NAVORSING OOR DIE TAKSERING VAN WATERKWALITEITS-PROBLEME AS GEVOLG VAN MIKROBIESE GROEI IN DRINKWATERVER-SPREIDINGSTELSELS – WNNR

Ten spyte van die voldoende ontsmetting van water, kan dit gebeur dat sekere mikro-organismes in die waterverspreidingstelsels versamel deur die vorming van biofilms (slymlae).

Die doel van hierdie projek is om, eerstens, 'n literatuuroorsig te onderneem oor die probleme in verband met watergehalte wat verband hou met biofilms. Daar sal spesiaal verwys word na potensiële patogeenorganismes en organismes wat reuke en smake gee. Tweedens sal 'n ondersoek geloods word na die omvang en aard van waterkwaliteitsprobleme wat verband hou met mikrobiese groei in Suid-Afrikaanse verspreidingstelsels vir drinkwater.

RESEARCH ON PELLETISATION IN UPFLOW ANAEROBIC SLUDGE BED (UASB) SYSTEMS – THE UNIVERSITY OF CAPE TOWN

Recent developments have focussed attention on the use of anaerobic digestion, particularly the UASB system, for the treatment of concentrated organic wastes. Treatment of certain of these wastes by the UASB process has stimulated "pelletisation" of the sludge which permits much higher volumetric loading rates than conventional completely mixed digesters, in the order of 5 to 7 times higher.

The principle objectives of this project will be:

- ☐ To check on the validity of the hypothesis on pellitisation by experimentally operating UASB systems with different wastes.
- ☐ To formulate models for pH control and calcium carbonate, metal sulphides and struvite precipitation in both completely mixed and UASB systems.
- ☐ To set up kinetic models for the process.
- ☐ To optimise the UASB system and develop operational and control strategies.

NAVORSING OOR DIE UITWERKING VAN BIOKORROSIE IN WATERSTELSELS – WNNR

Verliese as gevolg van biokorrosie kos die Suid-Afrikaanse nywerheid jaarliks groot bedrae geld. Dit gaan hier nie net om materiaal wat van tyd tot tyd vervang moet word nie, maar om die groot hoeveelheid chemiese middels (biosiedes) wat vir die beheer van die biologiese werking gebruik word.

Die doel van die projek is om die voorkoms en aard van die mikro-organismes en veral die sulfaat reduserende bakterieë in sekere stelsels (soos koeltorings) te bepaal.

Dit is bekend dat bakterieë hulle by die omgewing kan aanpas en daarom is 'n verdere belangrike doelstelling om die langtermyneffek van biosiedes op die bakterieë te ondersoek. Aangesien watergehalte ook 'n belangrike rol in biokorrosie speel, sal sekere aspekte in dié verband ook ondersoek word.

RESEARCH ON THE CHEMICAL AUGMENTATION OF BIOLOGICAL PHOSPHATE REMOVAL – THE CITY COUNCIL OF JOHANNESBURG

The first objective of this research project is to investigate and optimise phosphate precipitation from supernatant liquor from anaerobic digesters at various Johannesburg nutrient removal plants. Coupled with this is an investigation into the phenomenon of the apparent immobility of tightly bound intracellular phosphate, which, due to its bound nature, could lessen phosphate release during anaerobic digestion.

The second objective of the project is to investigate combined chemical/biological phosphate removal to address the problem of achieving consistent biological phosphate removal to within the 1 mg/l level required.

RESEARCH OF PHOSPHATE FIXATION IN WASTE WATERS BY MEANS OF CONTROLLED STRUVITE FORMATION – CSIR

Researchers are to investigate the feasibility of immobilising dissolved ortho-phosphate in the phosphate-rich mixed liquor within a biological nutrient removing activated sludge plant and also in the supernatant liquor arising during anaerobic digestion of phosphate-rich sludge produced in biological nutrient removal plants.

PREPARATION OF GUIDELINES ON COST-EFFECTIVENESS OF RURAL WATER SUPPLY AND SANITATION PROJECTS – CSIR

The objectives of this project are to develop guidelines on how to maximize the cost-effectiveness of rural water supply schemes; to develop procedures for quantitatively determining the objectives of rural development projects; to develop procedures and norms for evaluating achievements and providing guidelines for future projects which will avoid past mistakes and increase the probability of success of future projects.

The guidelines that will be the end product of these investigations are not intended to prescribe to the organisations involved with rural development or to reduce their autonomy, but to provide a basis for objective self evaluation and improvement and by so doing to contribute to the overall development of rural areas in Southern Africa.

PREPARATION OF ENGINEERING DESIGN GUIDELINES FOR ARTIFICIAL WETLANDS FOR WASTEWATER TREATMENT – CSIR AND SVIRIDOV, DE WAAL AND ASSOCIATES

Research work will be direc towards the following:

- ☐ To evaluate the use of artificial wetlands as an alternative waste water treatment technology under South African conditions.
- ☐ To conduct comparative economic appraisals to assess the reliability of artificial wetlands for various applications, and
- ☐ to prepare engineering design guidelines for the construction and use of wetland systems in South Africa.

NAVORSING OOR DIE VERWYDERING VAN KOLLOÏDE DEUR KOAGULASIE EN FLOKKULASIE UIT OLIESINTESE-AFVAL-WATER – UNIVERSITEIT VAN PRETORIA

Die sintese van olie en brandstof uit steenkool is essensieel om in Suid-Afrika se energiebehoeftes te voorsien, maar gaan ook gepaard met die gebruik van enorme hoeveelhede water wat, as gevolg van die sintese, organiese s as anorganiese afvalprodukte in die prosesafvalwater vrystel.

Ondersoek sal ingestel word na die gebruik van koagulante waarvan die vlokke wat vorm, kan dien as 'n adsorbent vir die verwydering van organiese materiaal. Daar

sal ook ondersoek ingestel word na die presiese aard van besoedelingstowwe sodat die beste proseskonfigurasie voorgestel kan word vir die verbeterde suiwering van afvalwater en hergebruiktoepassingsmoontlikhede waardeur watergebruiksbesparings teweeg gebring kan word.

ONTWERPKRITERIA VIR KRUISVLOEI-MIKROFILTRASIE (KMF) – UNIVERSITEIT VAN NATAL

Om die toepasbaarheid van KMF vir die behandeling van 'n spesifieke uitvloeisel vas te stel is uitgebreide proefskaaleksperimente nodig. Van drie tot ses maande loodsskaalstudies is nodig om ontwerpkriteria vir volskaalse toepassing te ontwikkel. Om hierdie lang looptyd te verminder en om 'n beter begrip van die proses te verkry, is 'n begin gemaak met die ontwikkeling van wiskundige modelle. Die voordeel van hierdie benadering is dat dit sal lei tot verbeterde ontwerp van kruisvloeimikrofiltrasiesisteme, groter vertroue in die proses tot gevolg sal hê en die beheer van multistadium aanlegte aansienlik sal vergemaklik.

Samehangend met die ontwikkeling van wiskundige modelle is daar sekere ontwikkelingsaspekte wat ook aandag sal kry soos

- die ontwikkeling van semipermanente membrane
- optimale voorafbedekkingsmetodes
- die ontwikkeling van materiaalondersteuningsisteme en die behandeling van olierige uitvloeisels
- hidrouliese vloeitoestande vir die skoonmaak van buise
- spuitstukontwerp om buisverstoppings te voorkom.

Bogenoemde aspekte sal ondersoek en toegepas word op papierfabrieke se masjien "swart"-water, anaerobies-werkende rioolslyk en leerlooieryuitvloeisels.

OORDRAG VAN AFVALWATERBESTUUR-TEGNOLOGIE AAN DIE VLEISPROSES-SERINGSNYWERHEID – BINNIE & VENNOTE

Die Waternavorsingskommissie het gedurende die afgelope drie jaar 'n projek ondersteun wat daarop gemik was om indringend ondersoek in te stel na die afvalwaterbestuur in die vleisprosesseringsnywerheid.

Langtermyn loodsskaalondersoeke het bevestig dat tru-osmose suksesvol aangewend kan word om abattoir-uitvloeisels sodanig te suiwer dat dit in sekere dele van die abattoir hergebruik kan word. Die proses toon ook potensiaal vir die produksie van 'n proteienryke neweproduk wat in die vervaardiging van dierevoedsel gebruik kan word.

Met dié projek sal gepoog word om die gaping tussen die loodsskaalstudies en die kommersiële toepassing van die proses te oorbrug.

RESEARCH ON SOLIDS-LIQUID SEPARATION IN BIOLOGICAL SYSTEMS – UNIVERSITY OF CAPE TOWN

An experimental programme will be conducted to study solids/liquid separation in both aerobic and anaerobic systems.

DIE ONTWATERING VAN SAAMPERSBARE FILTERKOEKE – UNIVERSITEIT VAN NATAL

Filterperse word algemeen gebruik vir die ontwatering van riool-, waterwerke- en nywerheidslyke. Ten einde die filtreerbaarheid van die slyke te verbeter, word polielektroliete of ander hulpmiddels bygevoeg wat sommige slyke saampersbaar maak. Die spesifieke weerstand van die filterkoeke en voginhoud is 'n funksie van druk. Die gebrek aan geskikte metodes om spesifieke filterkoekweerstand as 'n funksie van druk te bepaal noodsaak dat tydrowende eksperimente op 'n werkende aanleg gedoen moet word.

Met dié navorsing sal probeer word om metodes te ontwikkel vir die bepaling van spesifieke filterkoekweerstand sodat die gedrag van 'n filter voorspel kan word, die effek en dosis van poliëlektroliet of ander hulpmiddels akkuraat bepaal kan word en die vereiste filteroppervlak betroubaar bereken kan word.

DIE ONTWIKKELING VAN 'N GOEDKOOP ULTRAFILTRASIE-MODULE – BINTECH

Ultrafiltrasie is een van die groep drukaangedrewe membraanprosesse waaronder tru-osmose en mikrofiltrasie ook val. Tru-osmose maak gebruik van baie digte membrane wat in staat is om opgeloste soute onder hoë druk uit water te "filtreer". Ultrafiltrasiemembrane is minder dig en kan dus nie soute verwyder nie, maar wel opgeloste en kolloïdale organiese verbindings, insluitend bakterieë en virusse. Dit is dus 'n uiters geskikte proses vir die suiwering van uitvloeisels wat baie organiese materiaal bevat soos uitvloeisels van die voedselbedryf.

Die tegnologie vir die vervaardiging van ultrafiltrasiemembrane van poli-etersulfoon is reeds deur die Universiteit van Stellenbosch onder 'n Kommissiekontrak ontwikkel. (Die tipe membraan vorm die ondersteuningsmembraan vir saamgestelde tru-osmosemembrane). Die ultrafiltrasiemembrane kan in dieselfde module as truosmosemembrane gebruik word. Die modules is egter ontwerp om die hoë druk van tru-osmose te weerstaan en is derhalwe relatief duur. Ultrafiltrasie werk onder heelwat laer drukke sodat die ondersteuningsmodule dus baie eenvoudiger en goedkoper kan wees. Die ontwikkeling van goedkoop modules sal die toepassingsmoontlikhede van die proses baie vergroot en dus lei tot suiwering van sekere uitvloeisels tot 'n hoër gehalte.

NAVORSING OOR 'N GEKOMBINEERDE FLOTTASIE-POEIER-KOOLSTOFPROSES VIR DRINKWATER-BEHANDELING – WNNR

Die voorkoms van oormatige algegroei in baie van ons oppervlakte waterbronne veroorsaak probleme tydens die behandeling van die water.

Opgeloste-lugflottasie is 'n effektiewe proses om hierdie alge te verwyder aangesien dit van die alge se natuurlike dryfeienskappe gebruik maak om effektiewe skeiding te verseker.

Flottasie het egter geen effek op die verwydering van verbindings wat reuke en smake veroorsaak nie en is net gedeeltelik suksesvol vir die verwydering van materiaal waaruit gechloreerde verbindings gevorm word. Hierdie verbindings word effektief deur aktiewekoolstof-filtrasie verwyder. Die proses is egter baie duur en dus word alternatiewe prosesse soos die gebruik van poeierkoolstof ondersoek.

DIE ONTWIKKELING VAN TEGNOLOGIE VIR TRU-OSMOSE MET KRISTAL-GROEIKERNE (TOK) – DIE KAMER VAN MYNWESE, YSKOR EN BINTECH

Sekere tipes waters is baie moeilik om met bestaande tegnieke te ontsout. Dit is veral water wat hoë konsentrasies skaalvormende soute soos kalsiumsulfaat bevat, wat probleme veroorsaak. Ondergrondse mynwater in sekere gebiede val in hierdie kategorie van "moeilike" water en die Kommissie en Kamer van Mynwese werk dan ook reeds oor die afgelope aantal jare saam om geskikte tegnologieë te ontwikkel vir ontsouting van mynwater.

Een van die prosesse wat baie belofte toon, is 'n spesiale truosmosestelsel waardeur kristalgroeikerne gesirkuleer word om sodoende skaalvorming op die membrane te voorkom.

NAVORSING OOR DIE KONSENTRASIE VAN UITVLOEISELS MET VERSEËLDE-SEL ELEKTRODIALISE – WNNR

Elektrodialise is 'n elektries-gedrewe membraanproses vir die ontsouting van water en uitvloeisels. Een variasie van die proses naamlik elektrodialise met omkeerbare polariteit word reeds op volskaal in Suid-Afrika toegepas vir die ontsouting van sekere tipes uitvloeisels. 'n Ander variasie van die proses kan gebruik word vir die sogenaamde elektro-osmotiese pomp van sure, basisse en soute. Op dié manier kan sekere tipes uitvloeisels tot baie hoë kon-

sentrasies gekonsentreer word wat dan herwinning van die sure, basisse of soute moontlik maak, of die finale wegdoening van so 'n konsentraat vergemaklik.

Die verseëlde-sel proses maak gebruik van 'n nuwe konsep naamlik 'n verseëlde-sel membraankonfigurasie wat die konsentrering van uitvloeisels tot hoë vlakke moontlik maak.

In hierdie projek sal die doeltreffendheid en die beperkings van die proses op 'n verskeidenheid uitvloeisels bepaal word.

'N VERGELYKENDE STUDIE VAN CHLOORDIOKSIED EN ANDER OKSIDANTE IN DRINKWATER-BEHANDELING – WNNR, DIE WES-TRANSVAALSE STREEKSWATER-MAATSKAPPY EN FLOCCOTAN

Die gebruik van chloor vir ontsmetting van water kan aanleiding gee tot die vorming van gechloreerde verbindings waarvan sommiges moontlik gesondheidseffekte kan hê. Dit is dus wenslik dat die vorming van hierdie verbindings so veel as moontlik beperk word, of dat die gevormde verbindings uit die water verwyder word. Die gebruik van chloordioksied as ontsmettingsmiddel in plaas van chloor kan die probleme tot 'n groot mate voorkom. Dit is dus wenslik dat die tegniese en kostedoeltreffendheid van chloordioksied as alternatiewe ontsmettingsmiddel ondersoek word.

RESEARCH ON MAXIMIZING IRRIGATION PROJECT EFFICIENCY IN DIFFERENT SOIL-CLIMATE-IRRIGATION SITUATIONS – UNIVERSITY OF THE ORANGE FREE STATE

The preliminary activities of this project will include the acquisition of crop, cultivar, irrigation system and soils data on selected irrigation projects or schemes. A wide range of appropriate, newly-developed methods will be used in a mathematical model to assess the suitability and efficiency of existing production systems from the point of view of effective water utilisation. The correction of serious deficiencies and various improvements to systems will be recommended. Optimal irrigation schedules at project and farm level will be determined within the constraints of available water supplies. To facilitate overall irrigation scheme management, irrigation scheduling models will be integrated with models for water supply and distribution. Although the basic models have already been developed, they will have to be adapted for different situations, and considerable on-farm calibration will be necessary to account for microclimate and soil variations.

NAVORSING OOR OPGARING EN BENUTTING VAN REËNWATER IN GROND VIR DIE STABILISERING VAN PLANTPRODUKSIE IN HALFDROË GEBIEDE – UNIVERSITEIT VAN DIE ORANJE-VRYSTAAT

Daar bestaan min gegewens oor die maksimale hoeveelhede van reënwater wat deur verskillende grondbewerkings- en benuttingspraktyke in die grond opgegaar en daarna verbruik kan word. Omdat hierdie gegewens ontbreek, is daar ook min kwantitatiewe inligting oor die potentsiële vermindering van afloop en van aanvulling van oppervlaktewaterbronne as gevolg van sodanige praktyke. Verder is dit nie bekend tot watter mate die stabilisering van plantproduksie in halfdroë gebiede, gekoppel aan die maksimale opgaring en benutting van reënwater in grond, die druk op die gebruik van oppervlaktewaterbronne vir voedsel- en veselproduksie kan help verlig nie. Laastens is dit nie duidelik watter wyses van grondbenutting en grondvogbestuur die hoogste doeltreffendheid van verbruik van opgegaarde reënwater in halfdroë gebiede sal verseker nie.

Derhalwe is dit belangrik dat navorsing onderneem word om die impak van verskillende grondbewerkings- en benuttingspraktyke op die grondwaterbalans in die wortelsone te bestudeer, en hieruit die praktyke wat die mees effektiewe opgaring van reënwater teweegbring, uit te ken.

NAVORSING OOR FAKTORE WAT DIE WATERVERBRUIKS-DOELTREFFENDHEID VAN BESPROEIINGS-GEWASSE BEÏNVLOED MET SPESIALE VERWYSING NA DIE FISIOLOGIESE REAKSIES VAN DIE GEWASSE – UNIVERSITEIT VAN DIE ORANJE-VRYSTAAT

Gewasopbrengs word grootliks bepaal deur die fisiologiese gedrag van die plant ten opsigte van water, voeding en omgewingstoestande by verskillende groeistadia, waarvan sommige meer gevoelig vir vogstremming is as ander. Beter begrip van fisiologiese reaksies bly dus nodig vir optimale toepassing van besproeiingkriteria.

Met dié projek sal navorsers uit die resultate van onlangse verwante navorsing, hipoteses formuleer wat plantfisiologies getoets, verfyn en verantwoord kan word.

RESEARCH ON EVALUATION OF MOISTURE STRESS IN CROPS BY MEANS OF REMOTE CONTROL AERIAL SURVEILLANCE – UNIVERSITY OF THE NORTH

Researchers at the University plan to develop the use of remote-controlled aircraft as an inexpensive remote sensing platform, thereby placing remote sensing at the disposal of a wide range of investigators, consultants and even farmers who might otherwise not be able to benefit from its use. The other main aim of the project is to develop the use of onboard instrumentation (infrared thermometer, colour and infrared video cameras) for quantifying spatial variation of crop water stress and other water-related crop variables of importance in irrigation agriculture.

RESEARCH ON THE QUANTIFICATION OF THE EFFECTS OF LAND USE AND RUNOFF QUALITY IN SELECTED CATCHMENTS IN NATAL – CSIR

The aims of this project are:

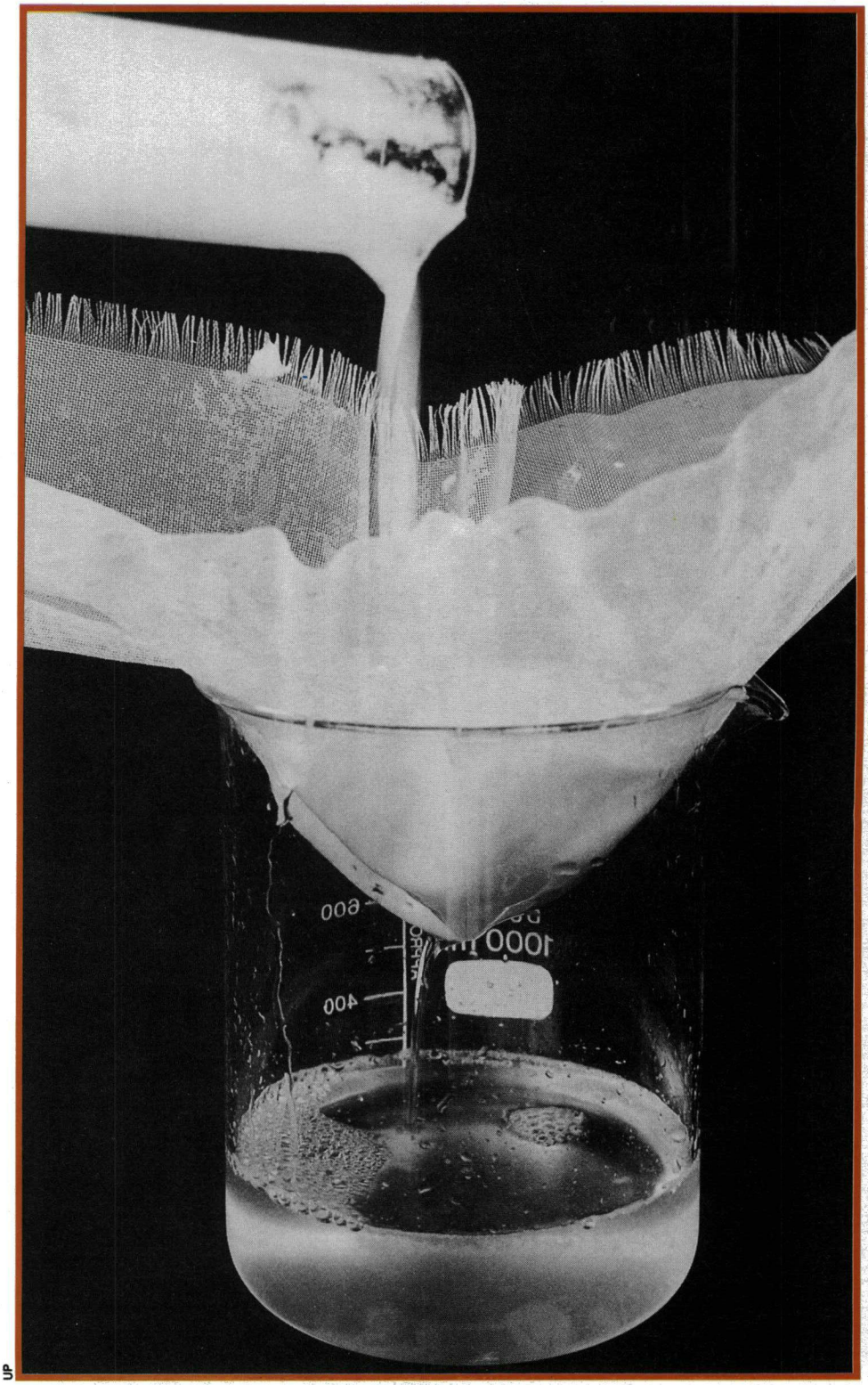
- ☐ To characterise and compare runoff water quality and annual loads from different types of land use, with particular reference to important land uses in the Mgeni catchment.
- ☐ To synthesize the data collected into a suitable form for inclusion into the proposed Mgeni catchment water quantity-quality model to be developed by the University of Natal.
- ☐ To investigate the need to set up a longer term monitoring programme on one or more selected catchments with specific land uses in order to assess spatical, temporal and development effects on water quality.

THE DEVELOPMENT AND TESTING OF DATALOGGING EQUIPMENT FOR THE MONITORING OF WATER CONSUMPTION PATTERNS – CSIR

This project will be aimed at the following:

- ☐ To develop in collaboration with local industry a lowcost eventdriven datalogger capable of recording the times at which events occur and the values of event parameters.
- ☐ To evaluate the performance of the datalogger as a suitable device for monitoring water consumption patterns and test the concepts on which the design of the datalogger is based.
- ☐ To develop applications where the datalogger may be usefully deployed to gain information on the performance and operation of water distribution systems.
- ☐ To investigate the local development of a suitable pressure sensor for measuring water pressure in pipes.

WATERSUIWERING –



Die gekonsentreerde biomassa word afgeskep en deur 'n sif gegiet.

UP ONTWIKKEL UNIEKE PROSES

Die Departement Chemiese Ingenieurswese aan die Universiteit van Pretoria het 'n unieke proses ontwikkel om water wat met organiese afvalmateriaal besoedel is, te suiwer. Terselfdertyd word 'n bruikbare proteïenproduk uit die afval geproduseer.

Prof W A Pretorius van die Departement Chemiese Ingenieurswese en hoof van die Afdeling Waterbenuttingsingenieurswese aan die Universiteit van Pretoria, sê die primêre doel van die eksperiment was om nywerheidsuitvloeisels wat so besoedel is dat dit nie na die riviere kan terugvloei nie en in verdampingspanne geberg moet word, te suiwer. Die proses, waarmee die water voldoende gesuiwer kan word vir hergebruik, berus op die metode van dinamiese seleksie. 'n Geskikte mikrobiese kultuur wat aan bepaalde vereistes voldoen word deur middel van 'n kruisvloeimikrosiftegniek geselekteer. Die organisme teer op die organiese afvalmateriaal en verwyder dit so uit die water. Daarna word die organismes as enkelselproteïen (ESP) geoes.

Volgens prof Pretorius sal die ESP wat in hierdie geval bestaan uit 'n fungus, moontlik as proteïentoevoeging in veevoere gebruik kan word. Die proteïen kan aan veevoermaatskappye verkoop word. In plaas daarvan dat 'n maatskappy dus geld moet spandeer om besoedelde water in verdampingspanne te berg, kan 'n goeie inkomste daaruit verkry word.

In dié eksperiment by UP is 'n monokultuur van Geotrichum candidum geselek- . Dié fungus, wat ook op sekere kase voorkom, het 'n gemiddelde ruproteïeninhoud van 50,2 persent en is reeds deur verskeie navorsers in die buiteland as 'n geskikte mikro-organisme vir die produksie van proteïen uit afvalwater voorgestel. 'n Navorser, Dabrowski, het in 1980 bevind dat Geotrichum candidum 50 persent van die vismeel in reënboogforelle se dieet kan vervang.

Twee belangrike faktore wat tot die produksiekoste van enkelselproteïen bydra is aseptiese bedryfstoestande en herwinning van die biomassa uit die gesuiwerde uitvloeisel. Daar is by die Universiteit van Pretoria in die ontwikkeling van die proses gepoog om bogenoemde probleme te oorkom deur die seleksie van 'n maklik oesbare organisme onder nie-aseptiese bedryfstoestande.

UP

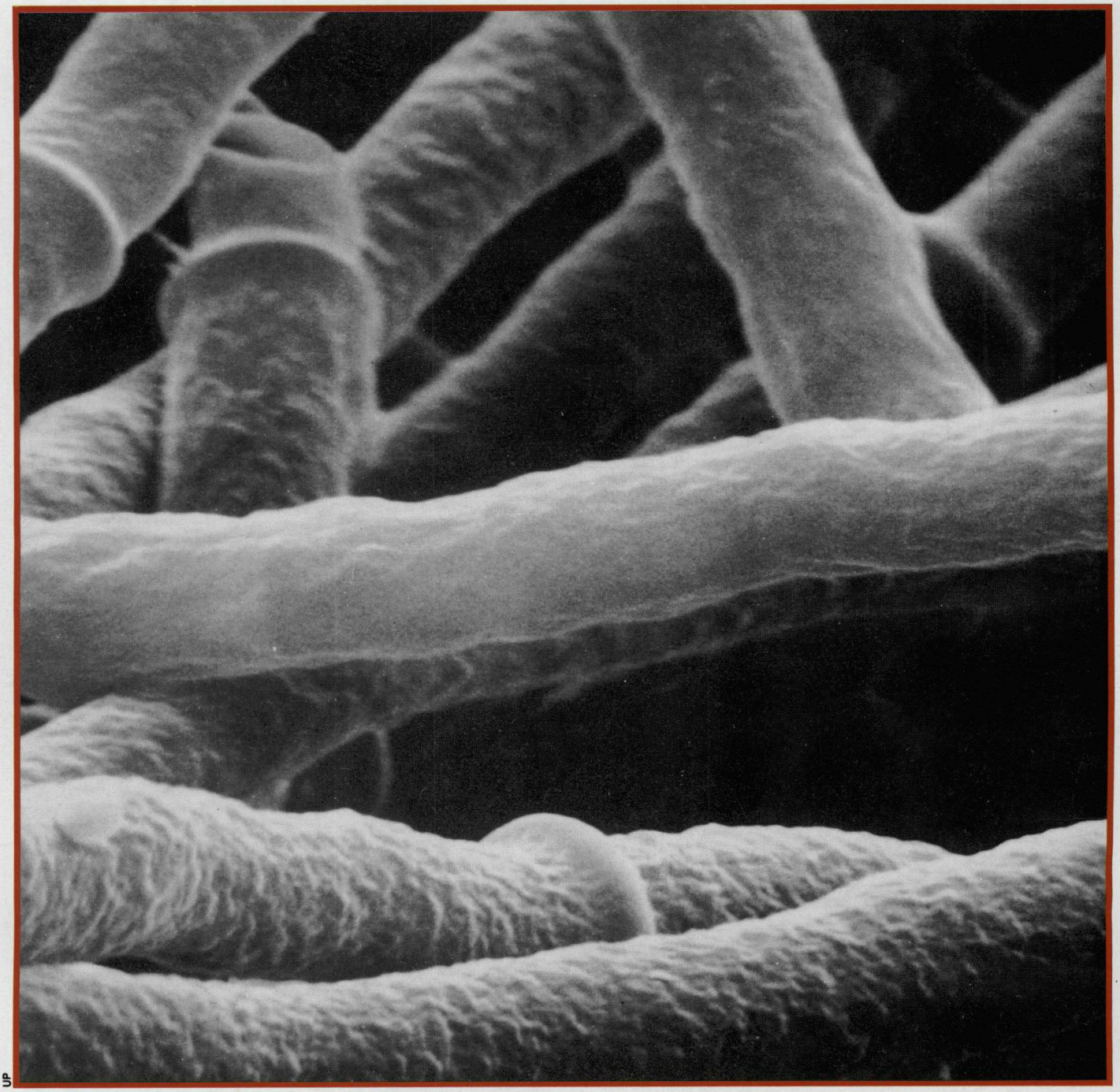
'n Digte fungus mat vorm op die sif en dit kan maklik van die sif gelig en in 'n koek gevorm word.

SELEKSIE

Omdat daar in die natuur 'n dinamiese ekologiese ewewig heers, kan sekere lede bo ander bevoordeel word deur seleksiedruk op 'n gegewe gemengde populasie uit te oefen. Die nywerheidsuitvloeisel is ingeënt met 'n mengselkultuur wat uit rioolwater verkry is. Deur gebruik te maak van die grootte van die mikro-organismes is 'n mikrosif as selekteerder benut. Die minimum hidrouliese retensietyd van die stelsel is so gekies dat die groeivermoë van die mikro-organismes kleiner as die maasopeninge van die sif, oorskry is, en hulle dus uit die stelsel gewas het. Slegs die mikro-organismes groter as die maasopeninge van die sif, kan hulle in die stelsel handhaaf. By 'n neutrale pH en 'n hidrouliese retensietyd van een uur bestaan die geselekteerde populasie uit twee lede naamlik 'n fungus Geotrichum candidum, en 'n bakterie Acinetobacter calcoaceticus wat daarop vassit. As die pH verlaag word groei slegs die fungus. Onder hierdie omstandighede is dit dus nie nodig om duur aseptiese groeitoestande deur middel van sterilisasie te skep ten einde 'n monokultuur te handhaaf nie.

OESMETODE

Primêre skeiding word deur natuurlike flotasie verkry. Die gekonsentreerde biomassa word afgeskep en deur 'n sif gegiet. 'n Digte fungus mat vorm op die sif en dit kan maklik van die sif gelig en in 'n koek gevorm word. Tot 96 persent van die



UP

'n Elektronmikroskoopfoto van 'n monokultuur van Geotrichum candidum.

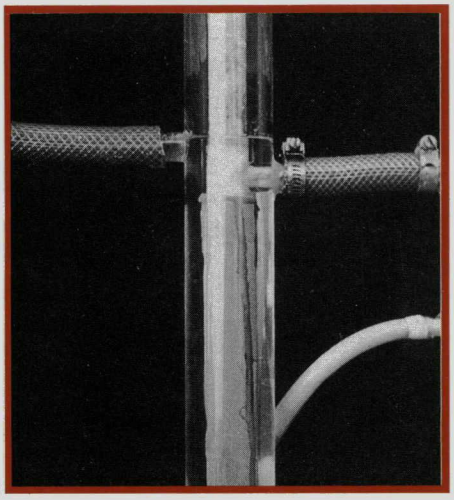
intersellulêre water kan op hierdie wyse verwyder word. Die enkelselproteïen word by 60 °C gedroog en het dan 'n aantreklike voorkoms en 'n aangename geur. Die proteïen het 'n gebalanseerde aminosuursamestelling en vergelyk gunstig met ander tipes proteïen soos sojaboon- en vismeel.

Prof Pretorius sê dat die proses in die nabye toekoms deur nywerhede soos SASOL aangewend mag word maar dat daar beoog word om dit ook vir rioolsuiwering te gebruik.

SASOL

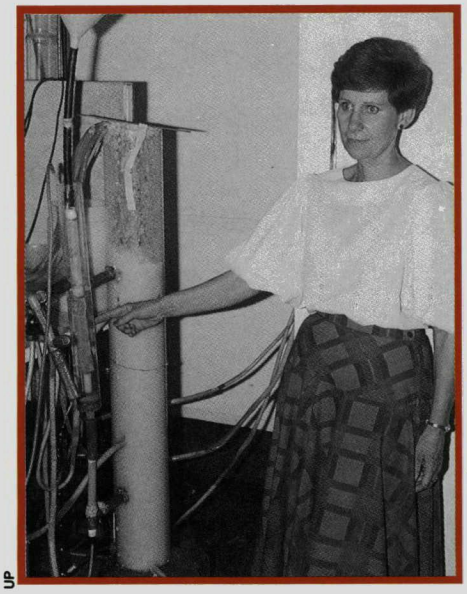
By SASOL word oerkoolstof onder andere gebruik om brandstof te vervaardig. Een van die neweprodukte van die proses is wateroplosbare vetsure. Hierdie stroom word tans saam met ander afvalstrome aan biologiese reiniging onderwerp. Twintig miljoen liters water word daagliks hiervoor gebruik en is dan so besoedel dat dit in panne gelaat word om te verdamp.

Dié uitvloeisel by SASOL is uit 'n watersuiweringsoogpunt baie geskik vir hierdie spesifieke metode:



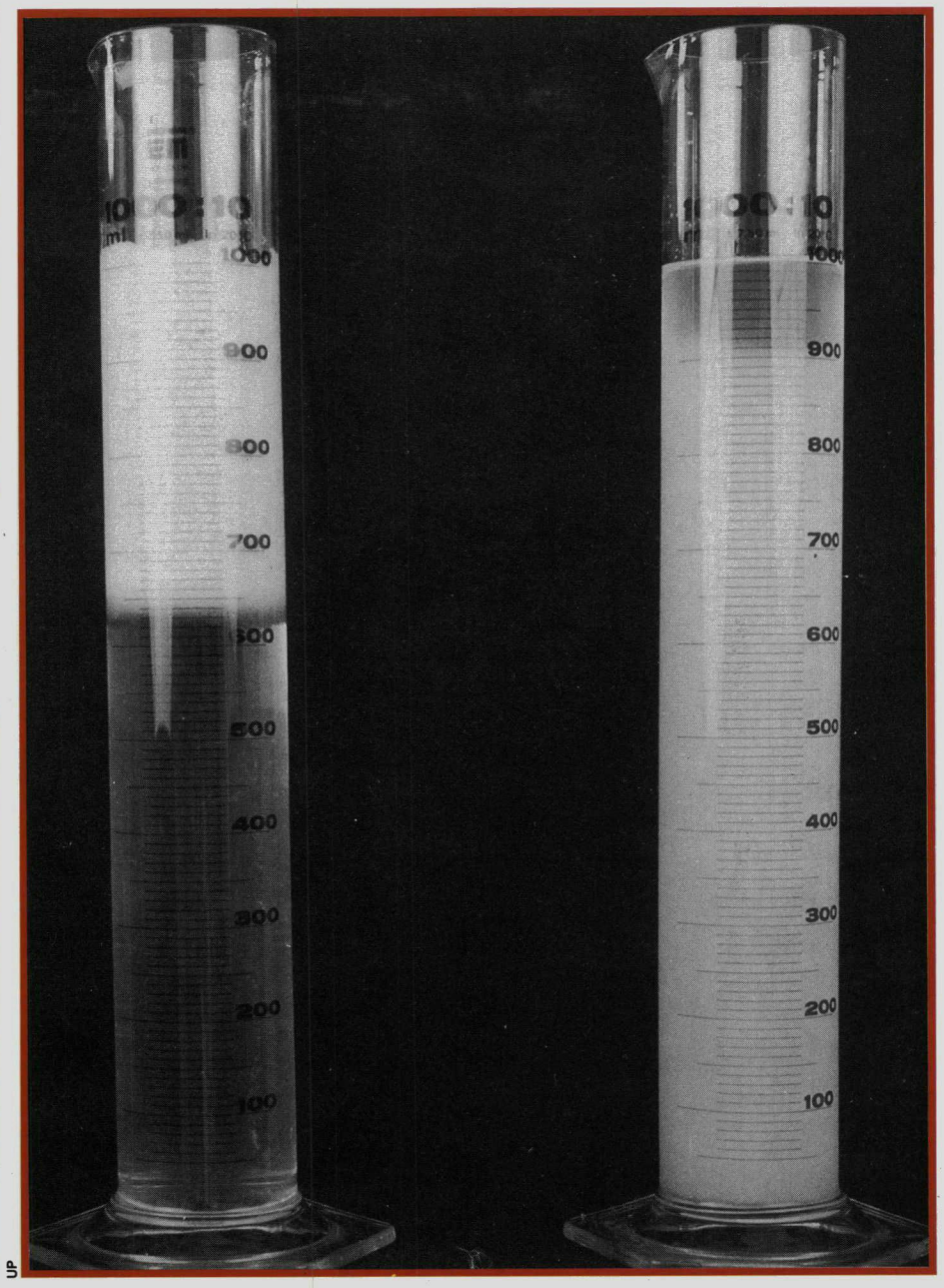
UP

Suiwering van die nywerheidsuitvloeisel deur 'n digte kultuur van Geotrichum candidum. Die sif dien as skeidingsorganisme tussen die kultuur en die uitvloeisel en 'n helder uitvloeisel word verkry.



UP

Mev A Kühn, lektrise by die Afdeling Waterbenuttingsingenieurswese aan UP, by die reaktor waarin die nywerheidsuitvloeisel gesuiwer word.



UP

Primêre skeiding word deur natuurlike flottasie verkry.

- ☐ Die water is steriel omdat dié prosesse teen 'n baie hoë temperatuur plaasvind. Daar is dus by die aanvang van die watersuiweringsproses geen mikro-organismes in die water teenwoordig nie.
- ☐ Die water se pH vlak is redelik laag wat ook voorkom dat mikro-organismes van buite in die water sal kan oorleef.
- ☐ Die afvalwater het 'n konstante samestelling omdat dit van 'n sintetiese proses afkomstig is.
- ☐ SASOL se fabrieke is van die grootstes in die land en produseer ongeveer 75 000 ton afvalwater per jaar. Hieruit kan nagenoeg 30 000 ton biomassa geproduseer word wat beteken dat 15 000 ton proteïene per jaar uit dié proses verkry kan word. Die inkomste uit hierdie bron kan beteken dat wat eers 'n uitgawe van miljoene rande beloop het, nou 'n goeie inkomste vir SASOL en ander nywerhede wat hierdie watersuiweringsproses gebruik, kan meebring.

'n Loodsaanleg is tans in die beplanningsfase en indien suksesvol, kan dit moontlik lei tot die oprigting van 'n grootskaalse aanleg. Nadat die water op dié manier gesuiwer is, kan dit geskik wees vir hergebruik of kan dit weer na die riviere terugvloei.

Prof Pretorius voorsien dat die dinamiese seleksiemetode vir 'n verskeidenheid probleemuitvloeisels 'n oplossing kan bied soos byvoorbeeld uitvloeisels by melkerye en suikernywerhede.

Clouds studied from Carolina

It has been obvious, since the beginning of the rain augmentation research at Nelspruit more than 5 years ago, that the present radar site at the Nelspruit airport is far from ideal. Because of the surrounding terrain, the lowest possible scan is tilted at 3 degrees to the horizon and even at this elevation, the beam is partially blocked by high terrain through more than 25 percent of its azimuth scan.

This means that at 60 km from the radar, the beam is slicing through space 4 km above sea level, a long way above the cloud bases from which the rain is falling.

It was clear that the radar should be relocated. The next problem was choice of a new site. The ideal radar site would consist of a slight depression on an infinite flat plain, an ideal never achieved in nature. However, the closest approach to this ideal would obviously be found on the Highveld. A second important consideration was: If a successful rain augmentation technology was to be developed, where would it first be used? To seek the answer to this question, the Department of Water Affairs is being consulted. In the meantime all indications are that preparatory investigations and response to limited cloud seeding with dry ice should be carried out over the Highveld regions to the west of Nelspruit, in the vicinity of the headwater catchments of the Vaal, Usutu and Komati Rivers. It is here that many of the interbasin water schemes are located.

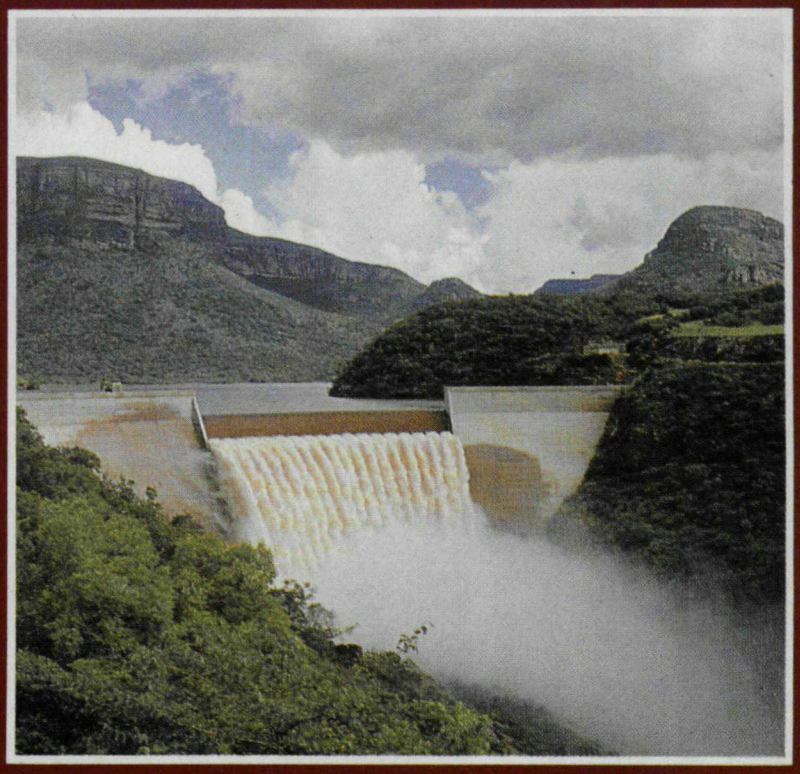
A search for a new radar site commenced from the town of Carolina, which is perched almost on top of the continental divide, which separates the South African rivers that drain into the Indian Ocean from those that flow into the Atlantic. Several sites were examined including an offer from SAPPI to locate the radar on one of their forestry properties. Eventually a site at the Carolina airport was chosen as the best compromise between an ideal site and the logistical problems of supplying power and communications.

The radar at the new site will be able to achieve a low level scan of 1 to 1,5 degrees. Radar crews will be flown from Nelspruit using the cloud base aircraft. This aircraft will then operate out of Carolina for the rest of the day. The Learjet will be launched and recovered from Nelspruit, since the runway at Carolina is too rough for the Learjet (a grass strip).

From Carolina, the radar will be able to look back at many of the clouds forming over the areas studied from Nelspruit as well as looking at the clouds forming over the Standerton-Bethal-Ermelo areas of the Highveld. The critical questions (from a rain augmentation point of view) concerning the similarities between the clouds over the new study region to those over the Lowveld should soon be answered!

– Graeme K Mather

Management of the WATER RESOURCES of the Republic of SOUTH AFRICA



Department of Water Affairs

1986

NEW BOOK SPELLS OUT SOUTH AFRICA'S FFICIAL WATER POLICY

The definitive publication for all water practitioners

An extensively illustrated, attractive 500 page colour publication entitled MANAGEMENT OF THE WATER RESOURCES OF THE REPUBLIC OF SOUTH AFRICA has recently been released by the Department of Water Affairs (DWA).

It contains a comprehensive statement on the water policy of the DWA and the reasoning behind it. The approach in this publication is in line with a world-wide trend over the past few decades to recognize the importance of effectively managing water resources.

South Africa is for the most part a semi-arid, water-deficient region of the world subject to variable rainfall, droughts, floods and high evaporation losses. Annual rainfall amounts to only 58 per cent of the world average, runoff is distributed unfavourably, the availability of underground water is limited and the quality of water sources is deteriorating.

In general the cost of providing water in most of South Africa is high compared with other countries. This is largely due to the greater storage capacity required on South African rivers to achieve equivalent yields. The cost will rise in the future owing to the greater distances that water will have to be transported to areas of increasing demand. The available water has to be shared to the best joint advantage between several countries, geographic regions and user groups, thereby requiring effective use of water at all times rather than indiscriminate and possibly wasteful use. Accordingly, the publication spells out who the users are, what the known resources are, what the effect of each type of use is on the quantity and quality available, and how changing circumstances are likely to influence availability and costs in the future.

The aim of this document is therefore to alert and sensitize water managers, scientists and consumers to the opportuni- and limitations associated with water use in South Africa.

The publication outlines the influence of climatic and topographic conditions on water availability and the evolution of water use in South Africa. The publication also describes present and expected demand by the main classes of water users. It highlights the difficulties in predicting future local, regional and total water use owing to changing trends in population growth, urbanization, and standards of living, while also detailing principles of scarce resource allocation. It covers appropriate approaches to supplying the consumptive and non-consumptive demands of towns and industry, power generation, mining, irrigation, stock-watering, aquaculture, recreation, nature conservation, forestry and the environment, illustrating each with tables and graphs of estimated demand for each sector from 1980 to the year 2010.

In detailing the availability of water, it describes the sources, quantities and qualities of surface, underground and unconventional supplies on a local to international scale, and the difficulties in assessing them accurately. It covers joint use by the RSA and other countries and the effect of changing land use on water availability, providing estima of surface water supplies, ground-water, effluent re unconventional sources (such as desalination, rainfall stimulation and icebergs) and the possibility of importation. It also illustrates factors influencing water quality such as salinity and eutrophication and details measures to exercise control over the pollution and reuse of water.

Rapid urbanization and industrial development is currently taking place in areas where adequate supplies of water are in short supply. In describing development plans to reconcile demand and supply, the publication deals with major drainage basin development plans and individual means of supplying the major metropolitan-industrial areas and decentralisation and growth points.

In addition to providing tables of data of runoff and dams, the publication contains a summary of the essence of the major objectives, policies and views of the DWA.

The DWA's major goal is to ensure the ongoing, equitable provision of adequate quantities and qualities of water to all competing users at acceptable degrees of risk and cost under changing conditions. Although economic merit is the dominant criterion for developing water projects, the water management strategy recognizes that goals other than the production of goods and services are important and it strives to identify these goals and allocate an appropriate significance to each. The DWA is keenly aware that, as success or failure in its role affects the fortunes of the private sector and the quality of life of the nation, it is essential to promote a consultative partnership with all water users. This publication lays the foundation for this partnership.

It is obvious from the problems detailed in the publication that the co-ordinated energies of the best water experts in the country will be required to an increasing degree to find wise and enduring solutions to these persistent problems. This publication will provide an invaluable background to everyone with an interest in the achievement of the vital goal.

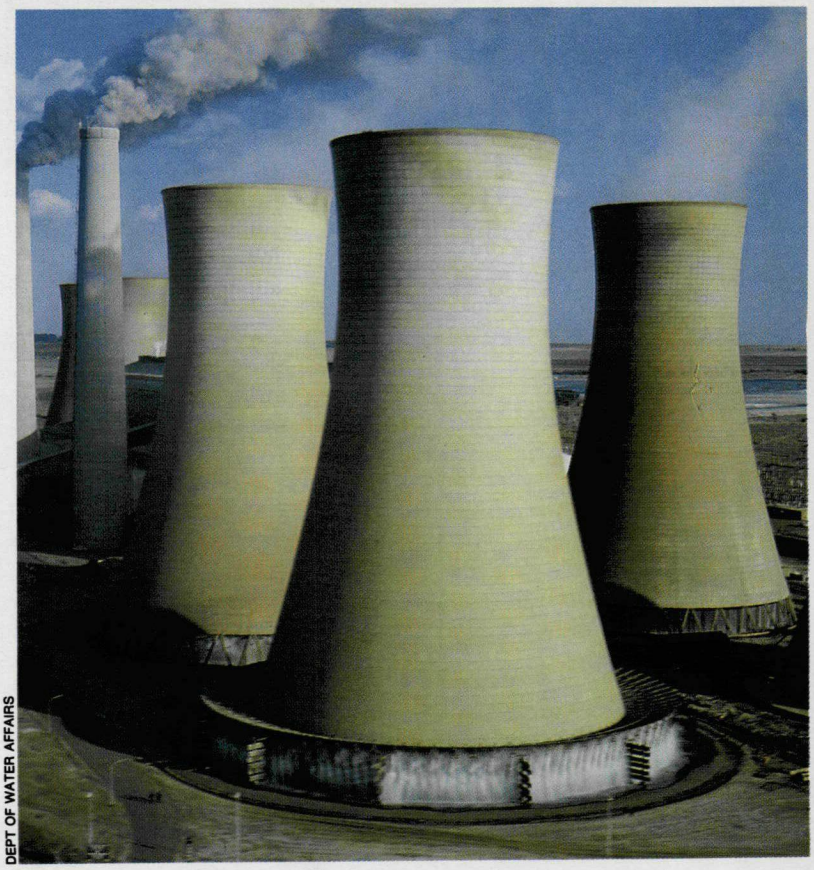
The DWA, in striving for excellence, is continuously reviewing its policies and practices to meet changing circumstances. This publication is intended to be a living document, with updates and new editions to be issued as and when appropriate.

From the report . . .

DEPT OF WATER AFFAIRS

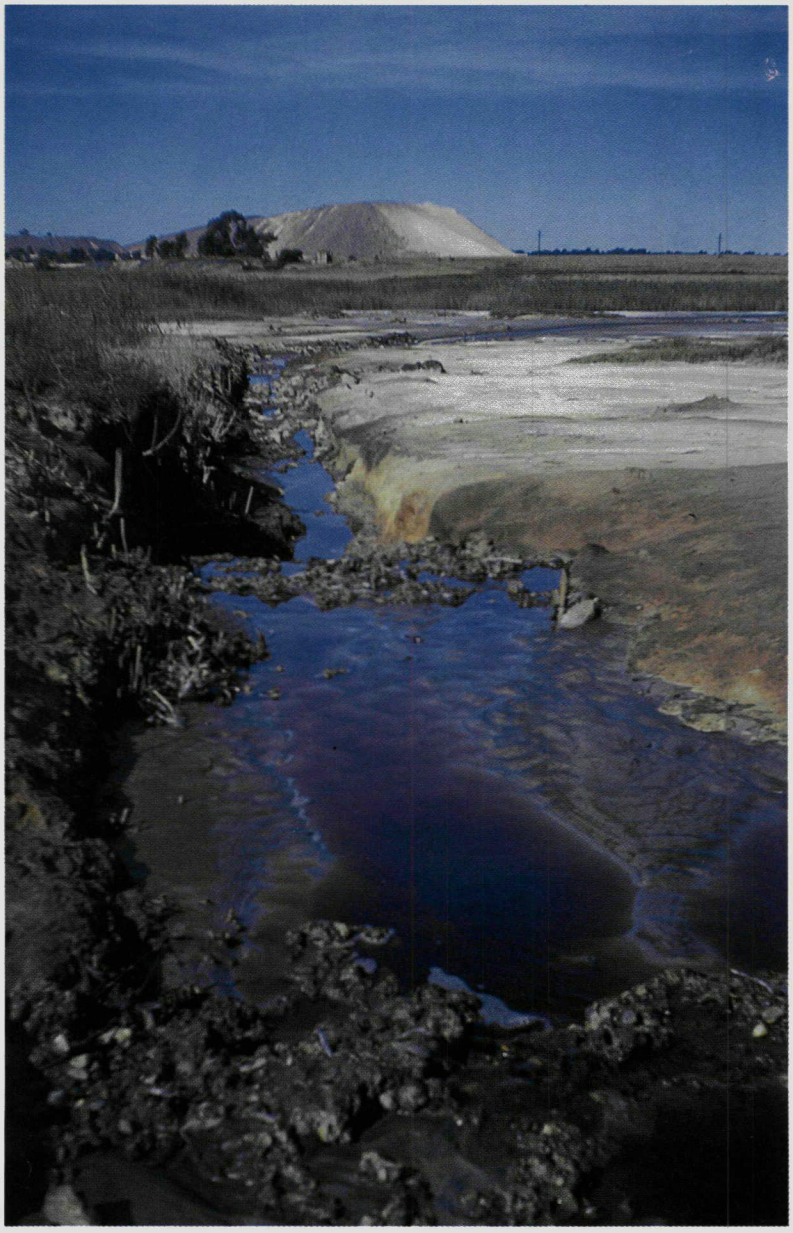
Groundwater: The ground-water resources of the country should be visualized as being contained in a multitude of mostly secondary aquifers or aquifer systems with limited quantities of extractable ground-water. By contrast, appreciable quantities of ground-water can be abstracted at high rates from boreholes judiciously sited on dolomite.

Cooling towers: To reduce the use of water for power generation, the Department of Water Affairs has requested Escom to consider using a dry-cooling process in future power-stations where this is economically feasible and where it can lead to a decrease in the consumptive use of water. Dry-cooling reduces the water use per unit generated to about 22 per cent of that of the latest wet-cooled power-stations.



DEPT OF WATER AFFAIRS

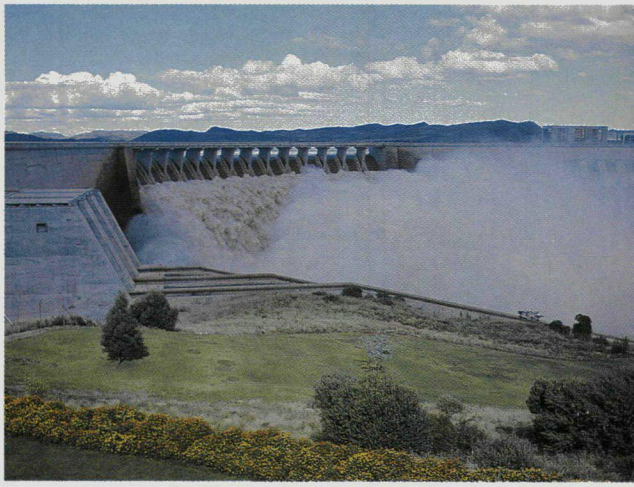
Copies of the first edition, in either English or Afrikaans, are obtainable from the Head, Liaison Services, Department of Water Affairs, Private Bag X313, Pretoria 0001. The cost is R50,00 per publication. (GST and postage included). Cheques or postal orders should be made payable to the Department of Water Affairs. To order, please complete the order card in this Bulletin.



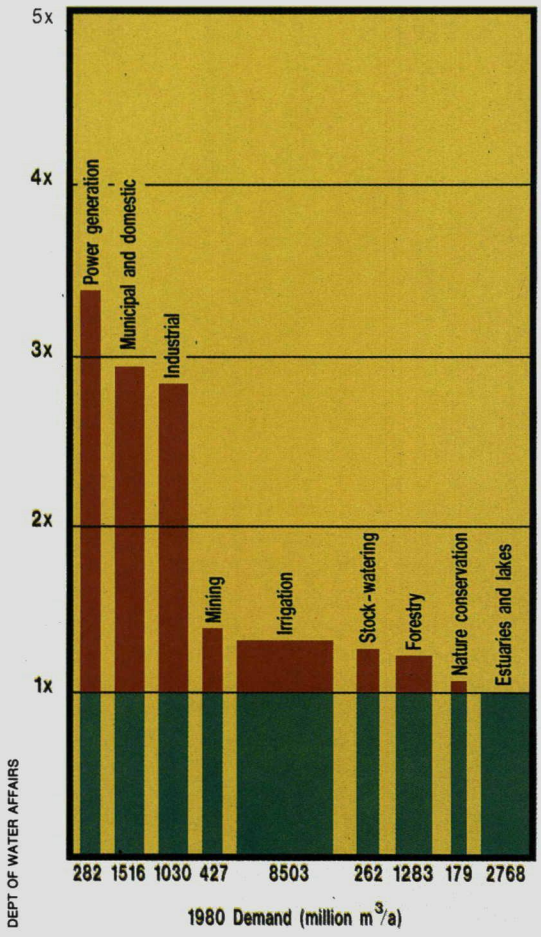
DEPT OF WATER AFFAIRS

Mine pollution: The quality of many water sources in the Republic of South Africa is declining. This is primarily as a result of salination and to a lesser extent because of eutrophication and pollution by trace metals and micro-pollutants.

In time, quality may become a more important factor than quantity as regards the availability of water in some areas, particularly in the interior.



HF Verwoerd Dam: The provision of larger storage capacities does not automatically provide a corresponding increase in the long-term assurance of supply.



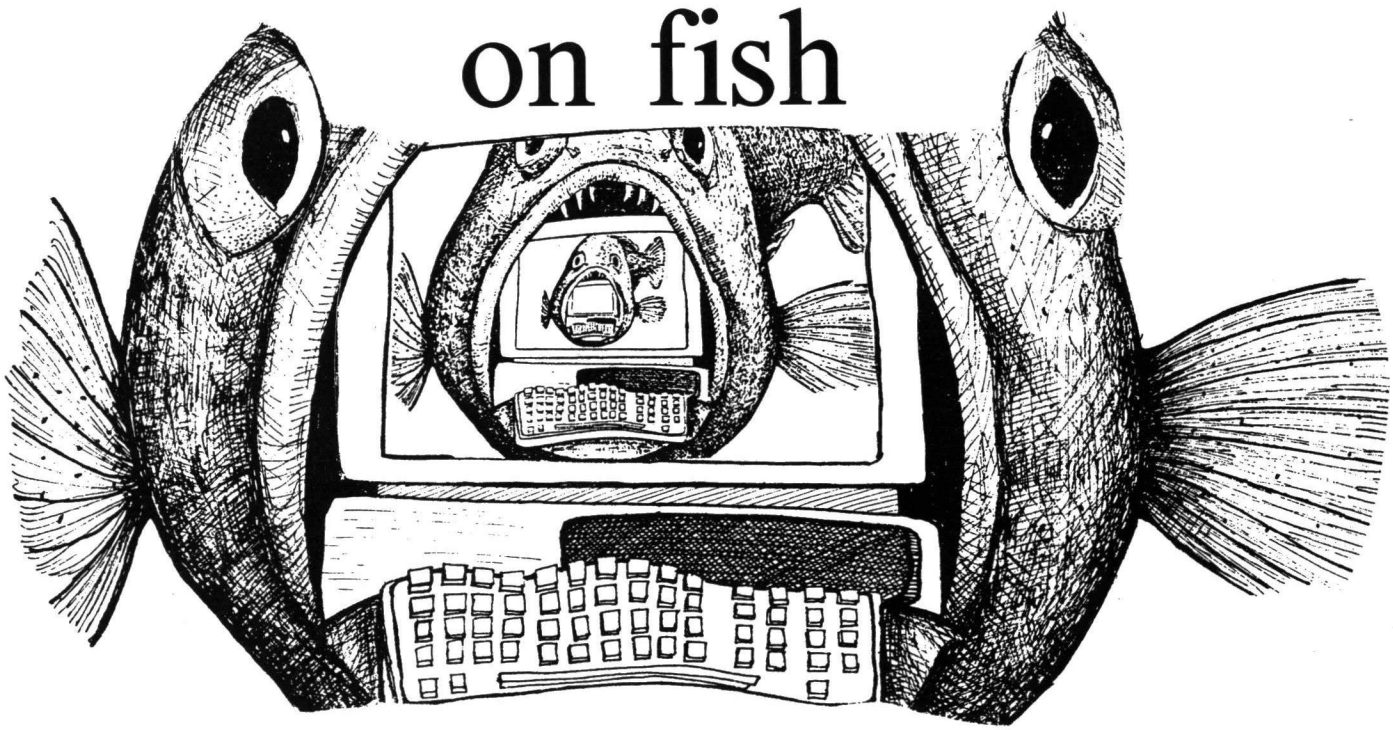
DEPT OF WATER AFFAIRS

Diagram: Expected growth in water demand from 1980 to the year 2010 per sector of use.

The aim of this publication is to alert and sensitize water managers, scientists and consumers to the opportunities and limitations associated with water use in South Africa.

F·I·S·H·L·I·T

Free facts on fish



A computerised bibliographical database named FISHLIT has been developed by the JLB Smith Institute for Ichthyology in Grahamstown in close corporation with the SA Water Information Centre (SAWIC) which has develped and is operating the well-known database WATERLIT. SAWIC is managed by the Centre for Information Services of the CSIR (formerly the National Institute for Informatics) on behalf of the Water Research Commission.

FISHLIT emanated from WATERLIT and has taken over and is expanding the "fish" function of WATERLIT. The JLB Smith Institute provides the specialist knowledge and data capture and the CSIR supplies the computer hardware, software and technical expertise. The South African Water Information Centre (SAWIC) now includes FISHLIT and disseminates information from FISHLIT as part of its WATERLIT service.

FISHLIT covers all aspects of the study of fish both marine and fresh water. It includes all branches of Ichthyology and Fisheries Science such as taxonomy, behaviour, biology, physiology, fish culture, fisheries management, aquarium fish and fish evaluation.

Every periodical, article, reprint, report or news article which enters the JLB Smith Institute's library, is scrutinised for relevance to FISHLIT. All relevant articles are selected for indexing.

When the indexing is done, the WATERLIT thesaurus is used to control keyword terms, which facilitates searching. About 15 keyword terms are allocated to each article and care is taken to include common name species, name and family as far as possible. Illustrations are also recorded in the keyword field, which is a feature unique to FISHLIT.

The database is growing by about 600 references per month and consists of about 5 000 references to date. FISHLIT is currently comprehensive from 1985.

References on specific topics can be retrieved

- ☐ by the use of retrospective searches which can be done at the JLB Smith Institute or by the South African Water Information Centre (SAWIC) as part of the WATERLIT service or
- ☐ by requesting a selective dissemination of information (SDI) profile from the SAWIC.

Since the referenced documents are all available in South Africa, they can be obtained either through the document delivery service of the CSIR or through interlibrary loan, if unavailable at one's own library.

For more information on FISHLIT please contact Mrs Margaret Crampton, JLB Smith Institute of Ichthyology, Private Bag 1015, Grahamstown, 6140 or phone her at (0461) 22-023 x 418. Information can also be obtained from the South African Water Information Centre, P O Box 395, Pretoria, or at telephone No (012) 841-3083.

Hyacinth study brings little hope for algae waters

The influence of water hyacinth (Eichhornia crassipes) on the water quality of South African lakes may be negligible according to a report released by the Water Research Commission.

The report entitled PRELIMINARY INVESTIGATION OF THE EFFECTS OF WATER HYACINTH ON ALGAL GROWTH AND WATER QUALITY is the result of a WRC sponsored study by the University of Natal's Department of Botany into the fact that low concentrations of algae and better water quality were associated with the occurrence of hyacinth in certain South African dams.

In the Vernon Hooper Dam near Durban, in the first six months following the introduction of hyacinth control a reduction in the cost of water treatment of 61 per cent was reported.

However, it was calculated that nutrient removal by a population of hyacinth of the size that occurred in the Vernon Hooper Dam (ca 20 ha) would not have been sufficient to account for the observed reduction in water treatment costs. Also, the area occupied by the hyacinth (10 to 20 per cent of the surface area at full supply level) was too small for shading and therefore to account for the reduction in water treatment costs. These observations led to the suggestion that the water hyacinth was producing a substance which inhibited algal growth (allelopathy). The WRC, therefore, in 1984 entered into an agreement with the University of Natal to investigate the effects of the water hyacinth on the algae.

The study could not confirm that the hyacinth produced an algal inhibitor in quantities significant enough to retard algal growth.

It is believed that the observations made were due to light inhibition since the hyacinth acted as a barrier to light penetration.

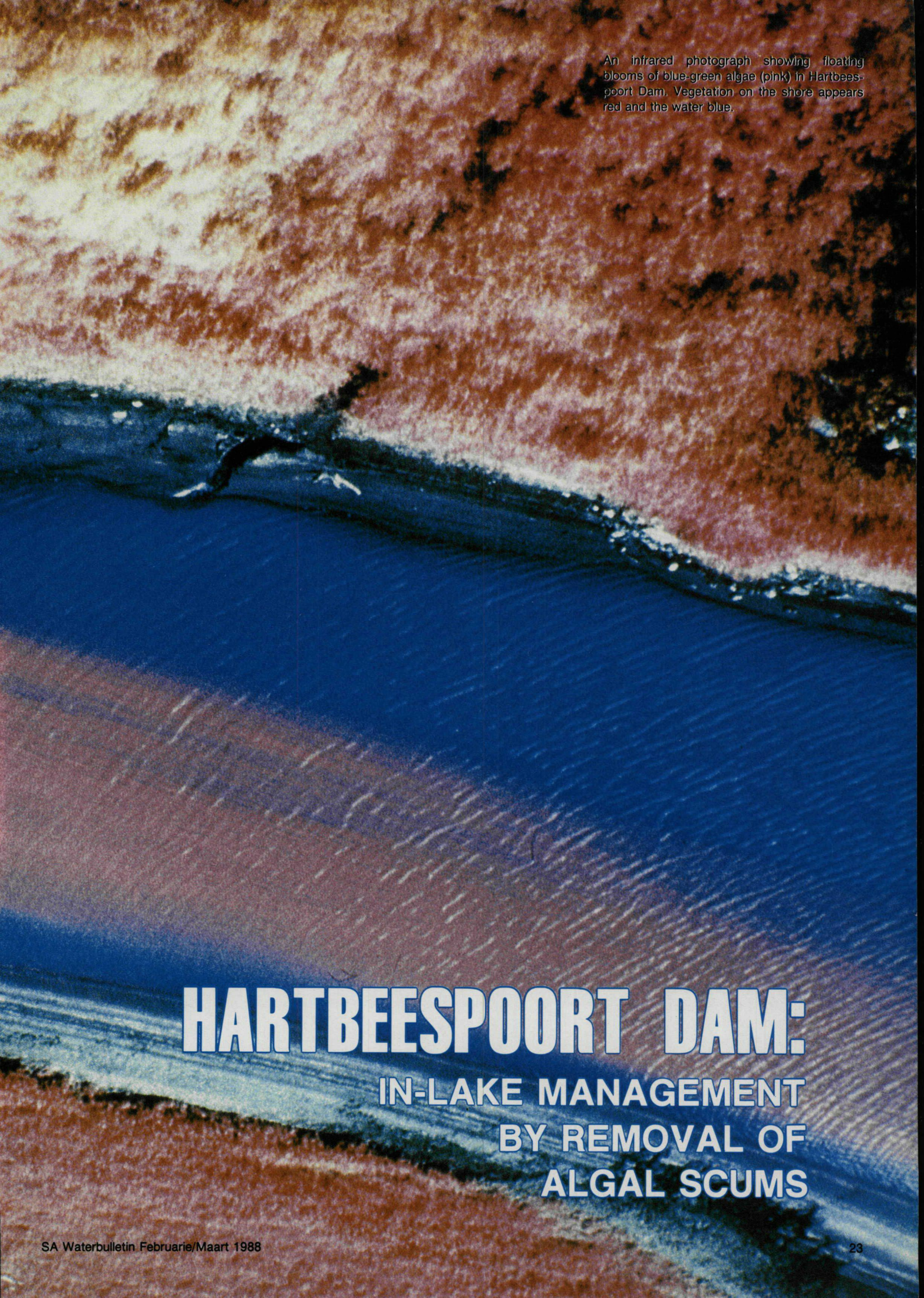
Water hyacinth tends to improve water quality primarily by removing nutrients, causing light limitation of algal production and increasing sedimentation rates. Use of complete hyacinth cover in lakes does not appear to be an economically viable option as it would prevent recreational use of the water body and the reduced rate of oxygen replacement would tend to reduce water quality and increase water treatment costs.

Water hyacinth could be most effectively used for nutrient removal and water quality improvement if grown on artificial ponds at point source nutrient inputs, provided diffuse source nutrient inputs to downstream waterbodies were small to point source inputs. However, further research into the potential of using hyacinth to improve water quality in South African lakes is required.

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

WRC

Photo: T. Zohary.



An infrared photograph showing floating blooms of blue-green algae (pink) in Hartbeespoort Dam. Vegetation on the shore appears red and the water blue.

HARTBEESPOORT DAM:

IN-LAKE MANAGEMENT BY REMOVAL OF ALGAL SCUMS

Tamar Zohary

National Institute for Water Research
CSIR, P O Box 395, Pretoria 0001

Huge algal scums, or hyperscums, composed of the blue-green alga *Microcystis aeruginosa* (95% of the biomass) form nearly every winter against the dam wall of Hartbeespoort Dam. Typically, these scums start to build up in April or May, when wind-speeds over the lake are declining (Fig. 1), increase in size and thickness throughout June, and eventually cover 1-2 hectares in July. By that time they may be up to one metre thick, contain 1-2 tonnes of chlorophyll (roughly equivalent to 100 - 200 tonnes of algal fresh weight), and up to 70% of the total algal biomass in the lake (Fig. 1). The hyperscums gradually break up in August, as a result of progressively increasing wind activity, and by the end of August or early September they are completely dispersed. These unsightly hyperscums release foul decomposition odours and become an accumulation site for floating objects, such as beer cans, bottles, logs, and other kinds of rubbish. Unless controlled, they persist for about three months and cause an outcry of public complaints.

Hyperscums are by far the worst symptom of the excessively enriched status of Hartbeespoort Dam. Smaller and more temporary surface scums, that may cover large proportions of the lake under calm conditions and accumulate at lee shores, also severely impair the recreational value of Hartbeespoort Dam.

What can be done to ameliorate these symptoms? Based on various model predictions it is now accepted that the legislation of a 1 mg l^{-1} phosphorus effluent standard will have a minor effect on chlorophyll concentrations and on the abundance of blue-green algae in this lake. At the same time, Hartbeespoort Dam remains a major water-supply source for the area to the north, and in-lake management strategies are desperately needed.

Based on a 5-year study of the population dynamics of the phytoplankton (algae) in Hartbeespoort Dam (Zohary, 1987), a strategy by which chlorophyll levels can be reduced and water quality improved for part of the year is proposed. The principle is to remove in May every year scums that accumulate at the dam wall (e.g. by releasing them downstream through the sluice gates at high water levels, or by pumping them downstream at low water levels).

TAMAR ZOHARY

Blue-green algae banking up against the dam wall of Hartbeespoort Dam forming a hyperscum. For scale the boat is 6 m in length.

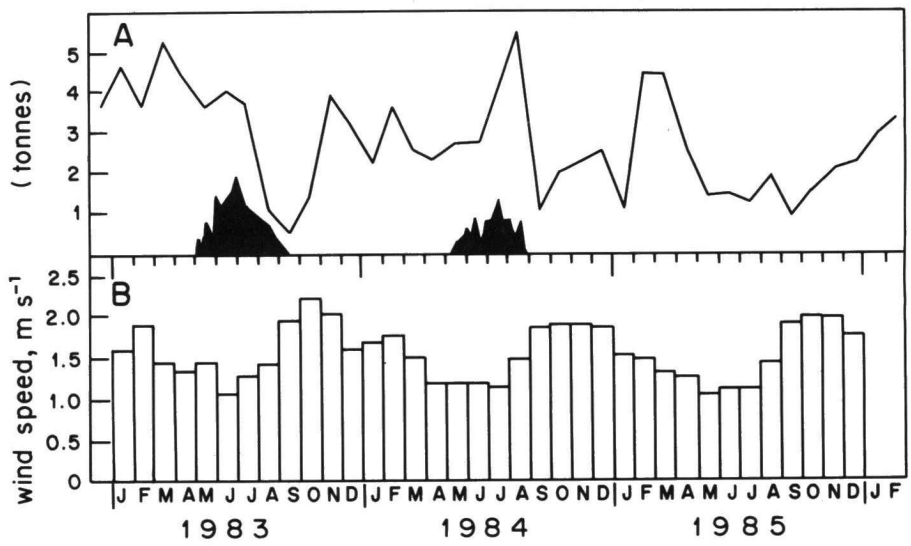


Figure 1

The likely outcome is relatively low chlorophyll levels and less hyperscum development for 5-6 months of the year. In order to explain why this would be the case it is necessary to understand the population dynamics and the buoyancy behaviour of *Microcystis* and how these relate to the prevailing wind regime in Hartbeespoort Dam.

MICROCYSTIS AERUGINOSA IN HARTBEESPOORT DAM

Microcystis aeruginosa is a blue-green alga with a buoyancy mechanism which causes it to float to the surface under calm

conditions. This buoyancy mechanism gives it an advantage over non-buoyancy species in hypertrophic Hartbeespoort Dam, where light availability, and not nutrients, is the major limiting resource. By floating to the surface, *Microcystis* has access to light and at the same time shades other species.

In Hartbeespoort Dam *Mycrocystis* is the dominant phytoplankton species up to ten months of the year, throughout summer, autumn and winter (Zohary, 1987). In winter, however, water temperature drops below 15 °C, a temperature below which growth rate of this alga is practically zero (Robarts and Zohary, 1987). Yet, in four out of five years of study in Hartbeespoort Dam, the mid-winter *Mycrocystis* population was nearly as large as the mid-summer population. The explanation is that populations that grow in summer maintain low loss rates (e.g. grazing, sedimentation, death, outflow) in autumn and winter and remain in the water column. However, these aging populations senesce with time and become over-buoyant (Reynolds and Walsby, 1975). This usually happens in April-May, at the time of the year when wind speeds are declining (Fig. 1). April and May are the months with the highest frequency of surface bloom formation. With mornings being typically calmer than the afternoons, the phenomenon is more pronounced in the mornings. Blooms that cover the entire Magalies arm of the lake in the early morning hours are slowly blown against the northern shores. They are then carried by surface currents that travel eastwards along the shore and into the dam wall gorge, along its western bank and towards the dam wall. The wall provides a wind shelter and the buoyant algae accumulate against it. With time hyperscums form.

PRACTICAL HINTS FOR REMOVING BLUE-GREEN ALGAL SCUMS

Removal of algal scums may prove extremely useful *if carried out at the right time of the year.* Between April and June scums naturally accumulate at the wall. At that time of the year water temperature is rapidly declining (from about 22 °C in early April to 13 °C in mid-June) and *Mycrocystis* growth rate is much retarded. Algae that are lost from the system through outflow in April, when water temperature is still above 20 °C, will rapidly be replaced through growth in the main basin. But in May and June water temperatures are low enough to ensure that removed algae will not be replaced by growth until late spring. Thus, by removing scums in May, the occurence of scums in the main basin will gradually decline and the formation of nuisance hyperscums at the wall will be prevented. In addition, chlorophyll concentrations will decline and will not reach pre-removal proportions until the next growth season, around November. In this way better water quality can be maintained for 5-6 months of the year.

In contrast, removing scums in summer is unlikely to have measurable effects on the chlorophyll levels in the lake. In summer algal growth-rate is limited by light availability and self-shading determines the maximum carrying capacity of Hartbeespoort Dam. Removing *Mycrocystis* from the system in summer will decrease the light limitation caused by self-shading and within days the population will reach its pre-removal size.

At the dam wall gorge winds usually blow towards the wall during the morning but they change direction and blow away from the wall and towards the main basin nearly every afternoon. As a result scums that were blown towards the wall in the morning are transported away from it in the afternoon. Therefore, if scums are removed by releasing water downstream, water should be released only during the mornings, when its algal content is likely to be highest.

The matter of how to remove the scums should be left to engineers. Obvious suggestions would be to flush the scums downstream by opening the sluice gates in years of high water levels, or to pump them downstream in years of low water levels. However, the consequences downstream of releasing scums in these manners were not considered here. Hyperscums are highly anaerobic and the oxygen demand resulting from their release may effect the riverine flora and fauna; Water purification works may not be capable of handling the high algal content in these waters; and drop-irrigation systems may be clogged. These and other likely consequences must be considered when a method for removing the scums is selected.

TAMAR ZOHARY

The consistency of the algae composing the hyerscum is that of thick porridge.

THE MAY 1987 EXPERIENCE

Following public complaints about the intolerable hyperscums at the dam wall, the Department of Water Affairs opened the sluice gates of Hartbeespoort Dam on 25 May 1987 for about two weeks. Within days the huge hyperscum and additional floating blue-green algal blooms were washed downstream. Surface chlorophyll concentration in the main basin dropped dramatically, from a peak of 6 500 $\mu g\ l^{-1}$ (!) measured on 14 April to below 10 $\mu g\ l^{-1}$ on 26 May. Following that, surface chlorophyll $\propto$ concentrations below 20 $\mu g\ l^{-1}$ were recorded on 8 out of 10 sampling days between 26 May and 29 September 1987 (higher values were 34 μl^{-1} on 7 July and 130 μl^{-1} on 4 August). The *Mycrocystis* population reached its typical pre-removal concentrations only in November 1987, when surface chlorophyll $\propto$ concentrations increased above 200 μl^{-1}. For comparison, in 1984 and 1986, when hyperscums that formed near the dam wall were not flushed, surface chlorophyll $\propto$ concentrations in the main basin throughout June, July, August and September were below 20 μl^{-1} on only 24% (n = 17) of the sampling days in 1984 and 10% (n = 10) in 1986.

These data cleary demonstrate that flushing hyperscums has a measurable as well as visible effect on the water quality of Hartbeespoort Dam in winter.

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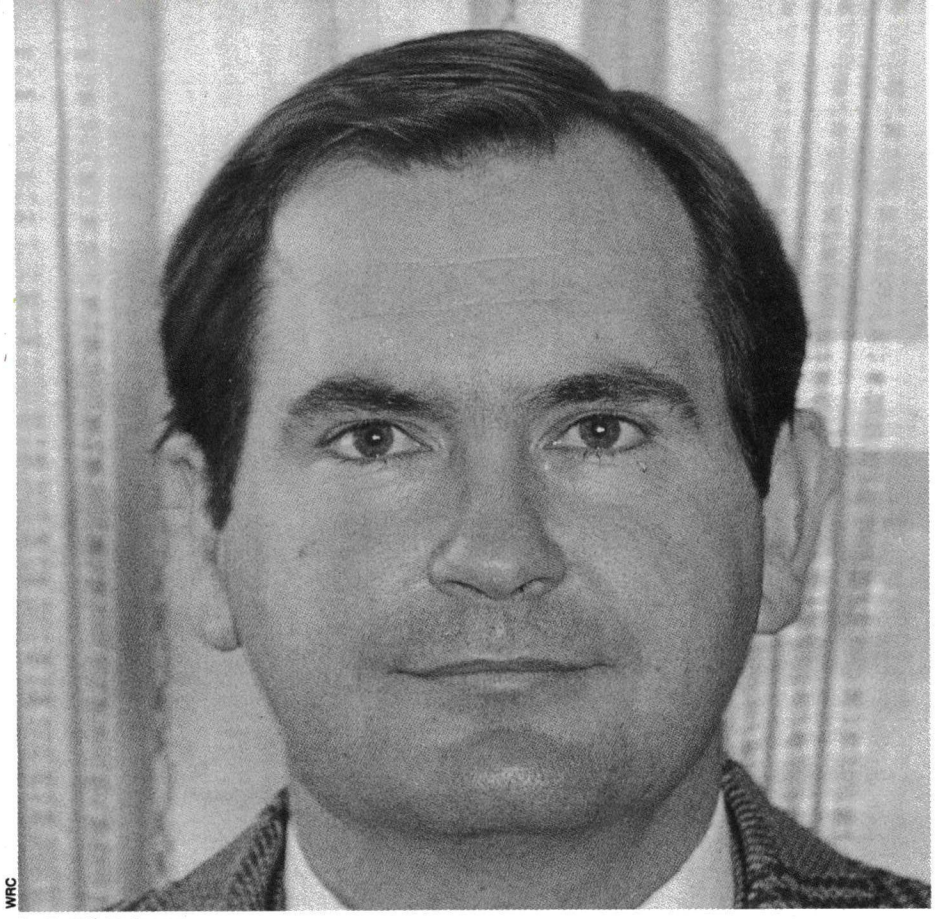


WRC

Dr P J T Roberts

ROBERTS RESIGNS

Dr P J T (Peter) Roberts, previously Senior Adviser to the Water Research Commission, has taken up the post of Director at the Institute for Commercial Forestry Research at the University of Natal, Pietermaritzburg.

Dr Roberts joined the WRC in January 1980 as assistant adviser and was mainly responsible for the co-ordination and promotion of water research in the fields of ground water, hydrology and meteorology. He was Managing Director of the Company for Research on Atmospheric Water Supply (CRAWS) and well-known in South Africa for his excellent work on weather modification and rain augmentation.

ALGAE USED FOR FUEL PRODUCTION

By 1989 an American experimental plant run by Microbial Products, Inc., Fairfield, California, at the city of Roswell's (New Mexico) test facility will be producing gasoline and diesel fuels from microalgal ponds. The project has received a $225 000 contract from the Solar Energy Research Institute (SERI), Golden, Colorado, and is co-funded by the New Mexico Research and Development Institute.

According to the American publication Salinity Update the facility will grow and produce microalgae with high oil content that can be converted to motor vehicle fuels. The microalgal ponds have the potential to produce 5-7 barrels of fuel per acre per week. The facility's location makes use of a unique existing desalination facility, ample saline ground water and a long growing season.

SERI notes that some of the microalgae can have up to 70 per cent of their body content as lipid oils which can be converted into gasoline and diesel.

For more information write to Patty J Gillespie, Salinity Update, Colorado River Water Quality Office, Bureau of Reclamation, D-1000, P O Box 25007, Denver, Co 80225.

NEW BIOASSAY MONITORS WATER QUALITY

A bioassay which will be used to monitor water quality and effluent toxicity is sensitive, fast and inexpensive, according to its developer, John M Harkin of the University of Wisconsin's Environmental Toxicology Centre. For the new assay, he uses bits of membrane from mitochondria (energy-producing organelles found in mammalian cells). While a commercial test has not yet been done, patents and an exclusive commercial license are in the works.

Subjecting the organelles to sonic waves prepares submitochondrial particles, which contain enzymes needed for the toxicity tests. Joseph Alper and B J Spalding write in Chemical Week (10/28) that the present EPA-approved toxicity test for water quality and pollution control uses minnows, costs more than $700 for each chemical, and requires up to four days. Toxicity tests using bacteria cost only $2 and take only five minutes, about the same as the mitochondrial assay, but have only a 29 per cent correlation with the minnow test, while the mitochondrial assay has an 82 per cent correlation. One of the new assays has detected as little as five parts per billion of pentachlorophenol.

INTERNATIONAL WATER REPORT 10487

FREE DRUG FOR RIVER BLINDNESS

A drug used successfully to treat onchocerciasis (river blindness) will be available without charge to countries that request it, through a distribution program organized by the drug's developer, Merck & Co., and the World Health Organization. Onchocerciasis is said to be the world's leading cause of blindness and afflicts about 18 million people in the Middle East, Central and South America and West and Central Africa.

Merck's unusual decision to donate the drug, Mectizan, was made partly because those needing it most are unable to buy it. In addition, it was developed from a veterinary drug named ivermectin and those sales have been growing at an annual rate of 15 per cent.

The two groups will form a committee to advise on distribution. Merck is said to be concerned that the lack of health care infrastructure in certain regions could lead to incorrect use of the drug, causing unnecessary side effects. As it is, side effects from Mectizan are found to be minor and only one or two tablets are needed in a year. Onchocerciasis is spread by bites of a black fly that breeds in fast-flowing rivers. The fly is the vector for a parasitic worm, which produces millions of larvae. The drug kills the larvae and prevents adult worms from reproducing.

INTERNATIONAL WATER REPORT 10487

Werksessie oor Waterbehandelingstegnologie

'n Een dag werksessie sal op 24 Mei 1988 te Pretoria gehou word om aspekte rakende waterbehandelingstegnologie te bespreek: nuwe ontwikkelings, navorsingsbevindings, probleemgebiede.

Die hoofdoelstellings van die sessie is inligtingsoordrag en die bepaling van navorsingsbehoeftes.

Almal met 'n direkte belang in waterbehandelingstegnologie is welkom om die sessie by te woon. Finale reëlings sal getref word afhangende van die reaksie en besonderhede sal mettertyd aan belangstellendes gestuur word. Die koste vir bywoning beloop R20, middagete ingesluit. Voltooi asseblief die vorm en stuur terug aan dr C F Schutte, Waternavorsingskommissie, Posbus 824, Pretoria 0001.

Ek stel belang om die werksessie oor waterbehandelingstegnologie by te woon.

NAAM: .....

ADRES: .....

.....

ORGANISASIE: .....

MY BESONDERE BELANGSTELLING IS: .....

.....

EK SAL MOONTLIK 'n KORT BYDRAE LEWER OOR: .....

.....

Workshop on Desalination and Membrane Processes

A workshop will be held from 24 to 26 August 1988 to discuss new developments, problem areas and operating experience.

The main objectives will be information transfer and the identification of research needs.

Separate sessions will be devoted to microfiltration, ultrafiltration, reverse osmosis, electrodialysis and brine disposal.

The workshop will be held at a conference venue in the Eastern Transvaal. Arrangements will be finalised depending on response. The cost will be between R50 and R70 per day per person, which includes accommodation and all meals.

Attendance will be limited by available accommodation.

Early reply is therefore recommended.

Please complete this form and refer it to Dr C F Schutte, Water Research Commission, P O Box 824, Pretoria 0001.

NAME: .....

ADDRESS: .....

.....

ORGANISATION: .....

I AM INTERESTED IN MAKING A CONTRIBUTION ON: .....

.....

THE TREATMENT OF INDUSTRIAL EFFLUENTS WITH HIGH SALINITY AND ORGANIC CONTENTS: PART 1 AND 2

Prepared for the Water Research Commission by the Pollution Research Group, Department of Chemical Engineering, University of Natal

The treatment of industrial effluents with high salinity and high organic content has been examined using a range of techniques such as hyperfiltration (reverse osmosis), ultrafiltration, electrodialysis, adsorption, oxidation by ozone and air and cross-flow microfiltration.

The project outline considered two main processing routes for the treatment of the effluents: Scheme A involved removal of organics using processes such as ultrafiltration, oxidation and adsorption followed by removal of inorganics. Scheme B involved separation of both inorganics and organics to provide reusable water and further treatment of the concentrate by separation for by-product recovery or further concentration for disposal.

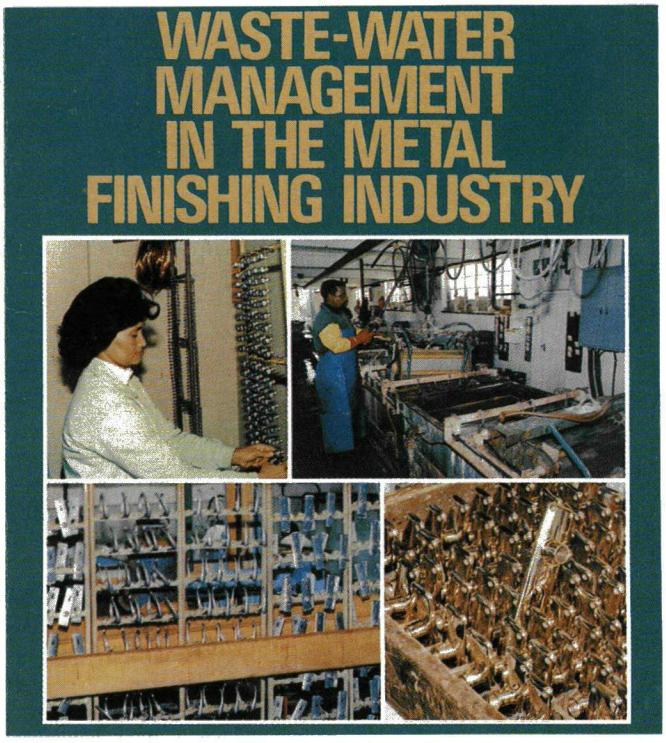
The effluents examined in this project were from:

- ☐ The pulp and paper industry, essentially from the various stages in the bleaching operations. (Specific studies were also conducted on a sulphite pulp mill spent liquor),
- ☐ The tanning industry, both wet-blue effluents and total tannery effluents,
- ☐ The manufacture of oxidation starch by a wet oxidation method in the maize wet-milling industry.

Part 1 of the report is supplemented by 11 papers emanating from the research and which is published as Part 2.

1987: Part 1 and Part 2
Price Free of charge
ISBN 0 908356 71 4
0 908356 72 2

Available on request from the Water Research Commission, P O Box 824, PRETORIA 0001. Telephone (012) 28-5461.



WATER AND WASTE-WATER MANAGEMENT IN THE METAL FINISHING INDUSTRY

by
Binnie and Partners, Consulting Engineers

This publication is the second in a series of reports and guides which stem from a WRC research project called the National Industrial Water and Waste-water Survey (NATSURV).

Natsurv is aimed at the establishment of guidelines which will reduce the water intake and waste-water disposal by industry and the results obtained in the survey of the metal finishing industry form the basis of this second report.

The term "metal finishing" covers a wide range of techniques for the treatment of metallic articles. These techniques give the product a surface which makes it suitable for its intended service conditions as well as providing an attractive appearance.

All field data have been collected from the PWV area where it is estimated that 46 per cent of South Africa's metal finishing operations are located. The electroplating, anodising and phosphating processes have been identified as the most water-intensive of this group; approximately 50 separate factories conducting one or more of these processes have been visited.

Specific Water Intake (SWI) was found to vary from 0,03 to 1,25 m^3 per "effective" m^2 of surface treated. Many simple yet effective methods are available to reduce water intake, primarily involving minor modifications to the existing plant. Target SWI's should be set at 0,1m^3/m^2 "effective" surface for operations treating in excess of 10 000 m^2/month; 0,2m^3/m^2 is more realistic for factories treating less than 10 000 m^2/month. Results indicate that a uniform target may be set for all three processes.

Specific Pollution Loads (SPL), based on total dissolved solids, were found to vary considerably within each process. Since the bulk of pollution from metal finishing operations derives from dumping of process solutions, it is suggested that initial efforts at curbing pollution be directed at these discharges.

This guide will be of value to the industry itself and also to municipalities, legislators, researchers and consultants in the water and effluent field.

1987: 32
Price Free of charge
ISBN 0 908356 81 1

Available on request from the Water Research Commission, P O Box 824, PRETORIA 0001. Telephone (012) 28-5461.

F G NEYTZELL-DE WILDE
A ORBIN
A M SOLYMOSI
A SIMPSON

THE TREATMENT OF INDUSTRIAL EFFLUENTS WITH HIGH SALINITY AND ORGANIC CONTENTS

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

WRC Report No 123/1/87

BIOLOGICAL INVASIONS

by
IAW MacDonald, F J Kruger and A A Ferrar

The Ecology and Management of Biological invasions in South Africa has been compiled in response to a rapidly increasing realisation world wide, but particularly in South Africa, that introduced species present a real ecological and economic threat to agricultural and conservation activi-

This book records the proceedings of a symposium held by the SA National Programme for Ecosystem Research. It repre-

ts the South African contribution to the international project coordinated by SCOPE (Scientific Committee on Problems of the Environment) to examine the glo-

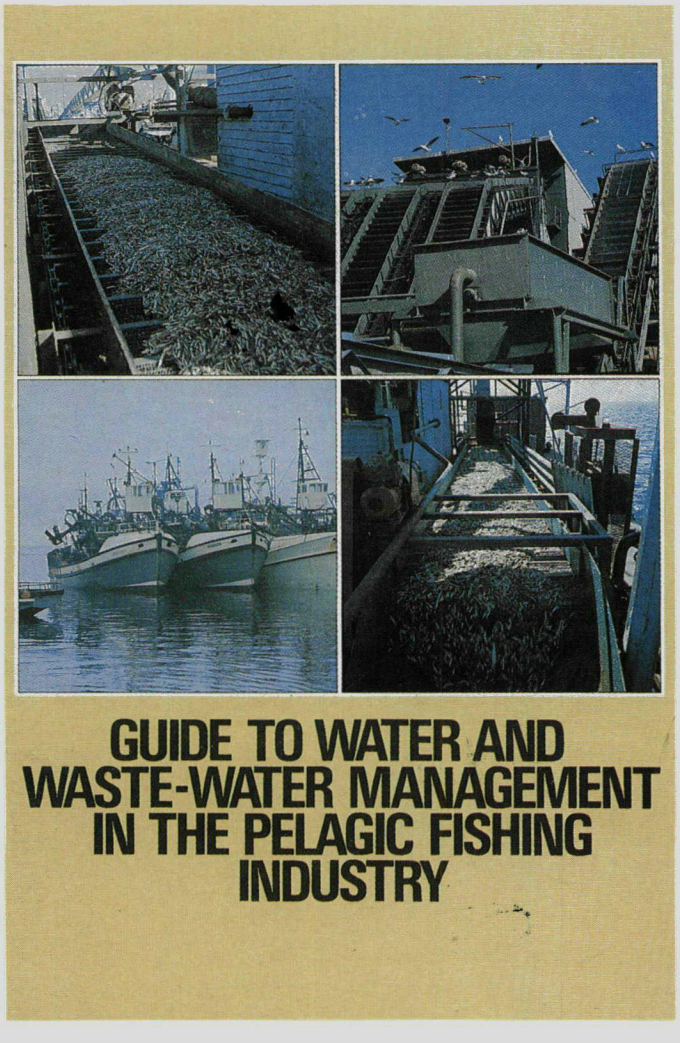
ecology of invasive plants, animals and micro-organisms. It sets out to review current knowledge and management practice in respect of the invasive spread of introduced species in Southern Africa.

Emphasis is centred on the study of those species which have successfully invaded non-agricultural regions and have disrupted natural ecosystem processes. The ecological processes involved are described, as are the principles which are necessary to control and manage invasive species in protected ecosystems and in grazing land.

The strength of the volume lies in it being a uniquely Southern African contribution. In the context of developing principles for management and ecological understanding, local data is freely compared with the international literature, but only insofar as it illustrates a locally derived point.

1987 344 pages
Price R39,50 + GST

Available from Book Marketing Services, P O Box 10105, CALEDON SQUARE 7905.



ANAEROBIC DIGESTIOIN. RESULTS OF RESEARCH AND DEMONSTRATION PROJECTS

Edited by
M P Ferranti, G L Ferrero and P L 'Hermite, Commission of the European Communities, Brussels, Belgium.

Proceedings of a workshop organised by the Commission of the European Communities, Directorate-General Science, Research and Development, and Directorate-General Energy, held in Villeneuvre-d'Ascq, France, 4-6 March 1986. 277 pages 78 illus 1987 £30.00.

METHANE FROM BIOMASS: A SYSTEM APPROACH

Edited by
Professor W H Smith, Institute of Food and Agricultural Sciences, University of Florida and J R Frank, project manager, Gas Research Institute, Chicago, Illinois, USA. Approx 500 pages.

R·E·P·O·R·T·S

BIOLOGICAL WASTES – AN INTERNATIONAL JOURNAL

The journal formerly Agricultural Wastes – is now published in sixteen issues per year, providing timely and topical coverage of a vital problem: the management and treatment of wastes from animals, factories treating agricultural products, crop residues, food processing and other sources of biological wastes. The journal is a primary focus for research on the effects of wastes on the environment, and of all aspects, whether laboratory or large scale, complex or simple, of treatment, use and recycling of organic wastes of all kinds, in the field, in the factory, on the farm, in all countries. Volumes 19-22 (1987), 4 issues per volume. £350.00 ISSN 0269 7483.

All three publications are available from Elsevier Science Publishers, P O Box 211, 1000 AE Amsterdam, The Netherlands.

GUIDE TO WATER AND WASTE-WATER MANAGEMENT IN THE PELAGIC FISHING INDUSTRY

Prepared for the Water Research Commission by Binnie and Partners

In recent years, interest in a number of maritime countries has been drawn to the problems faced by fisheries in complying with ever-stricter pollution control laws. South Africa, with its long coastline and important but scattered centres of the fishing industry, is no exception and in addition must cope with chronic and sometimes severe water shortages.

This guide is aimed at the management of factory processing in such a way as to minimise pollution, to recover valuable products from waste streams and, in particular, to conserve all sources of water so as to reduce waste-water volumes as well as to check pollution at source. In particular this publication focusses in a specific and quantitative manner on problems described in a previous publication of the Water Research commission entitled A Survey of Water and Effluent Management in the Fish-Processing Industry in South Africa (ISBN 0 908356 12 9, prepared by Binnie and Partners on behalf of the Water Research Commission), which is a useful introduction to the present work.

A high degree of co-operation between the Water Research Commission, its consultants, various government departments and the fishing industry itself has led to the formulation of guidelines, expressed in this publication as management targets. These targets cover control of effluents from ship holds, off-loading water, stickwater and fishpit bloodwater as well as effluent segregation or combination in order to rationalise effluent treatment or improve product yields. One of the most valuable aspects of the study has been to show that attention to anti-pollution measures yields cash dividends and it is to be hoped that management will seize this chance to explore greater profitability.

Finally, the work described has an on-going character. The guidelines provide a tool for management to progressively implement pollution control measures, in the course of which it is hoped that the experience gained will lead to further optimisation of water and waste-water management in the pelagic fishing industry.

1987: 42
Price Free of charge
ISBN 0 908356 60 9

Available on request from the Water Research Commission, P O Box 824, PRETORIA 0001, Telephone (012) 28-5461.

GROUND WATER

A workshop on the dolomitic ground water of the PWV area will be held at the Geological Survey in Silverton, Pretoria, on 28 March 1988.
Enquiries: Organising Secretary, Dolomite Ground Water Workshop, P O Box 35065, Menlopark 0102.

LAKE RESTORATION

An international symposium with the theme Lake restoration by reduction of phosphorus loading will be held in the Leeuwenhorst Congress Centre, Noordwijkerhout, the Netherlands, from 17 to 19 April 1988. The symposium will concentrate on the results of a Europe-wide survey of the effect of phosphorus control measures on eutrophied lake ecosystems.
Enquiries: The Organisers, Institute for Environment and Systems Analysis, Lake Management Foundation, Emmastraat 16, 1075 HT Amsterdam, the Netherlands.

WATER RESOURCES

The sixth IWRA Congress on water resources will be held in Ottawa, Canada, from 29 May to 3 June 1988. The theme is Water for World Development.
Enquiries: The Secretariat, Sixth IWRA World Congress on Water Resources, University of Ottawa, 613 King Edward Avenue, Ottawa, Ontario, CANADA KIN 6n5.

DRINKING WATER

The third national conference on drinking water with the theme "small system alternatives" will be held in St John's Newfoundland, Canada, from 12 to 14 June 1988. Authors are invited to submit abstracts for consideration.
Enquiries: Chairman, Third National Conference on Drinking Water, P O Box 205, St John's, Newfoundland, Canada A1C 5J2.

REVERSE OSMOSIS

A symposium on the advances in reverse osmosis and ultrafiltration will be held in Toronto, Canada, from 5 to 11 June 1988.
Enquiries: Dr S Sourirajan/Dr T Matsuura, Division of Chemistry, National Research Council of Canada, Ottawa, Ontario, Canada K1AOR9.

POLLUTION

The 8th International Symposium on environmental pollution will be held from 9 to 10 June 1988 in Toronto, Canada.
Enquiries: Dr V M Bhatnager, Alena enterprises of Canada, Cornwall, Ontario, K6H5V7, Canada.

LARGE DAMS

The 16th International Congress on large dams organised by ICOLD will be held from 13 to 17 June 1988 in San Francisco, USA. Topics include reservoirs and environment, embankment dams, new developments in concrete dams and design floods and operational flood control.
Enquiries: H L Blohm, Secretary, ICOLD, 88 Steering Committee, Bechtel Civil Inc, P O Box 3965, San Francisco, CA 94119, USA.

LIMNOLOGY

The 25th anniversary congress of the limnological society of Southern Africa will be held in Pietermaritzburg from 27 June to 1 July 1988. Post congress excursions will include trips to Maputhaland (St Lucia, Lake Sibaya, Kosi Bay and Ndumu Game Reserve), the Drakensberg pump/storage scheme and the Mgeni system.
Enquiries: Mr J Akhurst, Department of Botany, University of Natal, P O Box 375, Pietermaritzburg, 3200.

WATER SUPPLY AND SANITATION

A seminar on water supply and sanitation in KwaZulu will be held at the Elangeni Hotel in Durban from 28 to 30 June 1988.
Enquiries: Symposium Secretariat S.433, CSIR, P O Box 395, Pretoria 0001, Telephone: (012) 841-2063.

WATER QUALITY

The International Water Supply Association will arrange a workshop on water treatment and drinking water regulations in Vienna on June 30 to July 1 1988.
Enquiries: Prof D R Oehler (Chairman of the Standing Committee on Water Quality and Treatment) Bebelstrasse BO, D 7 000 Stuttgart-1 Federal Republic of Germany.

IAWPRC

The IAWPRC's 14th biennial conference and exhibition will be held during July 1988 in Brighton, England. South African companies are invited to participate in the exhibition.
Enquiries: IAWPRC, 1 Queen Anne's Gate, London SW1H9Bt, England. Telephone 01-2223848, Telex 918518 WASSOC, Attention IAWPRC.

WATER QUALITY

A conference on water quality and management for recreation and tourism will be held in Brisbane, Australia, from 10 to 15 July 1988.
Enquiries: R Sadler, Working Group Secretary, P O Box 388, North Quay, Brisbane, Queensland, Australia, 4000.

WASTE WATER TREATMENT

The 11th symposium on wastewater treatment will be held during November 1988 in Montréal, Québec.
Enquiries: Ms Stephanie Hunt, Environment Canada, Technology Development and Technical Services Branch, Conservation and Protection, Ottawa, Ontario K1A 0H3.

POLMET 88

An International conference on pollution in the metropolitan and urban environment will be held in Hong Kong from 28 November to 2 December 1988. Papers are invited for the technical sessions which will include: Environmental management practice, Industry and environment, Air quality management.
Enquiries: Polmet 88 Secretariat, c/o Hong Kong Institution of Engineers, 9/F Island Centre, No 1 Great George Street, Causeway Bay, Hong Kong.

S T A S O F T

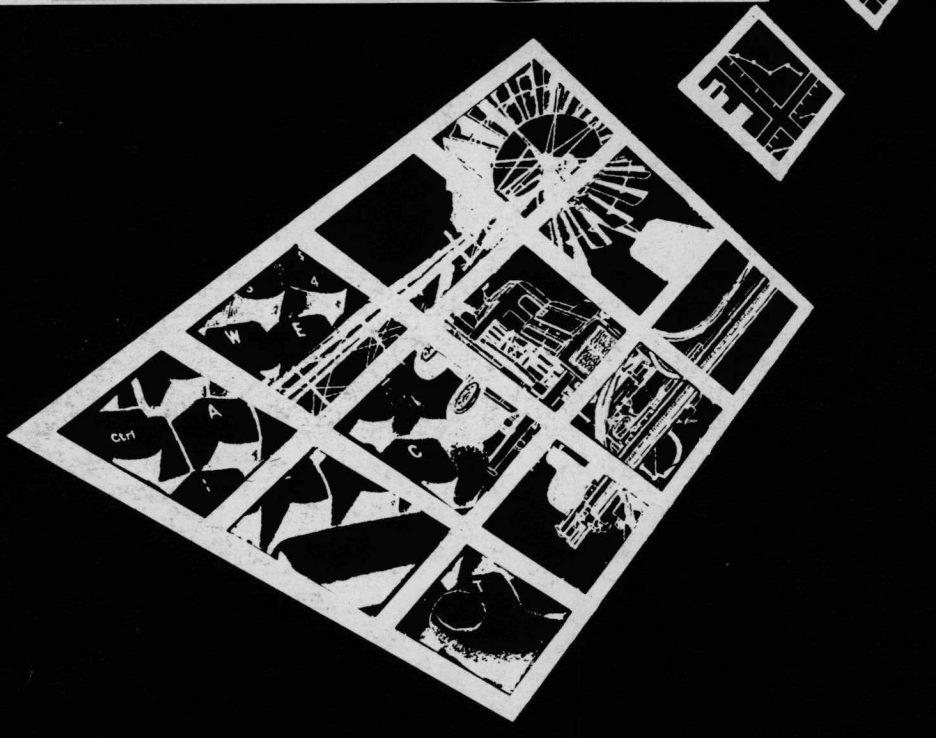
A user friendly IBM compatible computer program for the softening and stabilisation of municipal water supplies

STASOFT has been written to assist chemists, engineers and plant operators in the municipal water supply field with a method for quick and accurate determination of the chemical state of a water and the amount of conditioning chemicals to be added to it to obtain a desired final state.

The program is available free of charge to South African users and can be ordered from the Water Research Commission, P O Box 824, Pretoria 0001.

STASOFT was developed by the University of Cape Town with the financial support of the Water Research Commission with whom copyright is vested.

NEW G-BASE



THE COMPLETE GROUND-WATER DATA BASE

G-Base is a comprehensive ground-water data base, consisting of four modules, namely the data base, a statistical package, a graphics presentation package and a CAD based mapping facility. G-Base has been implemented on an IBM-compatible miero computer and is available on 5¼ and 3½ floppy disks.

G-Base makes provision for a large number of variables to be entered under the following main headings: geology, construction, installation, discharge, water levels, chemistry and water pollution, pumping test analysis, meteorology, borehole geophysics and surface hydrology. Data which have been entered into the data base can be extracted by programmes provided, to be analysed statistically, graphically and to be plotted on maps. Two- and three-dimensional contours are also supported.

The package can be used in various fields of water research such as in water supply, mine dewatering and water pollution studies. Mining companies, industries, local authorities and individuals dealing with ground-water aspects will benefit from this package.

For further information contact: The Director, Institute of Ground-water Studies, University of the OFS, Bloemfontein 9300, South Africa. Tel 051-4012394. Fax 051-473541.