SA WATERBULLETIN

Nuusbrief van die Waternavorsingskommissie
Newsletter of the Water Research Commission

AUGUST/AUGUSTUS 1982

Vrugte- en groenteïnmaak:

WATER ONDER DIE LOEP

Die Waternavorsingskommissie het 'n kontrak met 'n firma konsultingenieurs aangegaan met die doel om die watergebruik in vrugte- en groenteprosesseringsfabrieke te optimiseer en 'n praktykskode vir gebruik in dié nywerheid te ontwikkel ten einde water te bespaar en besoedeling te minimiseer.

Die firma, Binnie en vennote, het 'n opname gemaak van die watergebruik en uitvloeiselgenerering by 38 vrugte- en groenteprosesseringsfabrieke wat gesamentlik meer as 67 000 ml water/jaar gebruik en meer as 50 000 ml uitvloeisel/jaar stort terwyl 870 000 t vrugte en groente per jaar verwerk word. Die uitvloeisels bevat meer as 13 900 t chemiese suurstofbehoefte en 2 340 t gesuspendeerde vaste stowwe; 'n verdere 300 000 t vaste afval word jaarliks gegenereer.

Die opname het getoon dat die soortlike waterverbruik van fabriek tot fabriek wat dieselfde produk vervaardig, grootliks wissel en dat 'n groot daaglikse skommeling ook waarneembaar is. Waterverbruik het van 1,1 kl/t geprosesseerde sitrussap tot 52 kl/t bevrore ertjies gewissel. Die grootste skommelinge in waterverbruik is by peer- en perskeprosessering aangetref waar verbruik van 4,5 kl/t tot 29,0 kl/t vir geprosesseerde pere en van 2,5 kl/t tot 12 kl/t vir geprosesseerde perskes gewissel het. Die besoedelingslas wat deur dié produkte gegenereer is, het 29,0 kg CSB/t vir perskes en ongeveer 13 kg CSB/t vir pere beloop. Daar is gevind dat die ooreenstemmende gesuspendeerdestofinhoud in die uitvloeisel 4,5 kg per t en 2,6 kg per t vir perskes en pere onderskeidelik beloop het.

Die ondersoek het aan die lig gebring dat groot waterbesparingsprogramme intern met betreklik klein kapitale uitleg geïmplementeer kan word, en dat verbeterde waterbestuur besoedeling grootliks kan verminder deur produkstortsel en onnodige kontak tussen produk/vaste afval en water te voorkom. Twee prosesseringsfabrieke is derhalwe geselekteer vir

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'n Loodsaanleg vir die behandeling van uitvloeisel van die vrugte- en groenteïnmaakbedryf. Die Kommissie finansier navorsing hieroor.

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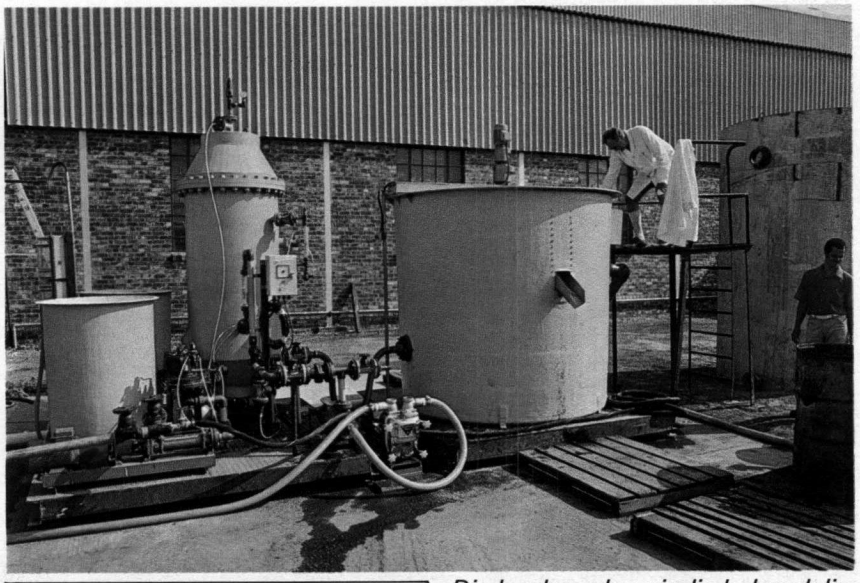
WATER ONDER DIE LOEP

(Vanaf bl. 1)



Die loodsaanleg vir die behandeling van uitvloeisel by die firma Gants in die Strand waar vrugte en groente geprosesseer word.

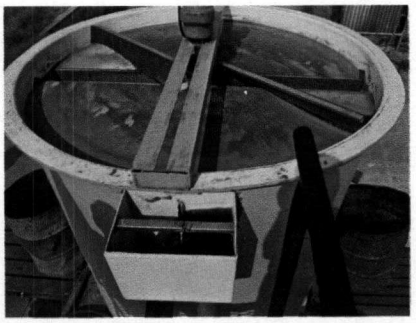
'n grondige studie om die minimumwaterverbruik vir elke prosesseringstap te bereken en om 'n praktykskode vir gebruik in die nywerheid op te stel ten einde water te bespaar en besoedeling te verminder.

Die ondersoek behels ook die voorbereiding van 'n praktykskode vir die voorbehandeling van uitvloeisel op die fabrieksperseel voordat dit gestort word. Om hierdie deel van die ondersoek te kan uitvoer, is 'n draagbare opgelostelug-flotasie-aanleg ontwerp en gebou wat 12 kl uitvloeisel van die nywerheid per uur behandel.

Die loodsaanleg is in twee eenhede vervaardig wat op glyspore gemonteer is. Die versadigerdeel is vir baie hoë gesuspendeerdestofladings ontwerp en alle aspekte van die aanleg is so beplan dat dit veranderinge aan die bedryfsparameters moontlik maak ten einde die ontwerpskriteria vir enige uitvloeisel te verkry. Waar moontlik is glasvesel gebruik om korrosie te voorkom, en die versadigingshouer beskik oor 'n interne harsbedekking met hoë weerstand.

Die aanleg het reeds getoon dat hierdie uitvloeisels met die minimum aan uitgawe behandel kan word. Die hele ondersoekprogram is daarop gemik om 350 Ml water/jaar oor die kort termyn en uiteindelik 1 500 Ml/j in die vrugte-en groenteprosesseringsbedryf te bespaar sonder dat die gehalte van die produk aangetas word.

In dié uitgawe
In this issue



'n Bo-aansig van die opgelostelug-flotasieenheid van die loodsaanleg hierbo uitgebeeld.

Die normale uitvloeisel met vaste stowwe by 'n vrugteïnmaakfabriek.

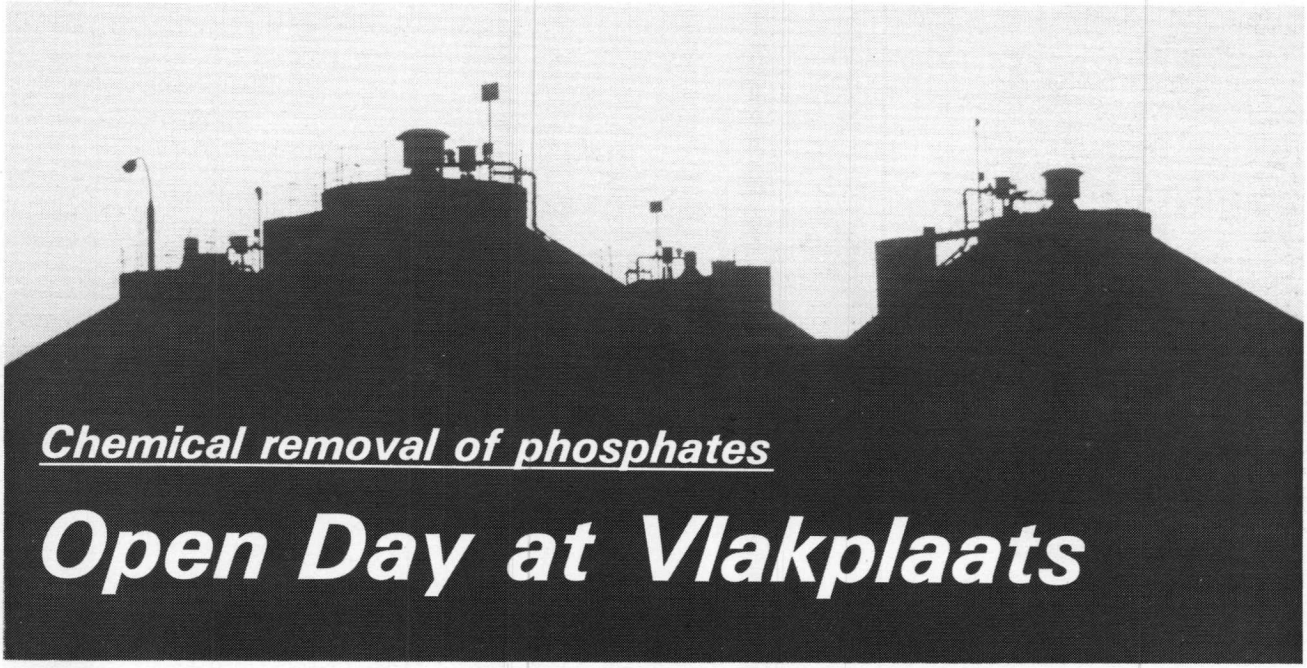
TEGNOLOGIEOORDRAG

In hierdie rubriek sal gereelde aankondigings verskyn van publikasies, simposia of ander gebeurlikhede met 'n praktiese inslag wat kan help om die gaping tussen navorsing en toepassing te oorbrug.

TTO

TECHNOLOGY TRANSFER

In this column regular announcements will be published of publications, symposia and other events of practical import which could contribute towards closing the gap between research and application.



Chemical removal of phosphates

Open Day at Vlakplaats

The Water Research Commission in collaboration with the Municipality of Boksburg recently arranged an open day at Boksburg's Vlakplaats Water Pollution Control Works to inform those involved with phosphate removal from sewage, i.e. city engineers and chemists, consulting engineers, government agencies, chemical and instrument suppliers, and research organizations, of the progress with the Commission's project regarding the chemical removal of phosphates from biological filter effluents.

On the 1st August 1980 legislation was promulgated for the control of phosphates in effluents: an amendment to the Water Act, No 54 of 1956, Article 21(1)(a). This legislation did not come as a surprise to local authorities since the Directorate of Water Affairs had been warning municipalities of the imminence of this legislation up to five years prior to its introduction.

A number of local authorities have made representation to the Directorate for an extension period for the introduction of processes and/or techniques to achieve phosphate reduction down to 1 mg/1 (as PO_4-P) in their sewage purification works. A number of reasons have been put forward by local authorities and even consulting engineers why extensions should be granted, *inter alia:*

- insufficient local knowledge of phosphate removal processes.
- insufficient experience on a practical scale to demonstrate the technical feasibility of such processes locally.
- insufficient time for budgeting and acquiring, installation and commissioning of facilities to remove phosphates from effluents, and
- insufficient time to train operators to run plants effectively within the legal phosphate limit.

The Directorate of Water Affairs has given serious consideration to these representations and has decided to grant extensions for a maximum period of up to five years, that is, up to the 1st August 1985. After this date all local authorities and industries which discharge to the sensitive catchment areas will have to comply with the standard.

The Water Research Commission has anticipated the need for technology for phosphate removal from effluents and already initiated research in this regard in 1973. One problem which became patently obvious is the need for locally proven technology for the chemical removal of phosphates from biological filter effluents, and consequently a project dealing

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specifically with this aspect was launched by the Water Research Commission in July 1979. The project is being carried out in collaboration with the City Council of Pretoria, the Municipality of Boksburg and the National Institute for Water Research and will be completed this year.

The project has yielded the information required locally for the chemical removal of phosphates from biological filters. A considerable body of information on chemical phosphate removal at full scale in South Africa now exists and in order to inform those involved in this field the open day at Vlakplaats was arranged.

The open day was attended by approximately 380 persons from all over South Africa and several papers were presented by specialists in the field on the subject of phosphate removal.

Mr H Best of the Directorate of Water affairs sketched the need for chemical removal of phosphates from biological filter effluents, while Dr Herman Wiechers of the Water Research Commission reviewed the Commission's involvement in this regard. Dr KEU Brodisch of the National Institute for Water Research presented a paper on the NIWR's research activities on the chemical removal of phosphates which was followed by a review of the research and development at the Daspoort Sewage Works and at the Vlakplaats Water Pollution Control Works by Mr N Thirion of the City Council of Pretoria and Mr AS Louw, chief chemist at Vlakplaats, respectively.

Mr P Odendaal, chief adviser of the Water Research Commission, summarized the proceedings and said that the Water Research Commission's ultimate goal in financing research work was to ensure, as far as possible, the practical application of useful research results.

Vlakplaats (cont.)

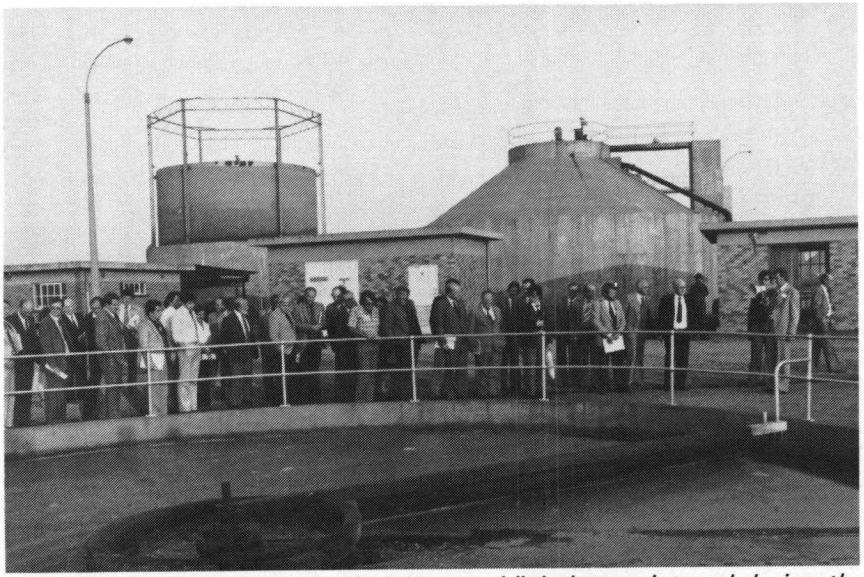
The key figures behind the Open Day: (f.l.t.r.) Mr PE Odendaal (chief adviser, WRC); Dr KEU Brodisch (NIWR); Mr AS Louw (chief chemist, Municipality of Boksburg); Mr H Basson (superintendent, Vlakplaats); Mr L Ferreira (Town Clerk); Cllr C Pieters (Mayor of Boksburg); Dr HNS Wiechers (senior adviser, WRC); Mr N Thirion (City Council of Pretoria); and Mr A Gerber (NIWR).

Course

With regard to nutrient removal from biological filter effluents, Mr Odendaal said that the Commission was planning a short course on the upgrading of biological filter systems in February 1983 in Pretoria, Durban, Port Elizabeth and Cape Town. The final results of the current research programme would also be published in the form of a technical manual early in 1983.

In the field of biological nutrient removal the Water Research Commission was planning the following, according to Mr Odendaal:

- A manual on the Phoredox process for biological nutrient removal, to be available soon.
- An open day on biological nutrient removal, planned for November 1983 at the Johannesburg Goudkoppies Works.
- A manual for the planning, design and implementation of activated sludge plants for nutrient removal, expected to be ready early in 1983.



Some of the large number of visitors to Vlakplaats pictured during the tour of the Works which formed part of the Open Day.

- A short course on the theory and design of activated sludge plants for nutrient removal, planned for February 1983, probably together with a course on the upgrading of biological filter plants.
- A short course on the implementation of sewage purification processes in order to comply with the General and Special Standard, planned for February 1984.

Copies of the papers presented during the open day are available gratis from the Water Research Commission, PO Box 824, Pretoria, 0001.

Vloedskade:

NUWE VERSLAG BESKIKBAAR

In die lig van die vloede wat sekere gedeeltes van Suid-Afrika in 1974 en 1975 getref het, het die destydse Departement van Waterwese die Waternavorsingskommissie versoek om navorsing oor vloedskade te laat uitvoer ten einde:

- die metodologiese beginsels vir die identifisering en evaluering van vloedskades te ontwikkel;
- die ontwikkelde metodologie op sekere riviertrajekte toe te pas; en
- verwantskappe tussen fisiese skade en vloedomstandighede te ontwikkel.

Die Kommissie het toe navorsingsooreenkomste aangegaan ingevolge waarvan die Instituut vir Sosiale en Ekonomiese Navorsing (ISEN) van die Universiteit van die Oranje-Vrystaat en die Buro vir Ekonomiese Ondersoek (BEO) van die Universiteit van Stellenbosch bogenoemde aspekte sou ondersoek. In die loop van die navorsing is die volgende verslae reeds gepubliseer:

Die navorsing is afgerond met 'n verslag waarin die riglyne vir 'n ondersoek na vloedskade uiteengesit word. Hierdie verslag ''Guidelines for assessing flood damage in South Africa'' deur DJG Smith, MF Viljoen en PH Spies, is onlangs deur die Waternavorsingskommissie vir algemene verspreiding goedgekeur. Die verslag beskryf 'n prosedure vir die uitvoering van vloedskade-ondersoeke op 'n ekonomies-wetenskaplike wyse.

Prosedures

Dit gee 'n kort uiteensetting van die ontwikkelde metodologie vir vloedskadebepalings ten opsigte van die benaderings wat vir verskillende tipes vloedskades gevolg moet word. Verder word die prosedures vir die meting van direkte vloedskades (byvoorbeeld beskadiging van geboue) en indirekte vloedskades (byvoorbeeld verlies in produktiewe mannekrag), ook verduidelik. Daar is ook 'n bespreking van die praktiese toepassing van die prosedures en probleme verbonde aan vloedskadebepalings. Verder word aanduidings gegee oor hoe die ontwikkelde verliesfunksies (wat die verband tussen fisiese eienskappe van die vloed en gepaardgaande skade gee) in toekomstige opnames gebruik kan word. Aangesien hierdie ondersoek tot die 1974- en 1975-vloede beperk was, is die verliesfunksies op hierdie stadium hoofsaaklik van toepassing op die riviertrajekte wat by die ondersoek betrokke was. Die verslag bevat ook voorbeelde van die vraelyste wat by ondersoeke van hierdie aard gebruik kan word.

Eksemplare van hierdie verslae kan by die Kommissie aangevra word. Die adres is: WNK, Posbus 824, Pretoria 0001.

- *Vloedskade in sekere riviertrajekte van die Republiek van Suid-Afrika:*
  - Deel I *'n Metodologie vir vloedskadebepaling* deur MF Viljoen en DJG Smith.
  - Deel II *Bevindings rakende vloedskades in drie riviervalleie in die Noordwestelike en Oostelike Kaapprovinsie* deur PH Spies.
  - Deel III *Bevindings rakende die 1974-vloedskades vir verskillende riviertrajekte van die Oranje-, Vaal-, Riet-, Seekoei- en Hartbeesriviere* deur MF Viljoen, JA Vos en PJ Marais.
  - Deel IV *'n Evaluering van die problematiek rondom vloedskadebepaling in die Republiek van Suid-Afrika* deur MF Viljoen, DJG Smith en PH Spies.
- *Die 1975-vloedskade vir verskillende trajekte van die Vaalrivier* deur MF Viljoen, JA Vos, DJG Smith en JW Prinsloo.

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COAL MINING & ENVIRONMENT

The Chamber of Mines of South Africa has recently published *Guidelines for the rehabilitation of land disturbed by surface coal mining in South Africa.*

The objective with the publication of these guidelines is to assist mine managements to carry out their national obligations in respect of environmental protection. The guidelines have been designed around the ''best practicable means'' approach, i.e. that regard will be had to local conditions and circumstances, the cost to be involved, and the necessity and practicality of their implementation. The guidelines have also been designed in the light of present knowledge. As time and scientific and technological knowledge advance the guidelines will be updated and revisions made.

The main sections of the guidelines deal with characterising the pre-mining environment, managing and protecting water resources, spoil grading and topsoiling, revegetating disturbed land, and planning, monitoring and recording.

Anders as in Europa en die Verre Ooste waar karpboerdery grootliks sy oorsprong gehad het, is water in Suid-Afrika 'n skaars en kosbare natuurlike hulpbron wat ook die slagaar van die landbou vorm. Die snelle uitbreiding van veral Staatsbeheerde besproeiingskemas stel ook hoë eise aan die boeregemeenskap aangesien besproeiingsgronde duur is en die beskikbare water oordeelkundig toegewys moet word aan verskillende gewasse wat voortdurend afgewissel moet word. Die klassieke beginsels van visboerdery in terme van waterverbruik en damruimte beskikbaar in die geval van hierdie gronde staan dikwels in direkte kompetisie met die intensiewe verbouing van landbougewasse. Hierdie artikel, geskryf deur F de W Brandt van die Afdeling Natuurbewaring (TPA) rapporteer oor

KARP IN KANALE

In 'n poging om 'n moontlike kompromie tussen visboerdery en die intensiewe verbouing van landboukundige gewasse te bewerkstellig, is 'n navorsingsprojek deur die Transvaalse Afdeling Natuurbewaring met die gedeeltelike finansiële steun van die Waternavorsingskommissie onderneem. Die benadering tot hierdie ondersoek is gegrond op die benutting van lopende water uit besproeiingskanale vir die grootmaak van vis waarna dieselfde waterkwota ook vir die dubbele en gelyktydige gebruik vir landboubesproeiing aangewend kan word. Sodanige intensifisering van visboerdery bring ook mee dat damoppervlaktes aansienlik ingeperk word en die hantering, voeding en uiteindelike oes van die visse vergemaklik word. Aangesien die visse in hoë digthede in die kleinste moontlike ruimte aangehou word, moet varswater voortdurend tot die sisteem toegevoeg word om afvalstowwe daaruit te verwyder en ook om voldoende suurstof aan die visse te voorsien.

Vir die doel van bogemelde navorsingsprojek is 'n eksperimentele, sogenaamde klaterkanaalvisproduksiestelsel (Eng: raceway) gevolglik aangelê by die Afdeling Natuurbewaring se Laeveldse Visserynavorsingstasie te Marble Hall wat op die Loskopdam-besproeiingskema geleë is. Die aanleg bestaan wesentlik uit 'n sewevoudig kanaal-damsisteem met 'n totale oppervlakte van minder as 0,1 ha en waar die water van die een dam (segment) na die ander oorvloei. 'n Totaal van ongeveer 14 000 karp is per eksperiment in hierdie sisteem aangehou en die visse is intensief met geformuleerde visvoerkorrels gevoer.

Die eerste produksieproewe in die klaterkanaal is gedurende 1977-1978 met 'n konstante watertoevoer van 0,028 m^3/s deur die sisteem uitgevoer. In die daaropvolgende periode van drie jaar is pogings aangewend om sekere basiese tekortkominge van die sisteem uit te skakel of ten minste te verminder om sodoende die produksiepotensiaal van die sisteem gaandeweg te verbeter.

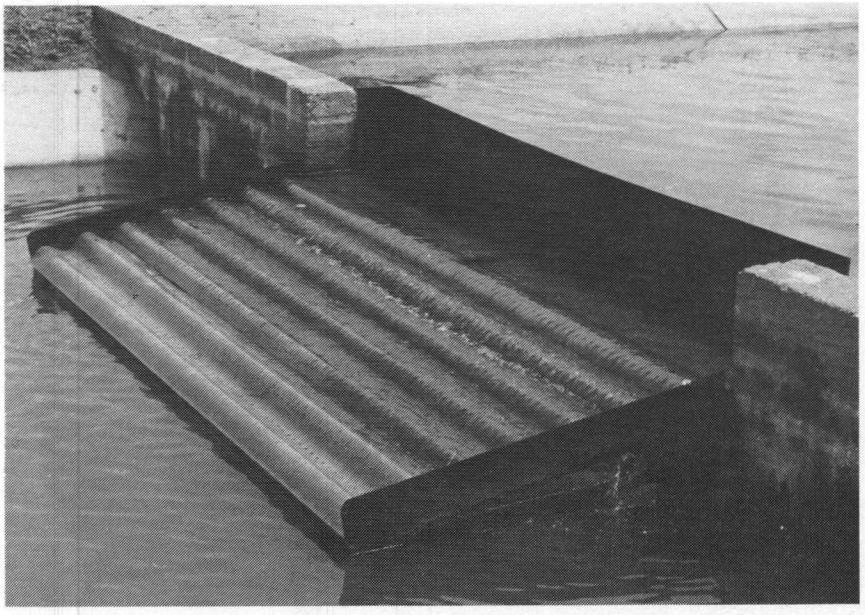
Uit die aanvanklike ondersoeke was dit gou duidelik dat die watertoevoer na die sisteem nie voldoende is om veral genoegsame opgeloste suurstof te voorsien wat benodig word vir die optimale groei van die visse in die eksperimente nie. As gevolg van hierdie basiese tekortkoming van die sisteem is visgroeiprestasie en ook visproduksie progressief in die opeenvolgende stroomafsegmente nadelig beïnvloed. Daar is gevolglik in die tweede en derde jaar oorgegaan na bykomende meganiese belugting van die water om die suurstofpeil van die water in die produksie-eenhede op minstens 45 persent versadiging te hou. Ongelukkig is die proewe vir twee opeenvolgende jare op 'n kritieke stadium onderbreek weens die knellende droogte wat in die omgewing ondervind is en ook 'n gebrekkige lewering van water aan die sisteem tot gevolg gehad het. Heelwat visse is tydens hierdie geleenthede verloor.

Alhoewel die verlangde effek van die bykomende belugting van die water nie ten volle nagevors kon word nie en die resultate nie onderling met die vorige seisoene vergelykbaar was nie, is waardevolle inligting ten opsigte van belugting

Die klaterkanaal-visproduksiestelsel wat by die Laeveldse Visserynavorsingstasie te Marble Hall gebou is. Die aanleg bestaan wesentlik uit 'n sewevoudige kanaal-damsisteem waar die water van die een dam na die ander oorvloei.

en die manipulering van vispopulasiedigthede (deur die onwillekeurige vermindering van visgetalle) wel ingewin. Alhoewel hierdie maatreëls wel die verhoogde suurstofkonsentrasies bewerkstellig het en die gemiddelde individuele groeitempo van die visse in werklikheid verdubbel het vanaf 2,3 na 4,4g/vis/dag, was dit nogtans nie moontlik om deur middel van hierdie stappe die opbou van toksiese stowwe, veral stikstowwe en koolsuurgas, noemenswaardig te verlaag nie.

'n Verdere tekortkoming van die huidige eksperimentele klaterkanaalstelsel is dat die sisteem oor min selfreinigingsvermoë beskik en dat organiese afvalmateriale na die bodem afsak en sodoende onhigiëniese toestande vir die visse skep. In 'n poging om hierdie probleem in 'n mate te bekamp en moontlik te benut, is 'n lae persentasie filtervoedende visse soos die endemiese bloukurper en uitheemse silwerkarp saam met die gewone karp gedurende die tweede jaar in die klaterkanaal geplaas. Gesien in die lig dat hierdie visse hoofsaaklik op afvalstowwe teer en die bybesetting daarvan teen slegs 3,5 present van die totale getal visse in die eksperiment, 'n massabydrae van tot 7 persent tydens afoes gelewer het en in sommige segmente bykans 'n 10 persent besparing op die voeronkoste aangegaan per kg visvleis verteenwoordig, kan die toekomstige gebruik van vispolikultiveringstegnieke 'n nuttige bestuursmiddel wees om die voeromsettingsverhouding van die visse in die klaterkanaal te verbeter.

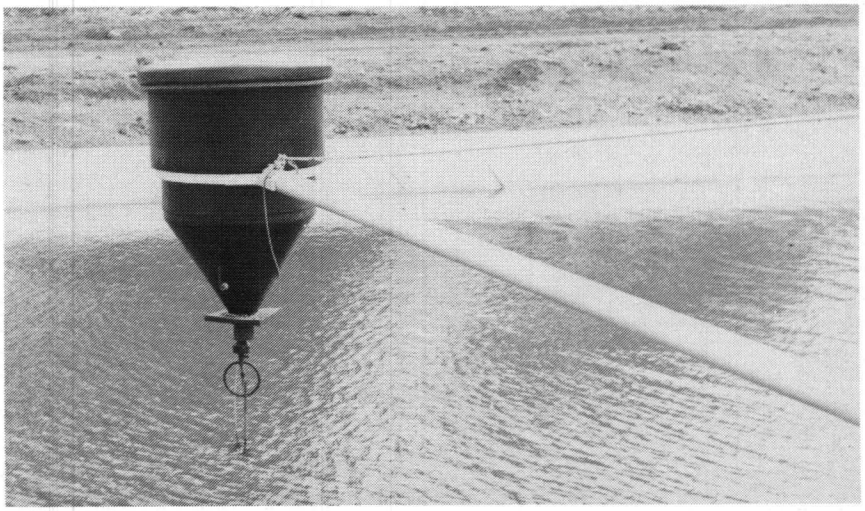


Die oorloopmeganisme tussen elke dam bestaan uit 'n digsluitende metaalkas aan die keerwalle wat na onder en bo oop is vir die vloei van water. Op hierdie manier word water uit die onderste waterlae onttrek. 'n Geriffelde en geperforeerde belugtingsplaat is aan die stroomafkant van die keerwalle aangebring om die oorloopwater te belug voordat dit na die volgende segment oorvloei.

Na gunstige proefnemings was die uitgangspunt gedurende die vierde jaar om 'n studie te maak van die effek van 'n verdubbeling in die tempo van watervloei deur die klaterkanaal (0,056 m^3/s) aangesien die volgehoue belugting van die water die produksiekostes aansienlik sou laat styg. Hierdie benadering was uiters suksesvol en die produksiekapasiteit van die sisteem is as gevolg van hierdie maatreël veelvoudig verhoog vanaf 5,4 tot 13,0 ton vis per seisoen en 'n besonder gunstige gemiddelde individuele groeitempo van tot 7,8g/vis/dag is in sommige kanaalsegmente gerealiseer. Hierdie resultate dui beslis daarop dat die bepaalde groeibeperkende faktore wat voorheen in die klaterkanaal werksaam was grootliks deur die verhoogde tempo van waterdeurvloei ingekort kan word.

Ten spyte van besonder gunstige voeromsettingsverhoudings van 1: 1,7 (vis : voedsel) wat van tyd tot tyd in sommige segmente van die klaterkanaal deur die loop van die verskeie proefnemings gerealiseer is, was die gemiddelde syfer egter ietwat hoër as 1:2. Aangesien die intensiewe voeding van die visse met hoëproteïenvisvoerkorrels soms so hoog as 75 persent van

(Na bladsy 8)



Visselfvoerders is in elke segment van die klaterkanaal aangebring om die hoëproteïen-visvoerkorrels aan die visse te voer. Hierdie apparaat word deur die visse op voedselaanvraag self in werking gestel en die voedsel is sodoende teoreties vir 24 uur in onbeperkte voorraad vir die visse beskikbaar. Die selfvoerder is 'n goedkoop arbeidsbesparende hulpmiddel wat relatief goeie voeromsettingsverhoudings tot gevolg kan hê.

KARP IN KANALE

(Vanaf bl. 7)

die totale produksiekoste kan beloop, is hierdie uitgawe dus van deurslaggewende belang vir die ekonomie van die onderneming. Die oordeelkundige rantsoenering van die voedsel (in die eksperimente is voedsel teoreties in onbeperkte hoeveelhede vir 24 uur aan die visse deur middel van selfvoerders beskikbaar gestel) is een moontlike manier van kostebesnoeiing terwyl groter visbesettingsgetalle 'n verdere manier mag bied om voedselvermorsing teen te werk en ook tot 'n hoër oes per volume produksie-eenheid mag lei. Die oorlewingsyfer vir die visse tydens die eksperimente het gemiddeld 80 persent beloop.

Gunstig

Vanuit 'n waterbewaringsoogpunt beskou, vergelyk die produksiesyfers in die klaterkanaal uiters gunstig met die produksievermoë van gewone visdamme indien dit in ag geneem word dat die totale wateroppervlakte van die sisteem slegs 0,1 ha is, maar omgereken na produksie per ha wateroppervlakte, 'n totale oesmassa van 115 000 kg vis/ha/seisoen gelewer is. Die berekende verlies aan water deur verdamping en wegsypeling vanaf gewone visdamme wat 'n ekwivalente visproduksiekapasiteit as die huidige klaterkanaal het, sal teoreties op sowat 110 000 kl water per seisoen te staan kom. Deur die klaterkanaalstelsel toe te pas, kan hierdie aansienlike volume water dus potensieel vir ander gebruike aangewend word.

Hoewel die bevindings uit die reeks proefnemings in die klaterkanaal tot dusver nog nie op 'n finale ekonomiese werkende eenheid dui nie en as gevolg van die volume water wat benodig word asook die patroon van watergebruik op die skema, die stelsel nie spesifiek van praktiese belang vir die Loskopdambesproeiingskema mag wees nie, is daar nietemin besondere rigtingwysende resultate verkry vir die verbetering van die sisteem wat moontlik elders tot 'n lewensvatbare onderneming mag lei.

NUWE TO-AANLEG VIR MIKONOS

'n Nuwe tru-osmoseaanleg met 'n kapasiteit van 500 m/dag is op die Griekse eiland Mikonos in werking gestel en sal drinkwater uit die Middellandse See aan die inwoners en toeriste verskaf.

Dit is die eiland se eerste truosmoseaanleg en is deur Aqua Chem van Milwaukee, VSA, gebou.

HAYWARD NUWE MINISTER VIR WATER

Sy Edele SAS Hayward, LV.

Gedurende Juliemaand is aangekondig dat mnr SAS Hayward, Adjunk-minister van Landbou en Visserye, aangestel is as die nuwe Minister van Omgewingsake en Visserye in die plek van dr CV van der Merwe wat van portefeulje verwissel het.

Sy Edele SAS Hayward, LV, is op 5 Augustus 1924 op Steytlerville gebore en ontvang sy skoolopleiding aan die Hoërskool Outeniqua op George. Hy moet sy studie aan die Universiteit van Stellenbosch staak vanweë sy vader se ernstige siekte en begin in 1945 boer.

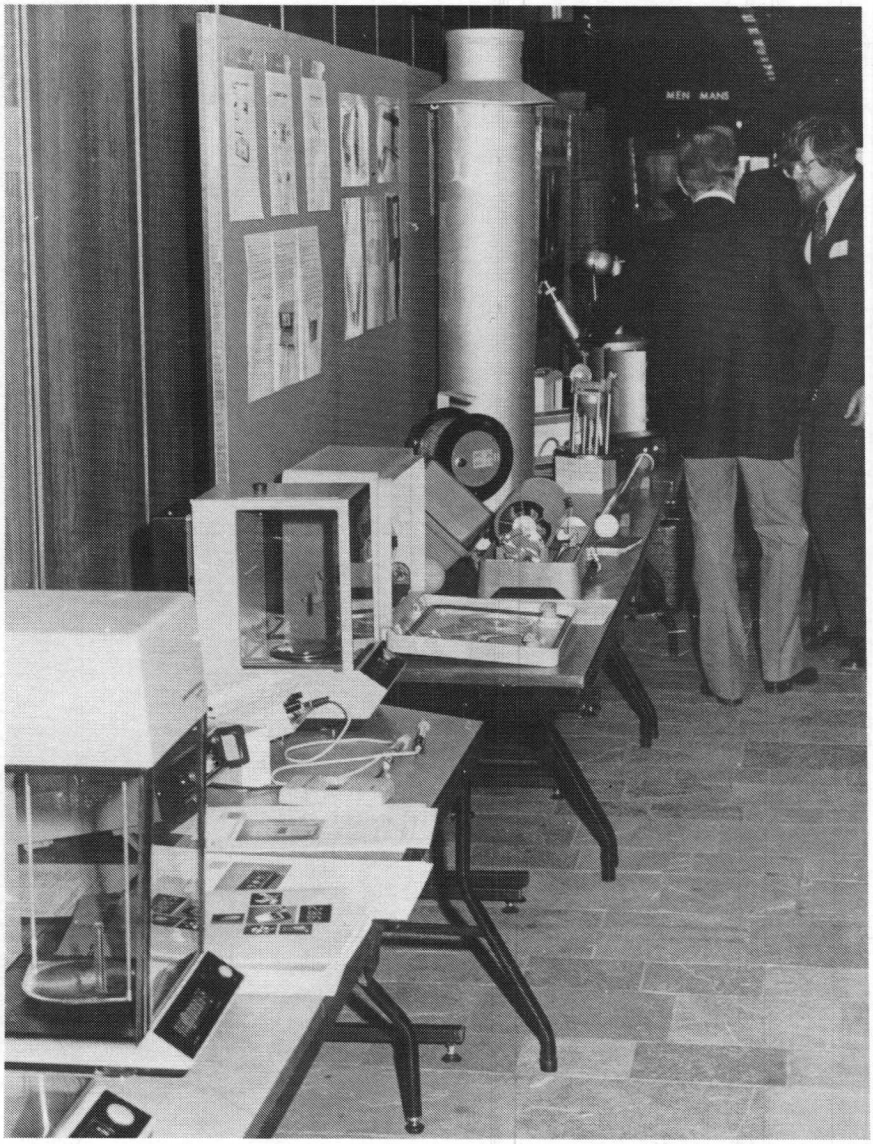
Nadat hy vir etlike jare in 'n wye reeks komitees, rade, verenigings en direksies gedien het, word hy verkies tot lid van die SA Wolraad in 1964 en tot lid van die Uitvoerende Komitee van die SA Wolraad in 1968.

In 1971 word hy verkies tot onderpresident van die NWKV van SA en vanaf dieselfde jaar dien hy in die Algemene Raad van die SALU. In 1977 word hy lid van die Uitvoerende Komitee van SALU.

Vanaf 1966 tot 1969 was mnr Hayward lid van die Kaaplandse Provinsiale Raad en word daarna LV. Hy was ook lid van die Kommissie van Ondersoek na die Bemarkingswet, ondervoorsitter van die Landboustudiegroep van die Nasionale Party-koukus en lid van die Gekose Komitee oor Besproeiingsake.

In 1950 is hy getroud met Sally Viljoen en uit die huwelik is twee seuns en twee dogters gebore.

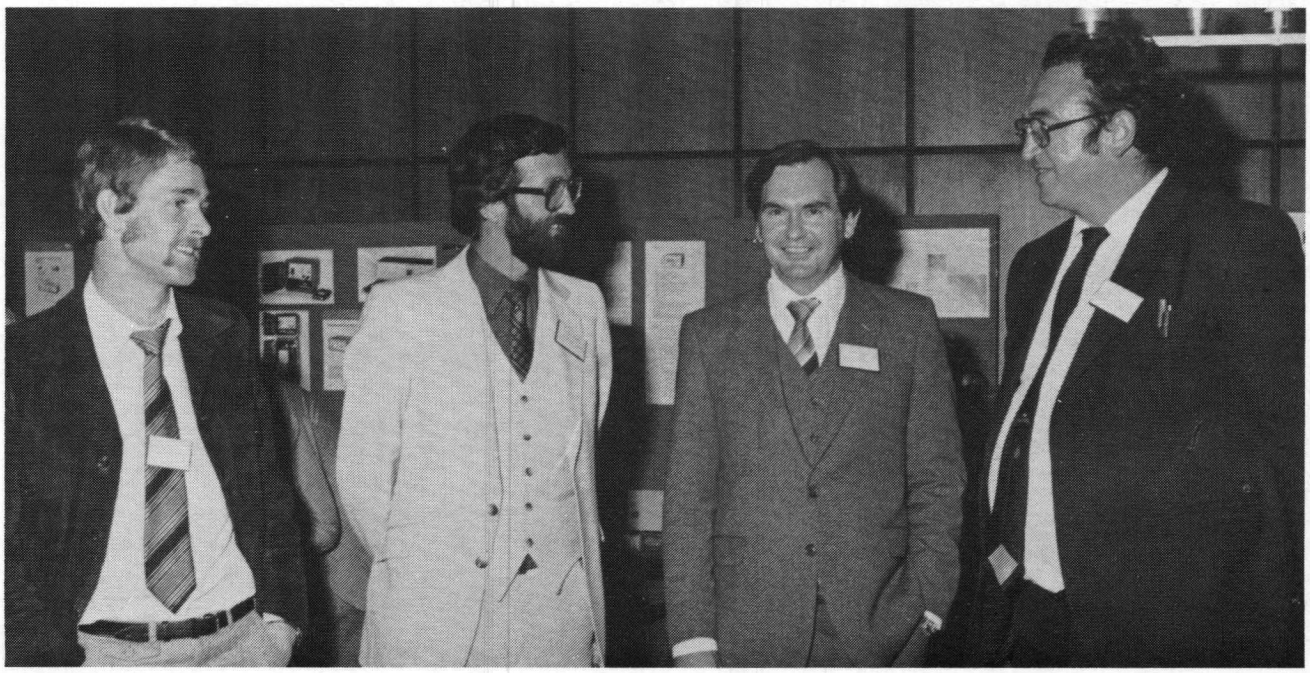
SA Waterbulletin verwelkom graag namens sy lesers die nuwe Minister in hierdie portefeulje wat van soveel belang vir die toekoms van die Republiek is. (In die November-uitgawe maak lesers nader kennis met die Adjunkminister, mnr JWE Wiley).



WRC's WORKSHOP ON HYDROLOGICAL INSTRUMENTS

Some of the instruments on exhibition at the Hydrological Instruments Workshop recently held at CSIR Conference Centre in Pretoria. The objective of the Workshop was to increase cooperation through communication between the users and the producers of hydrological instruments.

(Below): Seen during a lighter moment of the Workshop (f.l.t.r.): Dr Dennis Hughes (Hydrological Research Unit, Rhodes University); Mr D Cousens (adviser, WRC); Dr PJT Roberts (senior adviser, WRC); and Dr AL du Pisani (Soils and Irrigation Research Institute).



Hydrological Research Unit:

Reports presented to Minister

A series of research reports produced by the Wits Hydrological Research Unit under the leadership of Professor DC Midgley were recently presented to the Minister of Environment Affairs, Dr the Honourable CV van der Merwe, by the Vice-Chancellor and Principal of the University of the Witwatersrand, Professor DJ du Plessis.

The reports *Surface water resources of South Africa* (six volumes) and *Flood occurrences in South Africa* resulted from contracts with the Water Research Commission.

Under the flood studies the principal results included the development of programmes for flood forecasting, reservoir routing and flood gate operation. Point-rainfall and large-area storm studies were also undertaken and a design flood manual for South West Africa/ Namibia was produced. The flood plain management models were updated and streamlined and urban hydrology models were developed. In thanking Professor Du Plessis and Professor Midgley the Minister said that perhaps the most valuable output of the Hydrological Research Unit was produced under the water resources project funded by the Water Research Commission and which has been consolidated in the report *Surface water resources of South Africa.*

Prof DC Midgley, former director of the Hydrological Research Unit at the University of the Witwatersrand, discussing the reports with the Minister of Environment Affairs, Dr the Hon CV van der Merwe (left), and Prof DJ du Plessis, vice-chancellor and principal of the University.

Dr van der Merwe said that in a country like South Africa, with its comparatively meagre water resources, it was vitally important to develop the means to assess the degree to which available water resources could be safely exploited, both nationally and regionally. ''We all know that water resources on a sub-continental basis are strictly limited, but when studied on a regional basis, or within the limits of inter-basis water transfers, the position is seen to be serious indeed,'' he said.

Dr van Der Merwe said that provided long-term stream gaugings at a proposed dam site were available, it was a relatively straightforward matter to determine the volume of storage needed to meet a given duty, but gaugings were seldom available at the places where storage was required and practically never at the hundreds of sites where farm dams had to be built. ''It is obviously, therefore, a great boon to have the means to establish the optimum volume of storage to meet a prescribed duty anywhere in South Africa, with due allowances for silting and for current and possible future upstream abstractions,'' the Minister said.

Dr van der Merwe said that he was pleased to announce that this six-volume report provided the data for and demonstrated the methods of handling many of these and similar problems in the field of water resources.

The Minister also paid tribute to Professor Midgley and said that the research by the Professor and his team had met with great success. Some of the Hydrological Research Unit's most notable achievements

Some notable personalities in the field of water attended the presentation ceremony. In the usual order appear Dr CF Garbers (president, CSIR and WRC member); dr JP Kriel (WRC member); Prof DJ Schoeman (dean of the Faculty of Engineering, UP, and WRC member); Minister van der Merwe; Prof Midgley; Dr MR Henzen (chairman, WRC); Prof du Plessis; and Dr PJT Roberts (senior adviser, WRC).

the Minister mentioned included the following:

- A Design Flood Manual was produced by the Unit early in its history, aimed at providing guidance to engineers in determining design values for floods from catchments anywhere in South Africa. The Manual was subsequently updated and is a standard reference for government departments.

- Largely as a result of a request by the Commission of Enquiry into Water Matters the Hydrological Research Unit carried out a survey of water resources in South Africa. The report, published in 1969, was in great demand by private and government engineers.

- The Hydrological Research Unit was also instrumental in the early use of computers to develop mathematical models of hydraulic and hydrological systems. Many important modelling studies were undertaken and these studies culminated in the well-known Pitman rainfall/runoff model which has been widely used by consulting engineers and government agencies in the Republic and in neighbouring states to facilitate the appraisal of water resources.

- A flood plain management model was developed which generated intense interest, particularly from Australia where several groups had applied the model successfully to problem flood plains.

- Resulting from a contract with the Water Research Commission, the so-called PWV-model was developed, which simulates the movement of water and salinity throughout the Vaal River water supply system. The model is currently being applied by the Directorate of Water Affairs to facilitate the identification and testing of engineering measures to improve the quality of water distributed by the Rand Water Board and of the water released to users downstream along the Vaal River.

The Minister said that the Unit had also significantly contributed to an improved hydrological expertise in the Republic. This was illustrated by the fact that sixteen masters and nine doctoral degrees had been earned by persons working in or in close collaboration with the Unit. Engineers had been seconded to the Unit by the Department of Water Affairs, the CSIR and several firms of consulting engineers, and had had the opportunity of acquiring skills in mathematical modelling.

"Sadly, the Hydrological Research Unit has now closed down after twenty two years of operation. As in the case of most university research units, the Unit was built round the expertise of one person, in this instance Professor Midgley. He has now retired and I should like to congratulate him on what he has achieved and wish him every success and happiness," the Minister said.

The University will continue its water research activities through the Water Systems Research Programme which has been established in the Department of Civil Engineering. (See *SA Waterbulletin,* May 1982).

Hydrology:

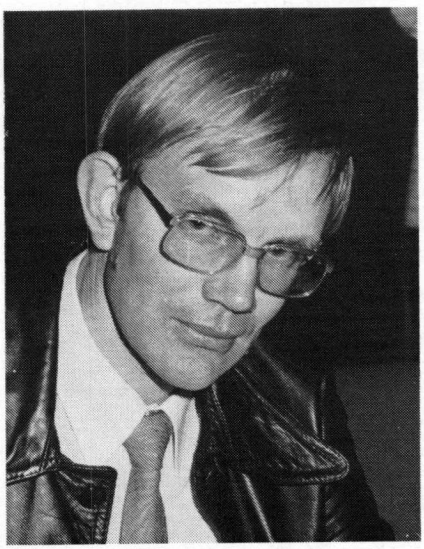
NEW RESEARCH PROGRAMME

A general view of the Ecca catchment. The research catchments are located only about 20 km from Grahamstown.

The Water Research Commission recently signed a contract with the University of Rhodes whereby the Hydrological Research Unit of the Department of Geography will conduct a new research programme on the generation of runoff, solutes and sediment in tributary catchments of the Great Fish River.

The project will run for a period of five years and the research team will be led by Dr JH (Hume) Moolman, who was recently appointed to the Hydrological Research Unit in Grahamstown. The main objective of the project is to overcome the high degree of empiricism of rainfall-runoff and hydro-salinity models currently in use in South Africa. Other aims include

- The collection of data on the principal processes associated with mineralisation, such as the natural generation, storage and transport of runoff, solutes and sediment as dynamically varying distributed processes at suitable locations in uncultivated semi-arid research catchments near Grahamstown.
- The analysis of the collected data with the view to test and improve existing hypotheses and assumptions regarding the natural processes associated with mineralisation and their interrelationships.
- The improvement of existing hydro-salinity models incorporating the improved knowledge of processes.



Dr Hume Moolman, leader of the research team.

The collected data, as well as data from any other mineralised catchments obtainable from the National Institute for Water Research, government departments and other universities will also be used to develop and test new models that will be suitable for applications of the following nature:

- Prediction of the influence of land use changes on both the hydrological and salinity regimes; for instance, the effects of the proposed scheduling of

additional irrigable areas in the middle and lower Fish, the lower Sundays and the Breede River catchments, as well as the consequences of the rapid progress of dry-land cultivation in the middle and lower Berg River catchment.

- The prediction of catchment management effects on the yield and salinity of runoff from mountain catchments where yield and especially salinity may be very important, e.g. the Little Karoo mountain catchments in the southern Cape.

- The development of a systems model for use in water resources management. This can be done by linking the hydro-salinity catchment model of the project to the Department of Agriculture and Fisheries' irrigation return flow model which they are developing for the Breede River irrigation areas.

The Hydrological Research Unit will utilize its present research catchment, the Ecca River catchment, for the project. The Ecca River catchment is a gauged research catchment of 74 km^2. It incorporates four nested gauged subcatchments varying in area from 1 km^2 to 23 km^2 situated in the Great Fish River catchment — one of the problem rivers in terms of salinity. (Concentrations in salinity in the runoff from the Ecca catchments fluctuate between 300 and 10 000 mg/1.) The vegetation is uniform over most of the catchment and the geology is uniform over about 70 percent of the area.

Well-defined tributaries as small as a few hectares inside the gauged subcatchments are common and would be extremely suitable for intensive studies of mineralisation processes, while the Ecca catchment is also in terms of climate, vegetation and geology, representative of most of the Great Fish River catchments and research results would therefore be applicable to the bigger area.

Members of the Steering Committee of the Great Fish River tributary catchments project pictured during the familiarization visit to one of the weirs in the research area.

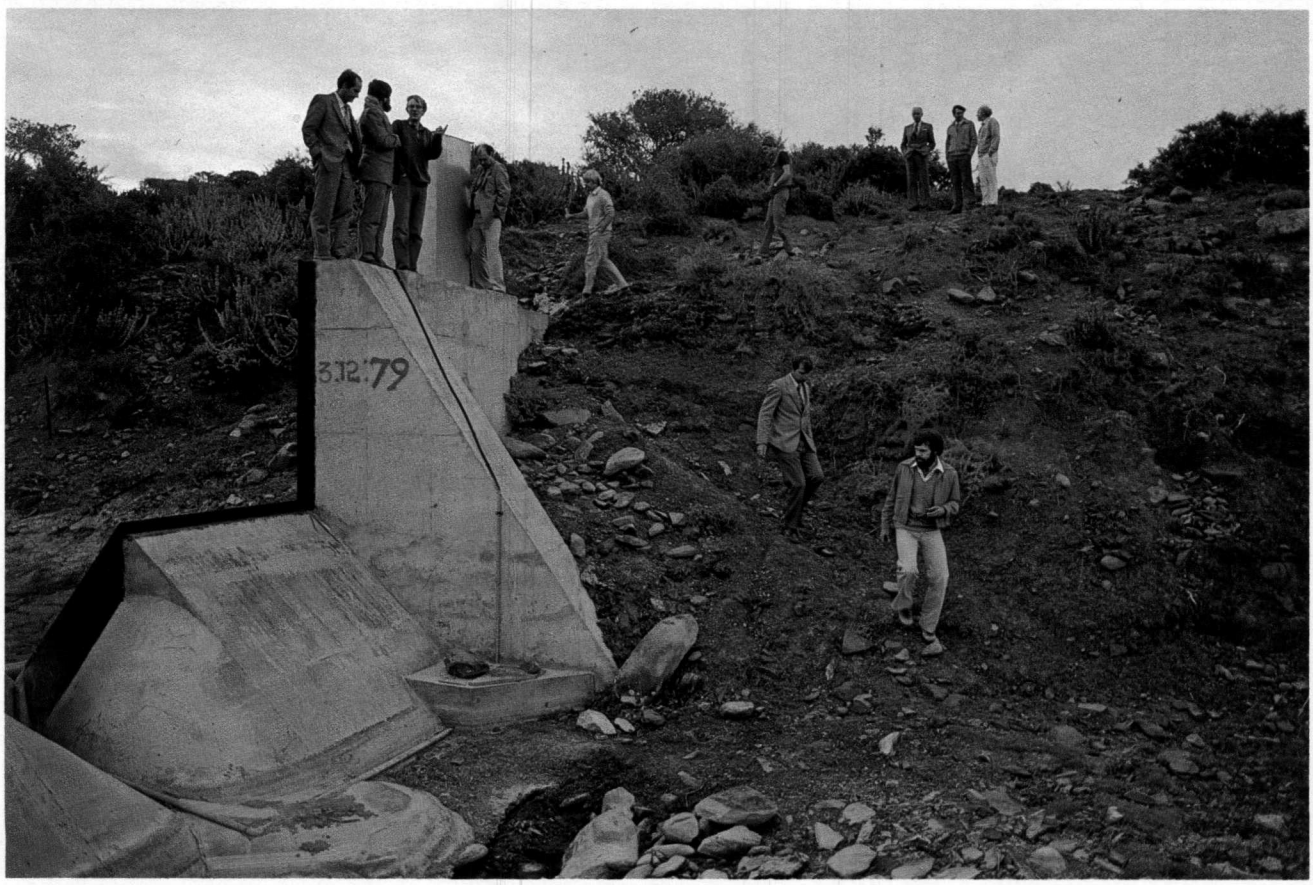
Hydrology

NEW REPORTS

The following reports were released for general circulation on request by the Water Research Commission:

- *Hydrological investigations in the Southern Cape coastal lakes region* by DA Hughes and AHM Görgens. The report deals with the physical setting, prevailing climate and available instrumentation as well as the precipitation characteristics and rainfall-runoff relationships. It is available from the Hydrological Research Unit, Department of Geography, Rhodes University, PO Box 94, Grahamstown 6140.

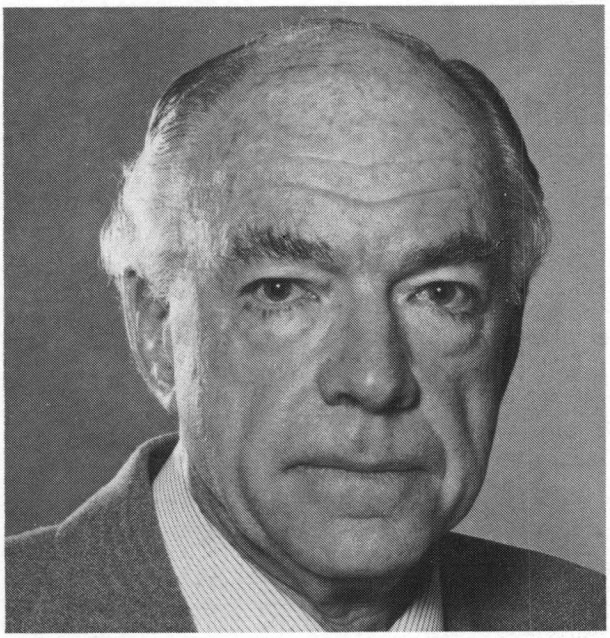
- *Temperature and evaporation data for the Zululand research catchments* by AS Hope, GJ Mulder and RM Sands. This report contains processed data and is available from the University of Zululand, Private Bag, KWA-DANGEZWA, Zululand.



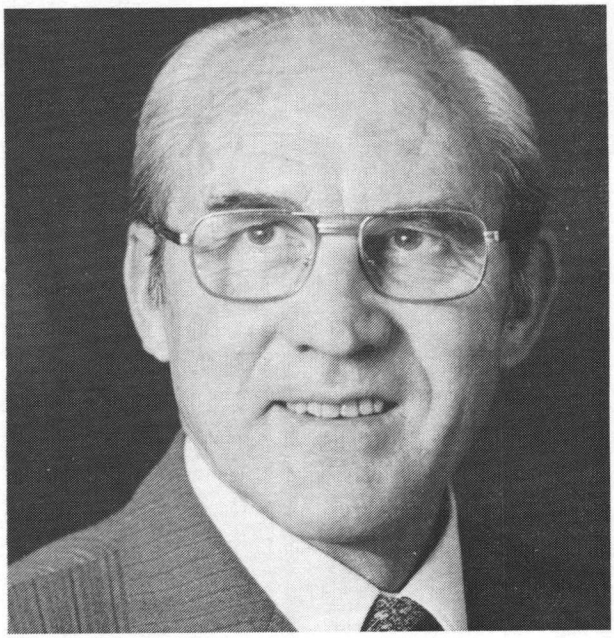
Die stede Johannesburg, Pretoria, Port Elizabeth en Windhoek het onlangs nuwe bekleërs in die pos van Stadsingenieur verwelkom. Op hierdie bladsye kry lesers die geleentheid om nie net die stadsingenieurs van nader te leer ken nie, maar ook om hulle menings oor hulle stede se waterprobleme in die komende dekade te verneem. Die bydraes is spesiaal vir *SA Waterbulletin* geskryf.

The cities of Johannesburg, Pretoria, Port Elizabeth and Windhoek recently welcomed new incumbents to the post of City Engineer. On these pages readers will be able not only to learn more about the city engineers, but also to obtain their views on the water problems of their cities over the next decade. The contributions have been written specially for *SA Waterbulletin.*

WATER — die stede in die toekoms / the cities in the future

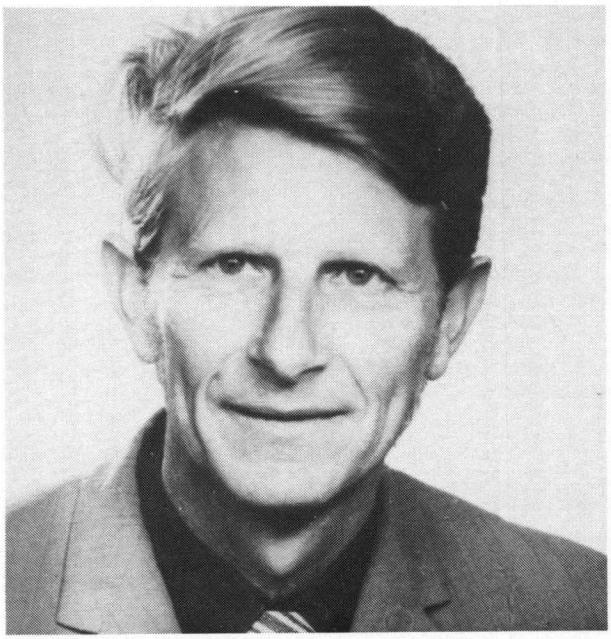


Mr JA Stewart, City Engineer, Johannesburg.



Mnr DH Marx, Stadsingenieur, Pretoria.

Mr AJ Clayton, City Engineer, Port Elizabeth.



Mr BL Haussmann, City Engineer, Windhoek.

Johannesburg – and the future

Johannesburg is in the unenviable position of having no readily available natural water resources to supply its ever increasing population. It is over 400 km from its nearest sea port. Its nearest major river is over 40 km away and it has no natural dams or lakes. It depends almost entirely on its potable water supplies from the Vaal River from which it draws, through the Rand Water Board's supply network, in excess of 200 000 Ml per annum to satisfy the demands of more than 2 million people of all races.

Johannesburg will thus be in an increasingly vulnerable position as time goes on, particularly as per capita water consumption is rising with the increasing standards of living of large sections of the population and also because of the continuing expansion of the PWV area which itself also depends on the Vaal River for its water supplies. In this regard it is significant that the water consumption of Soweto increased at the rate of over 15% per annum for the period 1973/74 to 1978/79 compared with the increase of approximately 3,1% per annum for the rest of the City area over the same period.

The City thus faces the challenge of ensuring absolute minimum wastage of water supplies, and in this regard individual house metering may not necessarily be the complete answer. With the very significant assistance of the Water Research Commission, the City's wastewater treatment plants serving the two watersheds in the North and the South have made, and are continuing to make, real progress towards eventual, in the long term full scale tertiary treatment of all effluents.

Johannesburg, like the other large cities in the Republic will inevitably have to face the problems of regional water supplies following on proposals recently under discussion at central government level. Its wastewater purification plants are already regional, accepting as they do, effluents from 9 adjacent authorities. The many and far reaching advantages of a metropolitan or regional approach to the problems of transportation have adequately been demonstrated following the passing of the Urban Transport Act (Act No 78 of 1977) and the subsequent development of the various Metropolitan Transport Advisory Boards. Johannesburg was appointed the Core City for the Johannesburg Metropolitan Transport area. In the event of the establishment of regional water control, a total water management system, involving the supply and reticulation of potable water and wastewater purification and re-use will demand water expertise and management of the highest order.

These are the challenges which the city has to face in the future. Their solution will require close liaison and co-operation of many professional disciplines and as in the past, the Water Research Commission will have to play a leading role.

JA STEWART, Pr Eng

John Alan Stewart was born in Johannesburg on 1 May 1918. He matriculated at Parktown Boys High School in 1934 and obtained the degree of B Sc Eng (Civil) from the University of the Witwatersrand in 1941.

After having seen war service with the SA Engineering Corps he joined a firm of consulting engineers (FE Kanthack and Partners, now Watermeyer, Legge, Piesold & Uhlmann) and was employed as assistant engineer for a period of three and a half years.

Joining the City Council of Johannesburg he successively held the posts of assistant, principal, district, chief roads engineer; then became chief construction engineer, and senior deputy city engineer before being appointed to his current post.

Mr Stewart, Pr Eng, C Eng, MICE (London), FI Mun Engs SA, M Inst WPC, FSAICE is a past chairman of the Johannesburg Branch of the SA Institution of Civil Engineers; past member of the council of the SAICE, and of the executive committee and educational and training committee; member of the sectoral advisory committee on civil engineering of the economic planning branch of the Office of the Prime Minister; member of the professional advisory committee on civil engineering of the SA Council for Professional Engineers.

He is married with two daughters.

Pretoria – en die toekoms

Die stad het tans 'n gemiddelde waterverbruik van 300 000 m^3/dag met 'n piekwaterverbruik van meer as 400 000 m^3/dag. Die normale groeitempo is ongeveer 4% per jaar wat beteken dat in die jaar 2000 die verwagte verbruik ongeveer 600 000 m^3/dag kan wees.

Pretoria is tans vir ongeveer 80% van sy waterbehoefte van die Randwaterraad afhanklik en sal in die toekoms in 'n groter mate daarvan afhanklik wees, aangesien sy eie bronne, te wete die Rietvleidam-watersuiweringswerke en die dolomitiese fonteine aan die suidekant van die stad, beperkte moontlikhede vir uitbreiding bied. Die Randwaterraad-wet verbied ook Plaaslike Besture wat verbruikers is, om verdere eie bronne te ontwikkel sonder dié Raad se toestemming.

RIETVLEIDAMSKEMA

Die Stadsraad het reeds in 1928 'n dam in die Hennopsrivier gebou asook 'n watersuiweringsaanleg.

'n Konstante lewering van 18 000 m^3/dag word van hierdie

(Na bl. 16)

WATER – en die toekoms

(Vanaf bl. 15)

bron verkry maar dit kan moontlik verdubbel word.

'n Ondersoek is reeds aan die gang om die moontlikhede van uitbreiding van die suiweringswerke vir optimale benutting te bepaal.

DOLOMITIESE FONTEINE

Hierdie fonteine wat grotendeels aanleiding gegee het tot die stigting van die stad waar hy vandag is, is vanselfsprekend 'n baie ekonomiese bron wat met min voorafbehandeling aan die verbruikers gelewer kan word. Die maksimumlewering is egter afhanklik van die langtermyn reënvalpatroon en die lewering van sekere van die fonteine het al gewissel van ongeveer 14 000 m^3/dag na 'n langdurige droogte tot 30 000 m^3/dag na goeie reënjare.

Dit is dus duidelik dat Pretoria self nie veel kan doen om die toekomstige waternood die hoof te bied nie. Deur gereelde vooruitbepalings te maak en aan die Randwaterraad te voorsien word die liggaam in staat gestel om vooruitbeplanning te doen ten opsigte van verdere toevoer na die stad in ooreenstemming met hulle beleid.

Die aandag word tans toegespits op die aanvulling van watervoorsiening aan die sentrale stadsgebied en ander groeipunte waaronder die inlywing van sekere buitestedelike gebiede ook 'n moontlikheid is.

'n Verdere probleem wat besig is om kop uit te steek is die ernstige tekort aan geskikte vaklui vir die bedryf en instandhouding van die voorsieningstelsel. Baie min geskikte jong mense tree toe tot hierdie uiters noodsaaklike ambagskorps.

As gevolg van die algemene tekort van water in die Republiek en in die besonder drinkwater, wat in die voorsienbare toekoms verwag word, sal die volgende waterbesparingsmaatreëls in Pretoria steeds dringend oorweeg en waar moontlik geïmplimenteer word:

- 'n Premie op die watertarief vir oormatige verbruik.
- 'n Premie op die watertarief vir verbruikers buite geproklameerde dorpe.
- Ondersoek na metodes om verbruik te beperk sonder onaanvaarbare verlaging van lewenstandaarde.
- Beter benutting van gesuiwerde rioolwater.
- Aanmoediging van hergebruik van water deur nywerhede.

DH MARX, Pr Ing

DH Marx is op 11 Mei 1922 in die distrik Viljoenskroon, OVS, gebore. Hy matrikuleer te Greykollege, Bloemfontein en behaal die grade B Sc en B Sc Ing Siviel aan die Universiteit van Stellenbosch in 1946 en 1948 onderskeidelik.

Na graduering tree hy in diens van die Stadsraad van Pretoria waar hy gedurende die afgelope 33 jaar in elke onderafdeling van die Stadsingenieurs-afdeling vir 'n korter of 'n langer tydperk werksaam is. Sedert 1969 is hy Hoofingenieur van onderskeidelik die Onderafdelings Riolering, Ontwerp, Watervoorsiening en Skakelwerk, waarna hy bevorder word tot Adjunk-stadsingenieur (Werke) op 1 April 1980 en tot Stadsingenieur op 1 Mei 1982.

Hy is geregistreer as professionele ingenieur en is 'n genoot van die SA Instituut vir Siviele Ingenieurs, asook van die Instituut van Munisipale Ingenieurs van Suidelike Afrika. Hy het altesaam nege jaar in die Pretoriase takkomitee van eersgenoemde Instituut gedien, waarvan twee jaar as voorsitter was.

Sedert 1970 is hy lid van die Navorsingsloodskomitee van die NBNI insake riolering, dreinering en watervoorsiening en hy verteenwoordig die Verenigde Munisipale Bestuur in die Siviele Ingenieurswese-adviesraad.

Port Elizabeth – and the future

The Port Elizabeth Municipality acts as regional water authority for the Metropolitan area which includes Uitenhage, Despatch, part of the Diaz Divisional Council Area, the East Cape Administration Board Area and certain independent coastal resorts, the main ones being Jefferies Bay and Cape St. Francis. The Municipality supplies about 90% of the water demand in the area. The present annual average daily water demand on Port Elizabeth operated treatment works is about 125 Mℓ/day.

The main supplies of water are drawn from the Kromme and Kougha Rivers, but the original supplies to the City from the van Staadens, Sand and Bulk Rivers, which have been in use since the end of the nineteenth century, are still in use. The present supplies, with a return interval for failure of once in fifty years, are capable of delivering 190 Mℓ/day. An additional source, Elandsjagt, is at present being developed on the Kromme River where the Department of Environment Affairs is constructing a dam, and the Municipality an associated treatment works which will increase the capability of the system to 280 Mℓ/day. The additional water from this source is expected to become available in 1985. The augmented resources will be adequate until about the end of this century if growth continues at the present rate.

The Port Elizabeth Metropolitan Area has an allocation of 568 Mℓ/day from the Orange River Scheme which should be adequate to maintain supplies well into the next century. Although other local resources are still exploitable to the west of the City it is probable, because of the expansion to the north of the City, that water will be taken from the Orange River before further development of local resources as the future develop-

WATER – and the future

ment lies on the entry route to the region of this water. The timing of the requirement for Orange River water is uncertain at this stage as extended use of the existing system could be obtained if the Fishwater Flats Water Reclamation Works can be utilised as originally planned to provide reclaimed potable water from treated sewage effluent. An experimental R.O. unit is due to be commissioned this year to allow operational difficulties and costs to be assessed.

The Port Elizabeth Metropolitan Area is therefore well placed to meet expected water requirements well into the next century and it is hoped that in due course this will encourage industry with a high water requirement to locate in this region. The cost of obtaining water from undeveloped resources does cause concern. There has been a rapid rise in construction costs over recent years and these costs, combined with high interest rates, result in heavy finance charges.

The total cost of treated water from the new Elandsjagt Scheme will be in the region of R0,60 per Kℓ inclusive of finance charges and treatment. It is evident, as with all scarce commodities, that the charge for water to consumers will increase significantly in the next 20-30 years.

AJ CLAYTON, Pr Eng

Arthur J Clayton was born in Windhoek on 27 June 1935.

After matriculating at Windhoek High School in 1953 he obtained the B Sc Engineering (Civil) degree in 1957. He started work with an oil company in Cape Town and then spent two and a half years with a consulting firm and one year with a civil contracting firm before joining the South West Africa Roads Department in Windhoek in 1963.

He joined the Windhoek Municipality as an assistant roads engineer in 1965 and was appointed as city engineer in 1967. This appointment was held until March 1982

Windhoek – and the future

Windhoek, the capital of an arid country three fifths the size of the RSA, is located on the crest (1670 m) of a mountain range and some 700 km away from the nearest perennial river.

With water shortages like the present crisis, the best ways to reduce consumption are by public voluntary participation, through publicity campaigns, and by deterrent tariffs increasing proportionally with increased use.

Environmental and Water Pollution control

Should water not be available in sufficient and affordable quantities Windhoek's appearance will suffer.

The high pollution and low dilution of the inflow into a dam downstream of Windhoek could be solved by treating its water with the reclamation process.

- High phosphate content (15 mg/ℓ) of maturation pond effluent is not anticipated to affect a dam with a distance 70 km downstream.

High TDS of reclaimed water of 830 mg/ℓ is a challenge to scientists and is countered by blending (but not more than 15% of total) with water from other sources.

Additional sewage treatment works will be constructed on demand.

Water Supply Strategy and Economics

The responsibility to supply Windhoek with potable water rests with the central government of SWA/Namibia. A long term supply pattern stipulating the extent of municipal contribution (underground and reclamation) is to be determined by the two tiers of government and will depend on policy, on what assumptions are made with climatic dry cycles to define "safe yield" of surface water, and on economics.

The state is providing the bulk of water at a presently subsidised rate of 23c per kl. Price increases are inevitable. The cheapest and "safest" supply is underground water at between 15 c and 27 c/kℓ including pumping. A contradicting criterion is that underground resources are to be preserved for crisis years of low rainfall. The extraction installations for optimum use are, however, to be erected and the present programme to increase the existing number of boreholes from 40 to 50 should be continued.

In principle water should be conserved by all means and hence maximum use should be made of reclamation. An additional reclamation works would cost R3,7 m in 1982 and unit cost to the consumer would be 79 c/m^3 with 2 Mm^3/a (compared to the present average though outdated price of 38 c/m^3) which in years of drought is indispensable but a financial burden with full dams.

BL HAUSSMANN, Pr Eng

BL Haussmann was born in Swakopmund on the West Coast 49 years ago and received his education there. He graduated in 1955 at the University of Stellenbosch and his entire experience has been gained with the Windhoek Municipality where he entered service as engineer grade II.

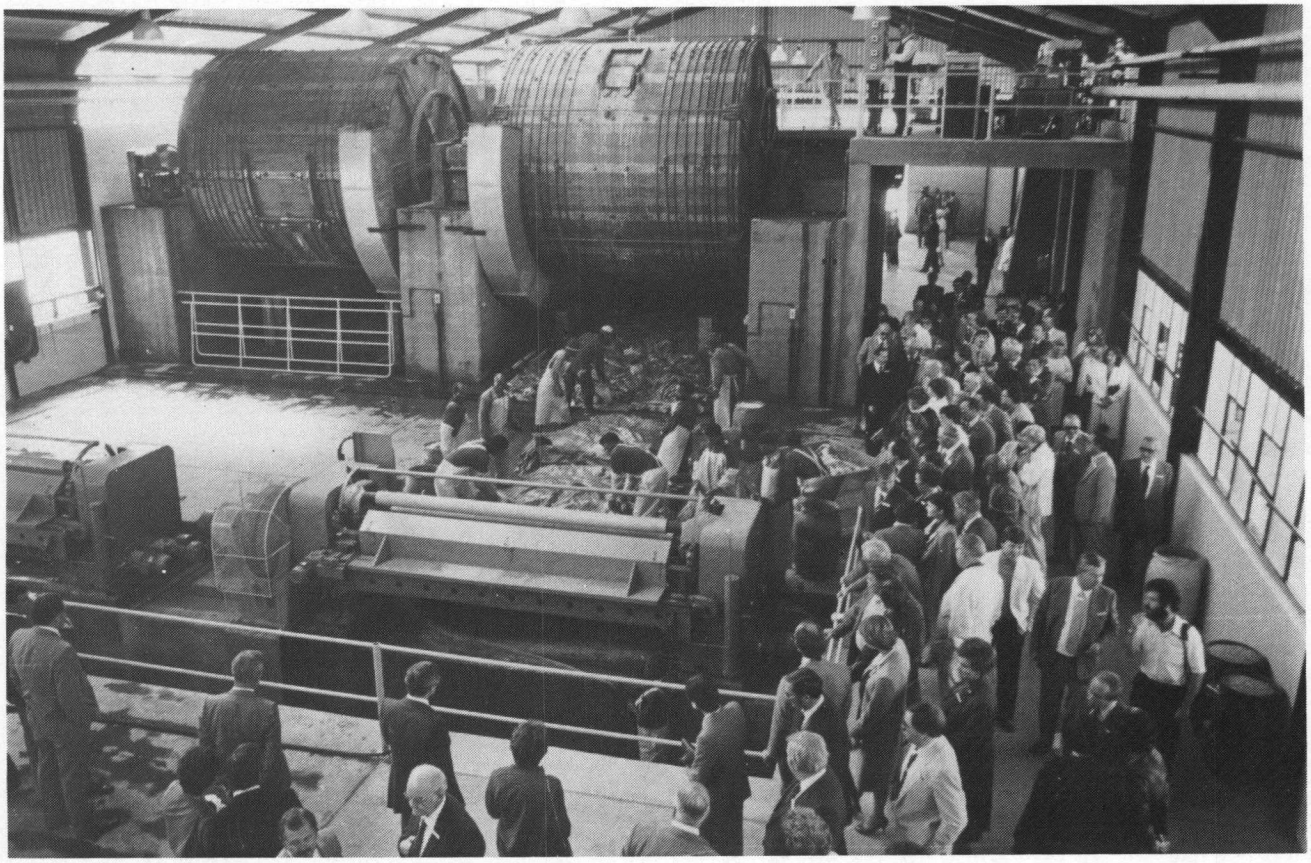
After holding the post of senior roads engineer, he was appointed deputy city engineer in 1967 and city engineer on 1 April 1982.

He is registered as a professional engineer and his institutional membership includes FSAIME (founder member), MIME, MSAICE, MAS & TS, and MEPA (founder member in SWA).

Mr Haussmann is married and has two sons. His interests and hobbies include farming, practical pistol shooting and photography, and he serves on a number of sports and social committees.

New tannery in Harrismith:

HIGH SALINITY IS LARGEST THREAT, SAYS MINISTER



Guests at the opening of General Hide Corporation's new factory at Harrismith viewing the beamhouse process.

'Increasing salinity poses the single largest threat to the quality of the Republic's limited water resouces'. This was said by Dr CV van der Merwe, Minister of Environment Affairs, when he recently opened in Harrismith the General Hide Corporation's new factory for the production of partly-processed, wet-blue hides for use by domestic and foreign tanneries.

The Minister said that traditionally tanneries and associated industries produced effluents which were notoriously difficult to treat in that they contained high concentrations of putrescible organic matter, a high mineral salt content and chemical constituents such as sulphides and chromates.

'Effluent problems in the hide and skin processing industry do not begin at the tannery,' the Minister said, 'since the method of hide curing can have a marked effect on effluent quality in the subsequent tanning operations.'

In order to remove excess moisture, hides have traditionally been cured by salting. On average about 6 kg of table salt were used to cure a 20 kg hide. The Minister said that the Republic produced some 2,5 million hides per annum with an average mass of 20 kg each. If curing was conducted by traditional methods, this represented an annual use of 15 000 tons of salt of which about 5 000 tons were disposed of at the curing sheds and the remaining 10 000 tons would be removed in the soaking processes at tanneries throughout the country. The tanners would then add a further 5 000 tons of various salts in their delining, pickling and tanning processes. Part of this will find its way to rivers and streams.

'General Hide Corporation's modern tannery here at Harrismith represents the first full-scale departure from conventional curing and tanning technology in the country,' the Minister said. 'This tannery will receive some 480 000 hides per annum from Cato Ridge and Johannesburg where they will be cured not with salt, but with a chemical antiseptic.

'Once here, the hides are subjected to a modern tanning sequence employing recycle of chrome liquors and terminating in a light chrome tan to produce so-

The Minister of Environment Affairs unveiling the plaque at GHC's new tannery near Harrismith in the Orange Free State.

called ''wet-blue'' hides. These hides can be exported or stored for long periods and allow much flexibility in subsequent tanning processes.'

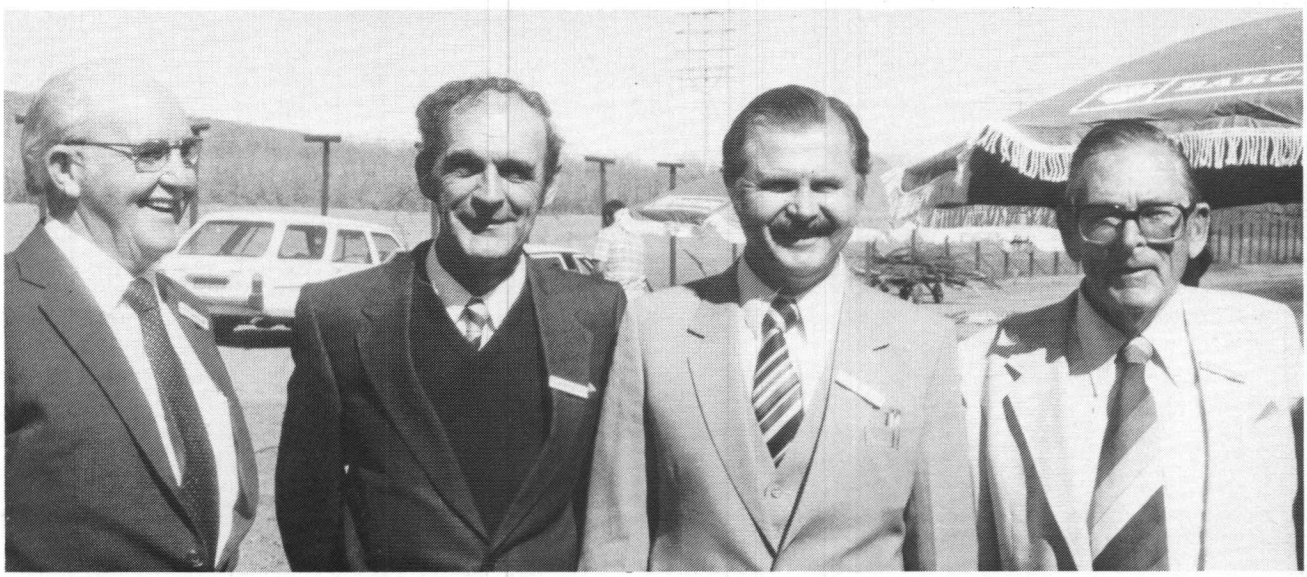
The Minister said that he sincerely hoped that General Hide Corporation's venture would serve as a model for future tanning operations.

'Even existing tanneries and curers can greatly improve their effluent quality by switching some or all of their production to chemically cured hides,' the Minister said. 'In fact, I would urge a move away from salt curing even in rural areas where techniques such as shade drying can be employed.'

The Minister said that notwithstanding the improvements in technology tanneries would continue to produce effluent which is extremely difficult to treat. In this regard, the Republic had made significant advances in the last few years thanks to research conducted under the auspices and with the financial backing of the Water Research Commission.

The investigation launched by the Commission into treatment of mixed and individual tannery effluents had been conducted by the Leather Industries Research Institute. Studies had involved site specific research at four leather industries and would terminate in a guide which would be of use to tanneries and fellmongeries throughout the country.

Guests from all over the Republic, Qua-Qua and England, France and Italy attended the opening ceremony and a tour through the factory.



Dr MR Henzen (chairman, WRC); Dr DR Cooper (director, Leather Industries Research Institute); Dr OO Hart (senior adviser, WRC) and Dr SG Shuttleworth (consultant to and former director of LIRI) were amongst the guests at the opening ceremony.

IMIESA

WATER DUURDER, SÊ MINISTER

''Inflasie is sonder twyfel die grootste enkele rede vir verhogings in die waterprys'', het Sy Edele dr CV van der Merwe, Minister van Omgewingsake, gesê toe hy die vyf en vyftigste konferensie van die Instituut van Munisipale Ingenieurs van Suidelike Afrika onlangs in Durban geopen het. Die Minister het gesê die Republiek se beperkte waterbronne speel ook 'n al hoe belangriker rol in die bepaling van wat water gaan kos, en Suid-Afrikaners sal hulle moet klaar maak vir 'n konstante verhoging in die waterprys.

Met verwysing na die Brown-verslag het die Minister gesê dat die gemiddelde koste van water in metropolitaanse gebiede gedurende die finansiële jaar 1977/78 14,3 c/m³ was, terwyl die prys vandag, vier jaar later, met meer as vyftig persent gestyg het.

Die Minister het gesê dat volgens die jongste beskikbare syfers die huishoudelike verbruik van water wat in 1970 meer as 1 700 miljoen m³ beloop het, tot ongeveer 7 600 miljoen m³ teen die jaar 2000 sal styg — 'n gemiddelde toename van net meer as vyf persent per jaar.

Volgens die Minister het dieselfde ondersoek ook getoon dat twee-derdes van al die water wat deur plaaslike owerhede verskaf word, na metropolitaanse gebiede vloei, en dat die vraag na water vroeg aan die begin van die volgende eeu die volume water wat uit natuurlike bronne beskikbaar is, sal oorskry. ''Die stadium is alreeds bereik waar die doeltreffende administrasie van watervoorsiening en waterverbruik nie net van die allergrootste belang geword het nie, maar in die toekoms ook al hoe meer aandag sal vereis,'' het die Minister gesê.

Dr Van der Merwe het gesê dit is vir hom 'n genoeë om aan te kondig dat 'n subsidieskema goedgekeur is vir die opspoor en benutting van ondergrondse waterbronne. Hy het daarop gewys dat sommige plaaslike owerhede meen dat dit onwys is om van onderaardse waterbronne afhanklik te wees, maar ''hoewel boorgate al in die verlede opgedroog het, is dit 'n feit dat grondwaterbronne voortdurend aangevul word. Wanneer die versekerde lewering van hierdie bronne vasgestel is, en dit word met oorleg gebruik, kan dit 'n aansienlike bydrae lewer om baie gebiede van water te voorsien'', het die Minister gesê.

Beleid

Die Minister het voorts gesê daar is in die laaste tyd baie gepraat en gegis oor die prys en voorsiening van water, en drie riglyne gegee waarvolgens die Departement hul beleid in die toekoms sal bepaal:

- Eerstens is dit die Staat en elke plaaslike owerheid se plig om te sorg dat daar aan die gemeenskap 'n voldoende watervoorraad van goeie gehalte beskikbaar is om aan sy higiëniese en basiese vereistes te voldoen. Die tarief op hierdie basiese behoefte behoort bepaal te word volgens die betaalvermoë van die betrokke gemeenskap.
- Tweedens moet die prys van water die skaarsheid van die kommoditeit weerspieël.
- Derdens moet die prys van water die groot kapitaalkoste wat waterwerke verg, weerspieël en behoort aanvullende voorrade teen die werklike prys pleks van die gemiddelde prys van al die voorrade gelewer te word. Dr Van der Merwe het

Minister CV van der Merwe open die konferensie. V.l.n.r.: Mnr DC Macleod (gasheer-ingenieur — Durban); aartsdeken J Draper; rl. SC Hotz (burgemeester van Durban); die Minister; mnr CJW Ross (stadsingenieur — Bloemfontein); mnr EJ Hall (verkose president van IMIESA); mnr WCD Smith (ere-sekretaris).

'n Algemene blik op die afgevaardigdes na die IMIESA-konferensie wat vanjaar in Durban gehou is.

gesê om aan hierdie drie vereistes te voldoen is dit duidelik dat tariewe op alle vlakke van die verbruikers teen 'n glyskaaltarief gehef behoort te word.

Waterverbruik

Die Minister het gesê 'n ander faktor wat die Departement van groot belang ag, is die kwessie van die meet van waterverbruik en die nodige rekordhouding in hierdie verband. Met die insameling van gegewens oor verbruike by plaaslike owerhede het die Departement gevind dat die posisie glad nie na wense is nie. In baie gevalle is die gegewens so onvolledig en onbetroubaar dat dit nie vir die beplanning van toekomstige werke vir die betrokke owerhede gebruik sal kan word nie. ''U mag wel vra of die akkurate meting van waterverbruik 'n noemenswaardige rol in waterbesparing speel. Geen owerheid kan sy waterlewering doeltreffend bestuur as hy nie in staat is om afwykings en verliese te kan opspoor nie en watermeters is die enigste middel tot hierdie doel'', het die Minister beklemtoon.

Hulpverlening

Wat finansiële hulp deur die Departement aan plaaslike owerhede betref het die Minister gesê dat 'n stelsel van hulpverlening onlangs hersien is en dat die wysiging reeds op 1 April vanjaar in werking getree het.

''Vertoë is al tot die Departement gerig om finansiële hulp aan plaaslike owerhede te verleen ten opsigte van koste wat aangegaan word in verband met die aanlê van rioleringskemas. Die Departement se beleid was nog altyd dat daar 'n verpligting op die verbruiker van water rus om die afloop wat uit die verbruik daarvan ontstaan, te suiwer tot 'n standaard waarvolgens dit nie ander mense sal benadeel wanneer dit hergebruik word nie. Die algemene standaard wat deur my in oorleg met die Buro vir Standaarde neergelê is, is 'n standaard wat myns insiens deur almal sonder buitensporige uitgawe gehandhaaf kan word'', het die Minister gesê.

Dr Van der Merwe het gesê dat daar wel regverdiging mag bestaan om finansiële bystand op 'n beperkte grondslag aan veral kleinere plaaslike owerhede te verleen waar rioleringswerke om higiëniese of ander geregverdigde redes, aangelê moet word of waar 'n hoër standaard van suiwering as die algemene standaard vereis word.

''Hierdie aspek word tans nog verder deur die Komitee van ondersoek na die Finansies van Plaaslike Besture ondersoek, en daar sal gewag moet word op die aanbevelings wat gemaak sal word,'' het hy gesê.

Besoedeling

Volgens dr Van der Merwe was die bepalings in verband met besoedelingsbeheer soos vervat in die Waterwet, 1956 'n versiende stuk wetgewing wat ons land se waterbronne tot dusver help vrywaar het van katastrofiese besoedelingsrampe. Met toenemende industrialisering en verstedeliking van die volkshuishouding, het die Departement bevind dat ons ook ten opsigte van wetgewing met ontwikkeling saam sal moet beweeg om die geleidelike verswakking van die kwaliteit van ons waterbronne, wat ongelukkig steeds voortgaan, betyds te kan

(Na bl. 22)

Die nuutverkose president van IMIESA, mnr EJ Hall, en sy aanvallige gade na sy inhuldiging. Mnr Hall is 'n voormalige stadsingenieur van Johannesburg en ook 'n lid van die Waternavorsingskommissie.

(Onder): Vier gades van vooraanstaande IMIESA-persoonlikhede en hul gasvrou afgeneem by die haainavorsingstasie te Umhlanga Rocks. In die gewone volgorde verskyn mevv Ross, Mcleod, Mackintosh (gasvrou), Hall en Smith.

(Van bl. 21)

beheer. Strenger wetgewing om dit te bereik kan nie vermy word nie, het die Minister gesê.

Hy het gesê aandag word tans gewy aan 'n algehele hersiening van die Waterwet en wetswysigings ten opsigte van nywerheidswaterverbruik en besoedelingsbeheer.

Sommige aspekte in die voorgestelde wetswysiging sal onder meer die volgende insluit:

- Die uitbreiding van bevoegdhede van beheer oor waterverbruik en uitvloeisels tot nywerhede wat gemiddeld tot 100 kubieke meter water per dag oor 'n maand gebruik.
- Die voorgestelde oplegging van 'n beletsel op alle plaaslike owerhede en ander statutêre liggame om water vir nywerheidsgebruik te lewer aan 'n nywerheid wat nie oor 'n permit ingevolge die Waterwet beskik vir die gebruik van water nie. Sodanige permit sal 'n nywerheid ipso facto onderhewig stel aan besoedelingsbeheermaatreëls in terme van die Wet.
- Die verlening van bevoegdhede aan die Minister om 'n plaaslike owerheid te versoek om waterverskaffing aan 'n nywerheid te staak indien sodanige nywerheid in gebreke sou bly om besoedeling van die wateromgewing te voorkom.

Ingenieurs

Die Minister het die munisipale ingenieurs bedank vir die wyse waarop hulle hul pligte nakom, veral op die bebied van rioolsuiwering en watervoorsiening. ''Die onrusbarende uitbreek van cholera wat in sommige gebiede epidemiese afmetings aangeneem het, het die noodsaaklikheid van waterverskaffing van die hoogste gehalte aan alle bevolkingsgroepe opnuut weer beklemtoon,'' het hy gesê.

Dr Van der Merwe het gesê baie werk sal nog in die toekoms gedoen moet word om genoegsame voorrade gesuiwerde water aan plattelandse gebiede te voorsien,

en bygevoeg dat hy glo dat daar in sommige gebiede ernstige aandag gegee moet word aan die gehalte van die water wat gelewer word.

Met hierdie saak in gedagte het die Departement van Omgewingsake in samewerking met die Departement van Gesondheid en Welsyn wetgewing opgestel wat die minimum opleidingsvereistes sal bepaal vir persone wat watersuiweringswerke bedryf.

"Daar sal in die toekoms van plaaslike owerhede vereis word om toe te sien dat hulle operateurs 'n goeie kennis en praktiese ondervinding van watersuiwering het," het die Minister gesê.

Die Minister het gesê die Direktoraat van Waterwese het gevind dat indien waterwerkeoperateurs die kursus vir tegnici suksesvol wil voltooi, voorafopleiding 'n vereiste is.

Kursusse vir indiensopleiding word tans gereeld gehou vir beide swart en blanke operateurs en vakleerlinge en het gelei tot 'n baie hoë slaagyfer in Techniconeksamens. Die Minister het voorts gesê dat indien munisipaliteite hulle operateurs na die Direktoraat wil stuur vir hierdie voorafopleiding hulle baie welkom is.

Waterrade

Dr Van der Merwe het ten slotte daarop gewys dat die totstandkoming gedurende die afgelope tien jaar van 'n aantal waterrade 'n nuwe faktor in waterverskaffing en bestuur gebring het. Die Minister het gesê hy voorsien dat meer van die werke van wat tans deur die Direktoraat van Waterwese bestuur word in die toekoms waterraadskemas sal word.

"Wetgewing wat verlede jaar in werking gestel is en wat waterrade magtig om rioolsuiweringsprojekte aan te pak in oorleg met plaaslike owerhede, sal dit moontlik maak om rioolsuiwering te regionaliseer waar dit 'n meer ekonomiese oplossing blyk te wees. Dit sal die waterrade ook in staat stel om 'n meer doeltreffende rol te speel in die beskerming van watervoorrade teen moontlike besoedeling", het die Minister gesê.

In die Novemberuitgawe word oor enkele van die referate berig.

NEW PUBLICATIONS ...

RECLAMATION & VEGETATION RESEARCH JOURNAL

by M K Wali and E M Watkin (editors-in-chief)

Elsevier's new journal RECLAMATION & REVEGETATION RESEARCH is an international and interdisciplinary forum for original scientific contributions directly relevant to the reclamation and rehabilitation of drastically disturbed lands.

Because of the inherent nature of the subject, papers published will cover areas of

- agronomy
- biology
- ecology
- engineering
- geology
- hydrology
- soil science
- legal and planning aspects

Authors are invited to submit suitable manuscripts, in triplicate, to: The Editorial Secretariat, "Reclamation & Revegetation Research", P.O. Box 330, 1000 AH Amsterdam, The Netherlands, or direct to one of the Editors-in-chief.

A detailed "Guide for Authors" is available on request and will be printed in the first issue of the journal.

Submission of Manuscripts

Manuscripts submitted should be original contributions not published elsewhere. Review articles will be accepted for publication only if these synthesize a body of information in a comprehensive manner, and make substantial contributions to reclamation and revegetation research. Each manuscript will be reviewed by two or more reviewers.

Articles of a descriptive or practical nature only are accepted at the discretion of the editors and published as (short) communications. A section will be devoted to book reviews, recent publications, conference announcements and meeting abstracts. Individuals and institutions are both encouraged to submit pertinent items. For effective use of space, all such items will be edited.

Chemistry

Environmental Chemistry Vol. 2

Senior Reporter: H.J.M. Bowen

For several years, the Royal Society of Chemistry has been publishing Specialist Periodical Reports (SPR's) – a series of annual (or in some cases biennial) review volumes which provide critical coverage of major areas of chemical research. SPR's are compiled by teams of scientists who have gained considerable respect for their contributions to the subject area.

First volume

The first volume of this series was published in 1975 and emphasized environmental organic chemistry whereas this second volume is deliberately slanted towards inorganic chemicals, covering the broad fields of the atmosphere and the hydrosphere, soils, and human diets. Reviewers of all these subjects agree that far too little information is available on the chemical forms of the elements in environmental reservoirs, thus laying down a challenge to analytical chemists. A broad review of mycotoxins is however included partly to redress the balance of inorganic topics.

Copies are available from

The Royal Society of Chemistry
Distribution Centre
Blackhorse Road
Letchworth
Herts. SG6 1HN

A large chemical factory such as Sasol II uses approximately 70 per cent of all its water supply for refrigeration purposes. The remainder primarily goes to steam generation, which in the case of Sasol II, is divided as follows:

- **one third of the steam becomes part of the product via our gasification process.**
- **a further third is used for the generation of electricity.**
- **one third is used for general purposes in the factory, mainly for heating purposes.**

THE WATER SYSTEM OF SASOL II*

by Deo Schrenk

Divisional Manager, Water Division

The source of water for the Sasol II factory is, firstly, the Grootdraai Dam situated in the upper Vaal River near Standerton, where water for the factory will eventually be drawn at a rate of 100 Mℓ/d. Drinking water is obtained from the Rand Water Board and the consumption will be approximately 2 Mℓ/d when the factory is in constant commissioning.

On account of South Africa's limited water resources, an effort has been made from the start of the Sasol II project to use the minimum of water. Where the processes allow for it, therefore, maximum use is made of air coolers. As a result the total water usage of the factory can be limited.

*Based on a talk to post conference delegates (IAWPR) in April 1982

The Sasol II factory is situated at the upper course of the Vaal Dam catchment area. Effluents from the plant would have to comply with the highest standards, or be totally eliminated. Early on during the project it had been decided that the factory would consist of non-effluent plant. This naturally meant that all effluents were to be reused or evaporated. For the project, Sasol was in many ways dependent upon own initiative — not to such a large extent regarding the individual upgrading processes, but to the magnitude of these processes and their intercoupling.

Basically the factory is divided into two cooling water systems. The first is the so-called utility cooling water system that contains relatively clean cooling water — oil pollution of this water must therefore be avoided at all times. The second is the process cooling water system, and it serves the largest part of the factory. A bigger danger exists that this water may be polluted in the processes.

Utility cooling water/ boiler feed-water/steam

As previously mentioned, raw water is received from the Grootdraai Dam in the Vaal River near Standerton via the Bosjesspruit Dam, which is situated south-east of the plant, and is fed to the factory by gravitation. The total water consumption of the factory when in full production is estimated at more than 100 Mℓ/d.

Firstly, water is sent through a flocculating process where the mud settles out and the clean water is transferred to a reservoir. This water is then fed to the utility cooling towers. Both these towers, as well as the process cooling tower, are hyperbolic, natural convention cooling towers. For the volume of water that Sasol II manages and the refrigeration of the water, the hyperbolic tower was the most economical type to construct.

Cooling water from the utility cooling towers circulates primarily to the steam/plant and the oxygen plant. In both these plants, oil pollution of the water will have dangerous effects e.g. in the steam plant it will curb the heat exchanging in the condensator tubes, and in the oxygen plant any oil in contact with the oxygen will result in explosions and fires.

An irregular aspect of this cooling water system is the fact that we can maintain two or less concentrations of salts in this cooling tower. The blowdown water is transferred to the boilerwater preparation plant, where it is upgraded to boiler water quality.

The preparation of boiler water consists firstly of warm lime softening to eliminate hardness of the water. Thereafter a further sodium softening is used to exchange the left-over calcium ions for sodium ions, whereafter the water is fed to the boilers. A part of the water after lime softening is fed through a demineralising plant. This demineralised water, together with condensate, is fed to a few waste heat boilers in the steam plant. A few boilers exist where even this demineralised water is not pure enough (as result of a high

A general view of Sasol II and III.

heat exchange rate) and therefore part of the demineralised water is fed through a polishing plant, from where the waste heat boilers are fed. Furthermore, steam is distributed to gasification, where the steam eventually condenses to form raw gas liquor, to electricity generation where condensate is recovered, and to different process units where a part is recovered as condensate. The condensate of the process units is monitored continuously to ensure that no polluted condensate is received back, and thus to ensure clean boiler feedwater.

Effluent upgrading and process cooling water

Regarding the different effluents that originate from the Sasol II factory, different methods are used for upgrading of the effluents so that the upgraded effluent may be used as process cooling water. The sources of effluents are, firstly effluents from water products that originate in the process itself. Saleable products are recovered from certain effluent streams, the products marketed by Sasol and the remaining water stream treated in an effluent treatment plant. Products that originate via these methods are chemicals like phenols, ammonia and other organic chemicals.

The next source of effluent is water that accumulates through the storm water and oil water dams via the different sewage systems in the factory. This water contains spilled oil, alcohols and other chemicals.

A next source of effluent is the blowdown water from the process cooling towers. This blowdown is necessary to curb the salt quality in the cooling water to acceptable levels. This water is also sent to the upgrading plant to lower the salt concentration.

At times the upgrading plant receives some domestic sewage from a seperate domestic sewage plant, which furnishes the necessary bacteria and lowers the load on the domestic sewage plant.

As seen on the flow diagram, fluoride from process effluents is precipitated by the addition of lime and the removal of CaF_2, after the effluents have been cooled down in a small cooling tower. All effluents are then mixed and fed to the activated sludge plant. This process is used for purification of domestic sewage, but it is used in our plant to upgrade the industrial effluent with the presence of enough carbon in the effluent to be used as food for the bacteria. The important process parameters are, firstly, the carbon and, secondly, the aeration in the big tanks where this activated sludge process takes place. This aeration is necessary to provide the bacteria with enough oxygen, and at the Sasol II plant there are four large blowers with 5,6 MW motors installed. The activated sludge process removes the biggest part of the organic impurities in the water through biological action. The ammonia in the water is also broken down through the nitrification/denitrification process.

Sludge and water are continuously drawn from these dams and sent to flocculators, where flocculating chemicals are added for the sludge to precipitate. A part of the sludge is recirculated to the aeration basins, and another part is permanently removed by putting it through a air flotation process. This air flotation process thickens the sludge to about 2 per cent solids content. Thereafter it is centrifugated to about 15 per cent solids, and then sent to the sludge in-

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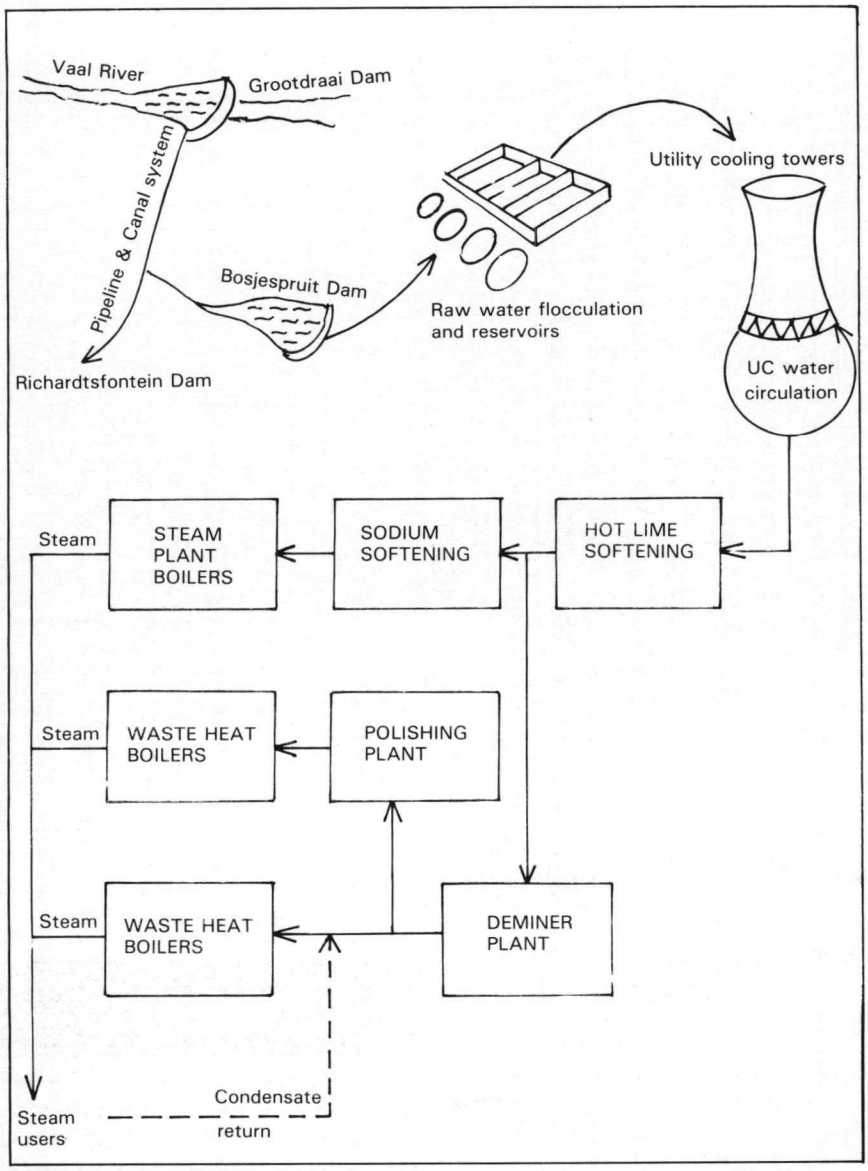


Raw water and boiler feed water treatment.

(From page 25)

cinerators to be incinerated. The centrate from the centrifuges are recirculated to the aeration basins.

The overflow of the flocculators is sent to the double media filters. These filters are loaded with sand and filtering carbon and are used to filter out all the solid particles and big flocs that are carried over with the overflow. The filtered water is passed on to activated carbon filters that absorb the remaining organic COD to a level acceptable for process cooling water. Because we use large volumes of activated carbon, and the activated carbon is saturated easily, we decided to erect our own carbon regeneration system. The carbon is regenerated by heating it at an exactly controlled temperature, whereby the absorbed organic particles are burned off.

The final phase in upgrading of the water is to send it through cation and anion changers, where the soluble salts are changed into more acceptable ions. The final water sent to the process cooling tower will be used to about 4 cycles of concentration, with salts accumulating in it, that means that we have to take the quality of the water into consideration before sending it out.

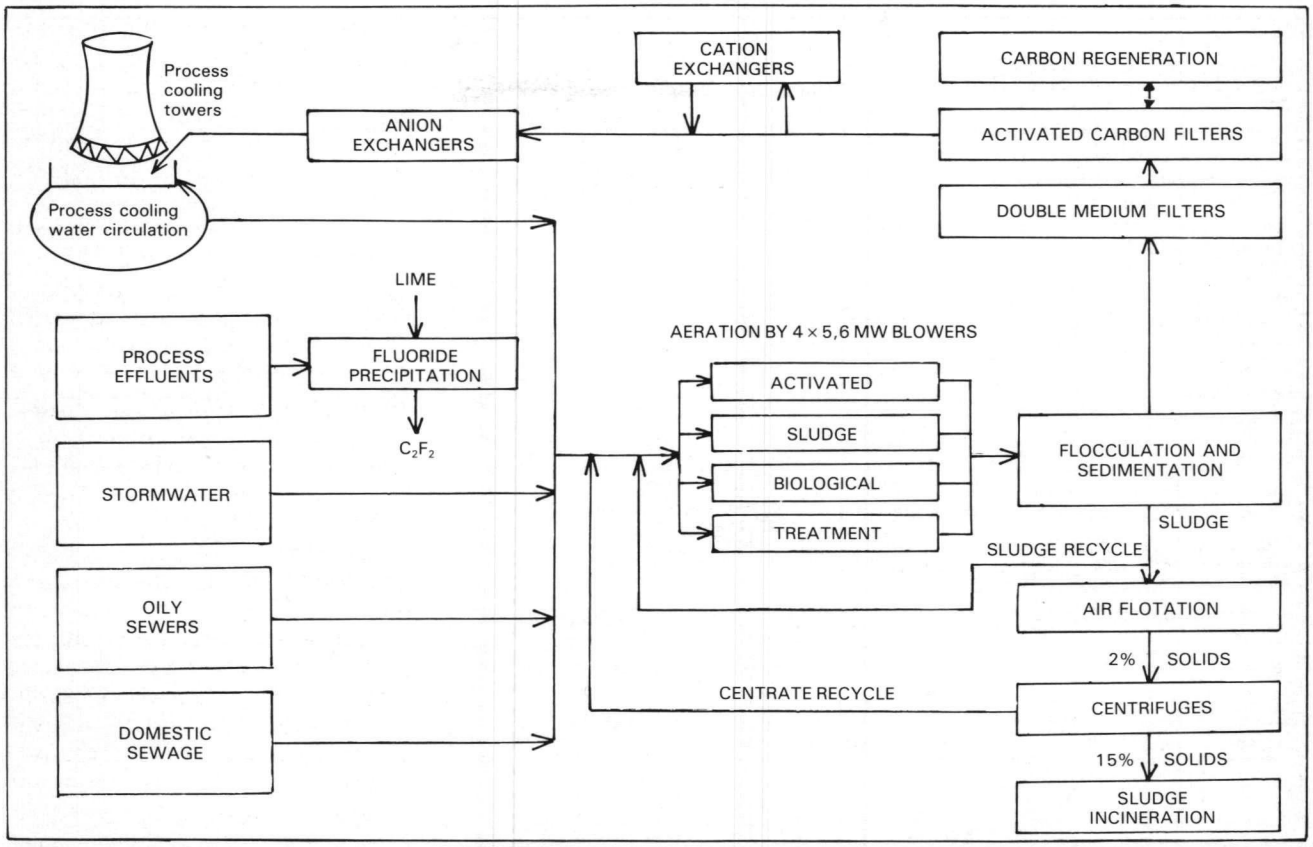
Water housekeeping

At Sasol II, we aim, in total, for a negative water balance whereby stormwater downflows during rainy times are taken into consideration. Our big storm water ponds can handle rain showers of up to 70 mm without any problems. This rainwater is pumped back to the different cooling water systems to help with the water balance.

Little streams of oils, alcohols and chemicals accumulate continuously in the different plants. The sewage design was, from the start, adapted so that pollution of cleaner water is kept to a minimum by keeping the sewage systems as far apart as possible. Thus we have internal sewage systems in the plants in order to minimize the danger of pollution. These internal sewages are not coupled to any general sewages, but are fed to catch basins and recirculated internally in the plant. The plant sewage system is the oil sewages that are spread throughout the factory, and where oily water effluents are dumped. This oil is then fed directly to the oil seperation dams where oil is continuously removed from the surface. The last sewage system is the storm water sewages that drain pollution free areas. This system usually operates at a low rate, except when a shower of rain takes place or a big dumping of water takes place in the factory; otherwise it carries washing water, (firewater), etc. Because this smaller stream of water may be polluted, the low flow of the stormwater sewages is fed to the oil dams. During rain showers, wtih a higher flow, the water flows to the storm water dams.

Domestic sewage is fed in seperate systems to the domestic sewage works. This sewage works cover both Secunda town and neighbouring black townships.

As a result of water treatment and upgrading of water by ion exchange, a lot of saline water is generated. This saline water is fed to evaporation ponds. At first we had an idea to evaporate the water by means of so-called ''takketorings'' but it proved not to be a success. The ''takketorings'' are common wood installations, filled with thorny branches, the water passes over the branches and the large



Effluent upgrading for use as process cooling water.

area results in high evaporation. Currently, we are looking at other means to evaporate saline water. We will eventually reach the point where the salt will be harvested for reuse.

Mnr Hans van Leeuwen, vroeër van die Nasionale Instituut vir Waternavorsing van die WNNR, het vanaf 1 Augustus 1982 'n pos as senior lektor in die Departement Chemiese Ingenieurswese (Afdeling Waterbenuttingsingenieurswese) van die Universiteit van Pretoria aanvaar.

Mnr Van Leeuwen was hoof van die Afdeling Industriële Uitvloeisel en senior hoofnavorsingsbeampte by die NIWN.

New publications

PROCEEDINGS OF THE SYMPOSIUM ON PEAT LANDS BELOW SEA LEVEL

Edited by H de Bakker and MW van den Berg
Softbound, 300 pages, 1981.
ISBN 90 70 260700

An International Symposium on Peat Lands below Sea Level took place at the International Agricultural Centre in Wageningen, The Netherlands, on August 24-28, 1981.

The proceedings assemble the papers as well as the reviews presented at the Symposium.

The papers and reviews were presented in three sessions of three papers each. Subjects treated: geology of the Holocene; history of the reclamation of the western fenlands and the organization to keep them drained; and soils and their geography; water management in the western Netherlands; drainage and behaviour of peat soils; and urban use of peat soils; use of peat soils for grassland; farm management on peat soils, and use of peat soils for horticulture.

In the reviews comparisons are made with coastal plain studies in several regions of the world.

O_3 GEBRUIK

Afvalwatersuiweringsinstallasies beskerm die omgewing teen waterbesoedeling, maar daar word dikwels beswaar gemaak dat hulle onwelriekend is en lugbesoedeling veroorsaak. Om hierdie probleem te bowe te kom is daar gedurende die laaste paar jaar geslote installasies met groter kapasiteite gebou wat skynbaar geen lugbesoedeling veroorsaak nie. Reuke en ander bakterieë word by dié suiweringswerke deur 'n hoë skoorsteen uitgeblaas sodat dit minder merkbaar is, maar tog baie beslis in die atmosfeer aanwesig bly.

'n Nuwe tegniek is egter onlangs ontwikkel waar die lug wat deur hierdie skoorstene vrygelaat word, eers deur 'n wasinstallasie gaan waar dit met osoonryke water gewas word. Die onwelriekende bestanddele word daardeur geoksideer en los dan gedeeltelik as onskadelike stowwe in die waswater op, terwyl bakterieë en ander skadelike mikro-organismes vernietig word.

TOERUSTING

Ten einde 'n inligtingsdiens aan ons lesers te lewer, verwelkom die redakteur bydraes vir publikasie (beperk tot ongeveer 300 woorde en een of twee foto's en diagramme) deur vervaardigers en verspreiders van nuwe toerusting en prosesse wat met die bevordering van wateraangeleenthede verband hou.

Sulke bydraes word egter ontvang of gepubliseer met dien verstande dat: (1) die betrokke vervaardiger of verspreider wat die bydrae lewer, verantwoordelik bly vir die inligting of menings daarin vervat en vir aansprake ten opsigte van daardie toerusting en prosesse; en (2) publikasie daarvan nie impliseer dat die redakteur of die uitgewer of die Waternavorsingskommissie die inhoud van so 'n bydrae aanbeveel of daarmee in ooreenstemming is nie.

Lesers wat meer inligting verlang, word versoek om direk met die vervaardigers of verspreiders in verbinding te tree.

Anton Prinsloo
REDAKTEUR

SA Waterbulletin
PO Box/Posbus 824
Pretoria 0001

EQUIPMENT

As an information service to our readers, the editor welcomes for publication contributions (limited to approximately 300 words and one or two photographs and diagrams) by manufacturers and distributors of new equipment and processes related to the promotion of water affairs.

Any such contribution is, however, received or published on the understanding that: (1) the relevant manufacturer or distributor submitting the contribution is responsible for the information or opinions expressed in it and the claims made therein for that equipment or those processes; and (2) its publication does not imply that the editor or publisher or the Water Research Commission underwrites or is in agreement with the contents of such contribution.

Readers who require further information are requested to contact the manufacturer or distributor direct.

Anton Prinsloo
EDITOR

NEW GENERAL PURPOSE PUMPS

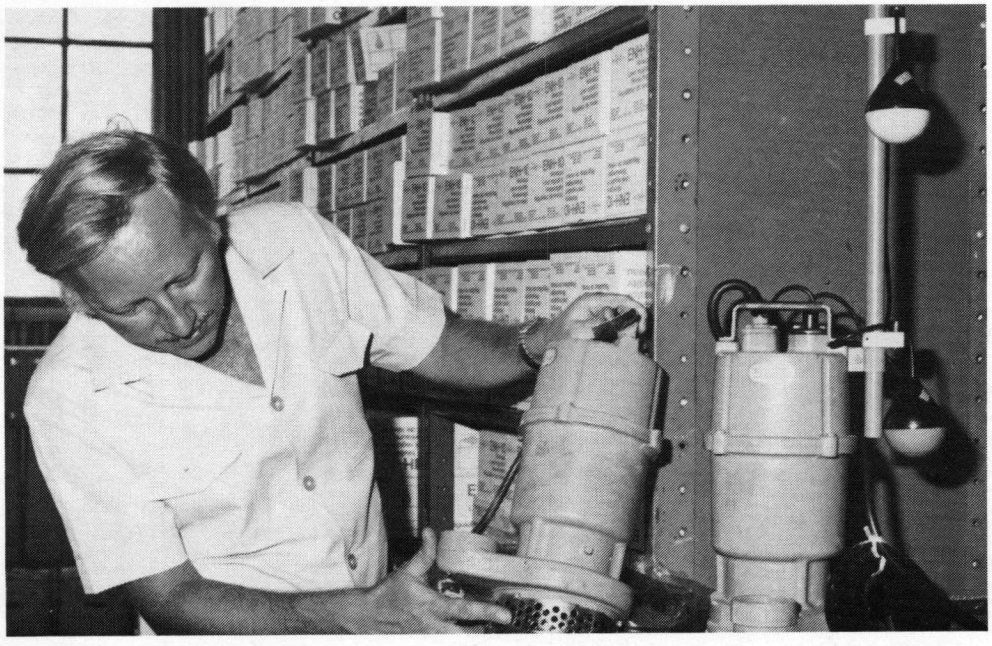
Flygt of Sweden, known throughout the world for their extensive range of high-quality submersible pumps – originators of the very first submersible – have just introduced a new range of low-cost general purpose submersible dewatering pumps to the South African market through their distributors Hugh Mellor, the pump people in Edenvale, Johannesburg.

The model L is for manual, and model LA for automatic operation, the LA coming complete with two miniature float control units for auto level control. Motors are either single or three phase, from 250 W to 750 W, and motor protection is provided as standard. Power is sufficient for 350 ℓ/min and 16 m head.

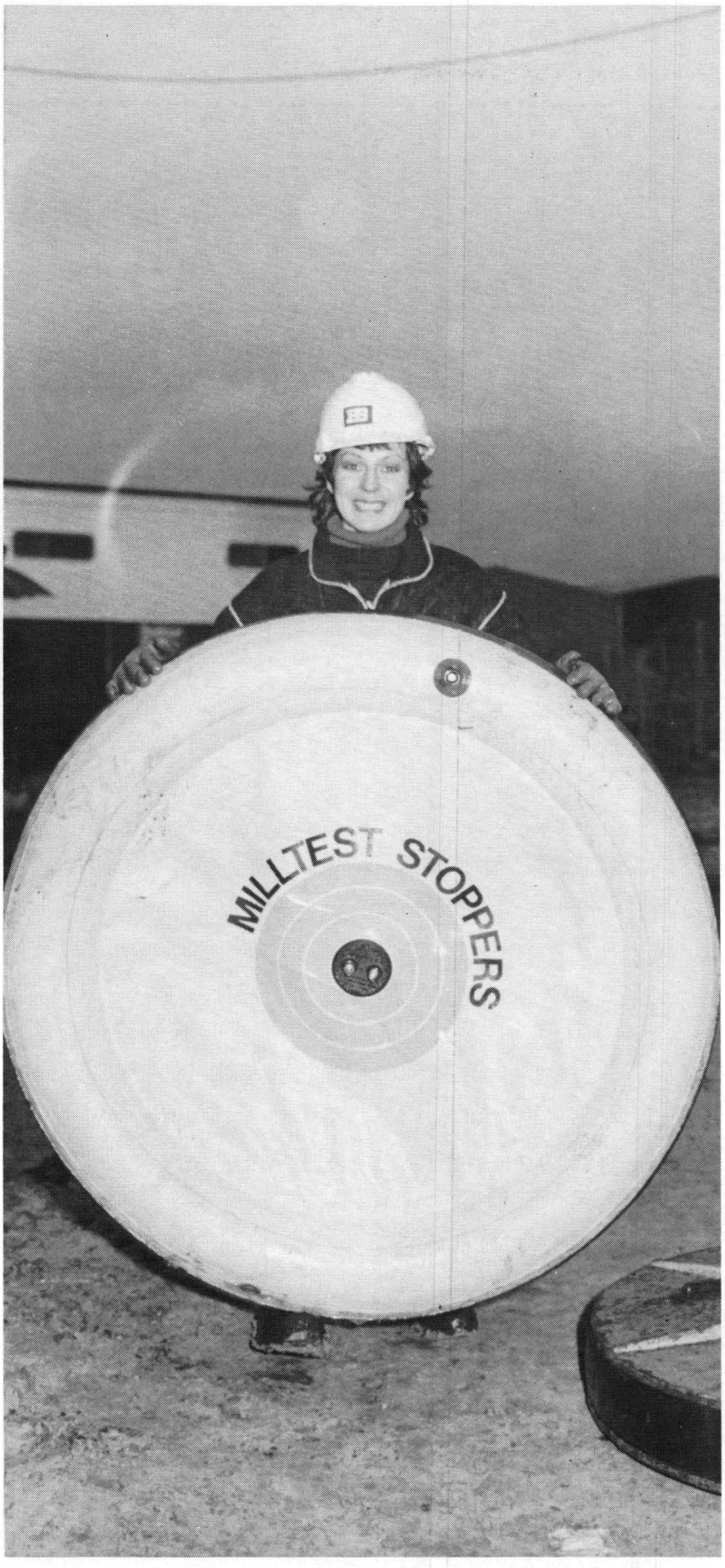
Hugh Mellor already market the ESPA range of mini submersible pumps which are ideal for parks, grounds, private gardens with fountains and small farms, and they operate on the vibrating armature principle. The L/LA series operate on the centrifugal principle, and are provided with double mechanical shaft seals as well as oil seals. The L/LA range will be able to fill the gap between the ESPA and the existing Flygt GF3041, and at the right price range.

The low-cost factor should not be a deterent when considering tough environmental conditions, such as found in South African mines as the pumps casing and impellor are in cast iron, and motor insulation is dry-type class E, with built-in motor overload protection.

Enquiries:
Hugh Mellor & Co. Ltd.,
PO Box 700,
Edenvale 1610.



Some of the pumps in the new Flygt series described in this article, being examined.



EQUIPMENT

NEW WAY TO CHECK PIPE LEAKS

Milltest pipe stoppers have brought a new technology to the task of checking pipes for leakage. They are manufactured by J.M. Henshaw Marine Ltd., Verrington Lodge, Wincanton, Somerset, England, who have used their extensive experience in the design and manufacture of inflatable boats to provide industry with a method of leak testing which offers many practical advantages.

Milltest stoppers comprise a membrane manufactured from hypalon/neoprene coated fabric contained within an inflatable tube, the circumference of which is covered by a neoprene band to ensure the effective seal.

Milltest pipe stoppers are suitable for all types of pipe and are available in 20 sizes from 350 mm to 1800 mm. They may be used with both metric and imperial size pipes. Individual sizes can be made to special order. Units up to 2100 mm have given excellent service.

Fraction

In comparison with traditional steel pipe stoppers, it will be immediately realised that Milltest units are only a fraction of the weight. Even the largest sizes can be manhandled in the deflated condition into the most inaccessable sites. There is no longer a need for crane assistance and transport from site to site can be undertaken by a small van or car.

The testing procedure is simple. Once the pipe wall has been cleaned, the Milltest stopper is placed in position and the tube inflated by foot pump or compressor to 10-15 PSI. Water can also be used for inflation purposes. When the second stopper has been installed, the pipe length is checked by building the pressure between the two stoppers through the Schrader valve on the centre of one stopper. The test is completed by observing readings on the U-gauge. Typically, the test procedure takes only five minutes.

Milltest pipe stoppers can be dispatched anywhere and, owing to their weight, can be air freighted to most locations at moderate cost direct from the manufacturer.

Enquiries:
Samuel & Pearce Ltd
4/6 George St
London Borough of
Richmond upon Thames
TW9 1JY
England.
Tel 01-9482204

EQUIPMENT

TRITIUM REMOVAL

Sulzer Canada has been awarded a contract by Ontario Hydro for the supply of a tritium removal system, to be installed at the Pickering Generating Station. This will be the first industrial-size tritium removal system in the world. The system consists of hydrogen isotope separation through a catalytic exchange cascade and a cryogenic distillation unit. The same principle was applied in a smaller tritium removal plant, which the Sulzer Group commissioned at the Institut Max von Laue/Paul Langevin research reactor in Grenoble, France in 1972.

The Sulzer Canada isotope separation department – first set up in Toronto in 1974 to deal with heavy water upgraders and finishing units – was expanded in 1978 to develop tritium removal technology.

Sulzer Canada has already supplied a broad range of high technology heavy engineering equipment and is a recognized supplier of components for CANDU reactors throughout the world.

The tritium removal plant at Pickering is scheduled for commissioning in 1985.

Sulzer's South African company, Sulzer Bros (South Africa) Ltd is based in Johannesburg.

Enquiries:
Sulzer Bros (South Africa) Ltd
PO Box 930
Johannesburg
2000
Tel 618-4125

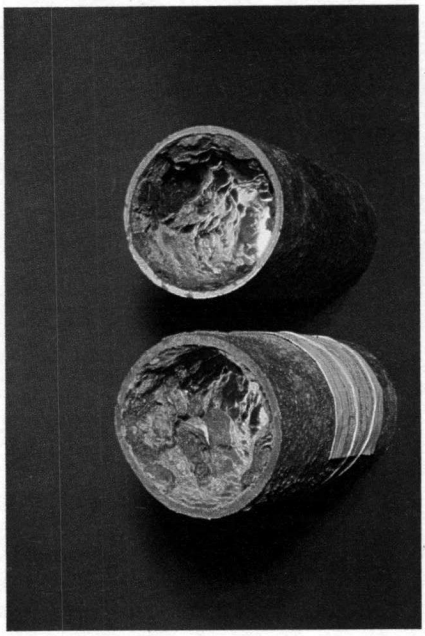
SELF-POWER DOSER

Wallace and Tiernan have introduced the self-powered chemical doser (SPCD) as an answer to the problem of treating small remote water sources with chemical reagent solutions.

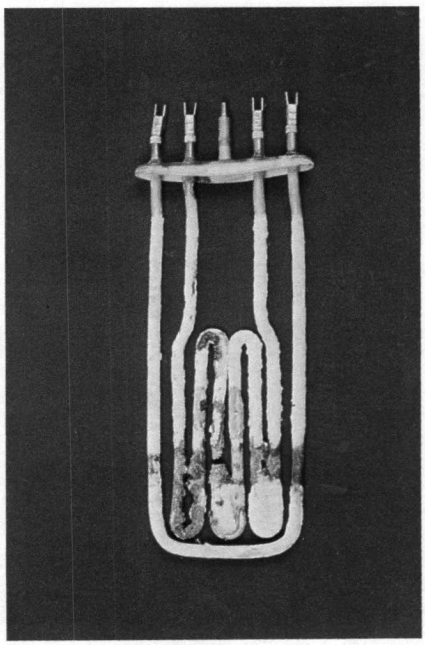
The manufacturers claim that the SPCD does not require any external motive force such as electricity or head of water to operate; can accommodate within acceptable limits variable flows and will stop under 'no flow' conditions; can apply a dose of more than 2,0 mg/ℓ at maximum water throughput using 10% sodium hypochlorite; has a chemical reservoir of 10 litres capacity which will last for more than 4½ days at maximum water flow with maximum chemical dose; has an adjustable dose setting range of 10:1; is manufactured from corrosion resistant materials throughout; and can be stripped and reassembled in minutes using only the most simple tools.

Enquiries:
Mr M Beevers
PO Box 458
Irene 1675
Tel (012) 65711/2

Hoogtepunte uit WNK-jaarverslag



Voorbeelde van korrosiewerking as gevolg van mineralisering.



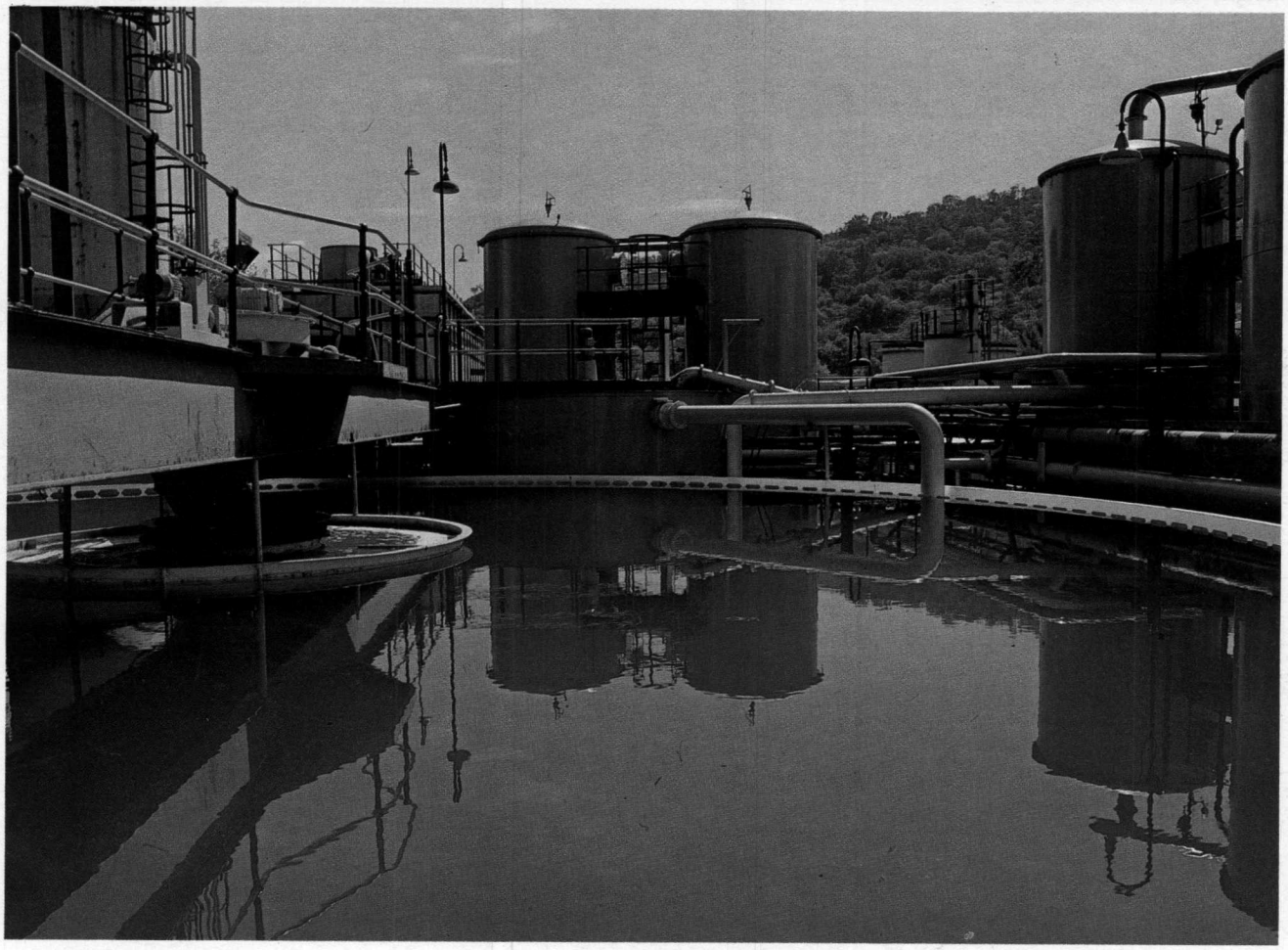
Ondersoeke na praktiese alternatiewe om die progressiewe toename in die soutinhoud van die water-voorsieningstelsel van die Vaal-barrage te kan bekamp

Die voortdurende toename in die opgeloste soutinhoud van die water in die watervoorsieningstelsel van die Vaal-barrage hou belangrike koste-implikasies vir plaaslike owerhede in. 'n Studie wat deur 'n spesialis-konsultant van die Kommissie uitgevoer is, het aan die lig gebring dat die toename in die soutinhoud van die water wat aan die Pretoria-Witwatersrand-Vaaldriehoekkompleks (PWV-kompleks) gelewer word, die gemeenskap tot R140-miljoen per jaar teen die einde van die eeu kan kos, indien maatreëls nie vroegtydig geneem word om die versouting stelselmatig te bekamp nie. Hierdie finansiële las sal deur die volgende faktore gesamentlik veroorsaak word:

- die nadelige effek van die hoë soutinhoud op huishoudelike loodgietersmateriale en warmwaterstelsels;
- 'n toename in die gebruik van seep;
- munisipale waterverspreidingsnetwerke word aan korrosie blootgestel en watermeters word deur die neerslag van soute aangetas; en
- die hergebruikspotensiaal van die water word aansienlik verlaag.

Ondersoeke na moontlike alternatiewe metodes om dié probleem die hoof te bied word tans deur die Departement van Omgewingsake uitgevoer aan die hand van verdere navorsing wat deur die Kommissie laat onderneem is.

WNK-jaarverslag



Die Stander-waterherwinningsaanleg by Das poort, Pretoria, waar die WNK geruime tyd navorsing gefinansier het.

WATER-HERWINNING

Vaartbelyning van koördinering in verband met navorsing oor waterherwinning in sy geheel

Die Kommissie het gedurende die jaar twee nuwe koördinerende navorsings- en ontwikkelingskomitees (KNO-komitees) in verband met waterherwinning in die lewe geroep. Die doel hiermee is om beter koördinering te bewerkstellig tussen die sewe navorsingsprojekte wat tans ondersteun word en om die navorsingsprogram meer vaartbelyn te maak. Op dié wyse kry lede van die nuwe KNO-komitees 'n meer oorsigtelike beeld van die navorsing.

Die KNO-komitee vir die Tegnologiese Aspekte van Waterherwinning het, behalwe die funksie van 'n gewone KNO-komitee, ook 'n bestuursfunksie ten opsigte van die projekte wat met die tegnologiese aspekte van waterherwinning te make het.

Die KNO-komitee vir die Gesondheidsaspekte van Waterherwinning het insgelyks 'n tweërlei funksie. Dit sal dus as loodskomitee optree vir die twee projekte in verband met die mikrobiologiese en gesondheidsaspekte van herwonne water en die epidemiologiese studies rakende waterherwinning.

Die nuwe bedeling het egter tot gevolg dat die KNO-komitees nie in besonderhede die tegniese besonderhede van elke projek kan behandel nie en die status van die tegniese subkomitees is gevolglik verhoog, om byvoorbeeld vorderingsverslae en navorsingsprogramme binne die breë beginselbesluite wat deur die KNO-komitee geneem is, goed te keur.

WATERBRON-NAVORSING

Daarstelling van meesternavorsingsplan oor die uitwerking van landelike grondbenutting en opvanggebiedbestuur op waterbronne

Tydens 'n werksessie oor die invloed van landelike grondbenutting en -bestuur op waterbronne wat in 1980 gehou is, is leemtes in die kennis in verband met hierdie onderwerp en die navorsingsbehoeftes geïdentifiseer en 'n meesternavorsingsplan hieroor is deur die koördinerende navorsingskomitee vir die Hidrologiese Siklus (KNHS) opgestel.

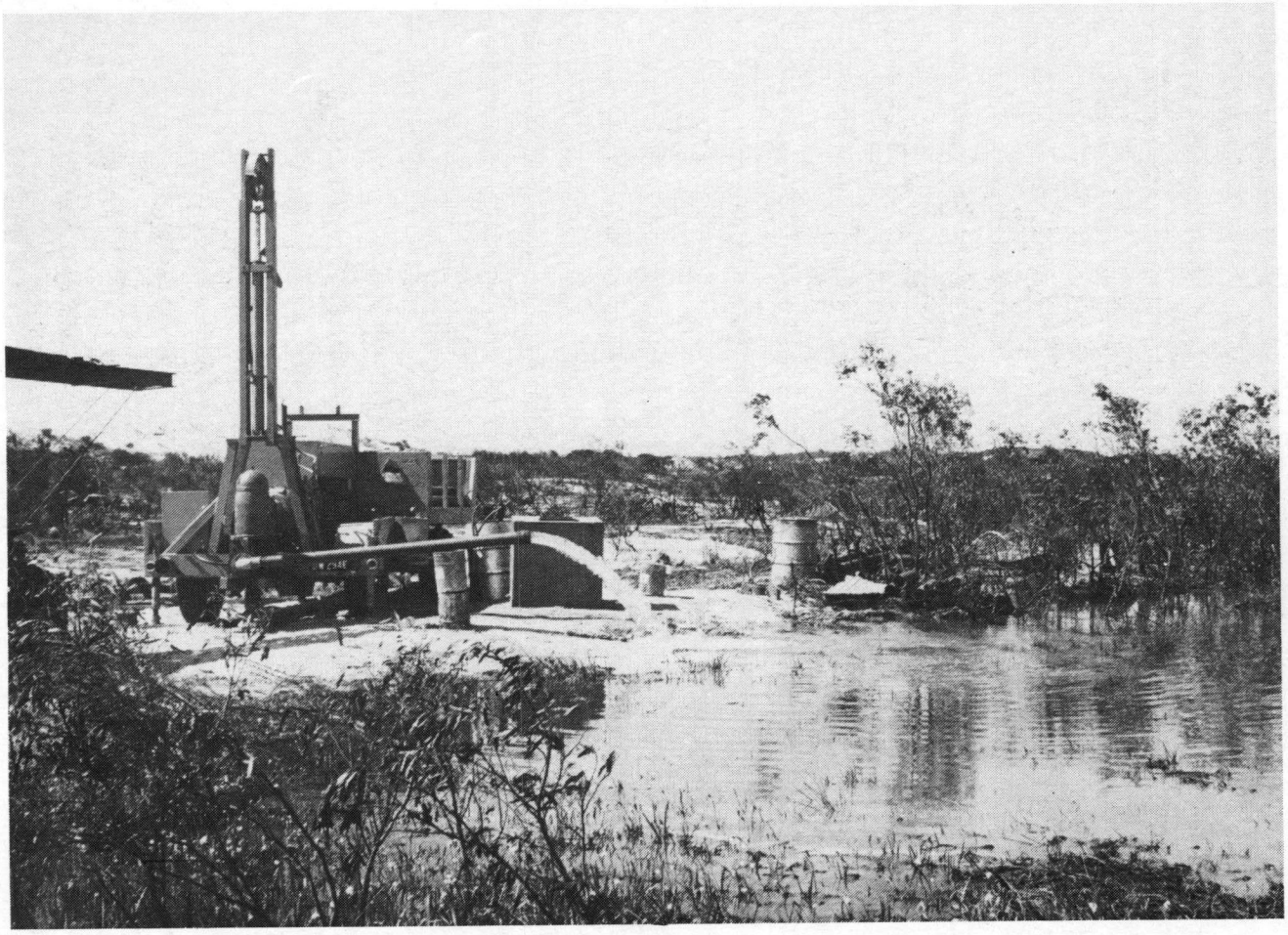
Die meesterplan as sodanig is deur die Kommissie in beginsel aanvaar en die volgende doelwitte word daarin vervat, nl:

- om die beskikbaarheid van voordelig bruikbare water te verhoog;

WNK-jaarverslag

- om die voordelige benutting van water te optimiseer; en
- om nadelige invloede op waterbronne te minimiseer.

Om navorsers die geleentheid te bied om spesifieke navorsingsvoorstelle aan die Koördinerende Navorsingskomitee vir die Hidrologiese Siklus (KNHS) voor te lê, is afskrifte van die betrokke meesterplan aan alle universiteite en navorsingsorganisasies waar aktiewe projekte in hierdie verband onderneem word, beskikbaar gestel.



GRONDWATER-NAVORSING

Daarstelling van 'n meesternavorsingsplan vir grondwaternavorsing

Teen die einde van 1981 het al die grondwaternavorsingsprojekte wat deur die Kommissie gefinansier is, ten einde geloop en die voorneme is om verskeie nuwe projekte gedurende 1982 en 1983 te inisieer. Wanneer projekte beoog word, is dit nodig dat die navorsingsmikpunte en -behoeftes weer getakseer word en daarom is 'n meesterplan gedurende die jaar ontwikkel.

Daar is besluit dat 'n studiegroep aangewys moet word om die meesterplan saam te stel. By die opstel van die meesterplan vir navorsing en ontwikkeling het die studiegroep, in noue samewerking met die Afdeling Geohidrologie van die Direktoraat van Waterwese, gebruik gemaak van verskeie bronne van inligting wat in die verlede as gevolg van die Kommissie se aktiwiteite ontwikkel het. Hieronder was die verslae van dr JF Enslin, 'n spesialis-konsultant vir grondwater van die Kommissie, en 'n feitesending na die buiteland.

Geohidrologiese navorsing is nodig vir die doeltreffende beplanning, bestuur en benutting van grondwaterbronne en word in besonderhede in die meesterplan behandel. Die breë navorsingsraamwerk van die meesterplan is gerieflikheidshalwe in die volgende kategorieë verdeel: instrumentasie — metodes en tegnieke; prosesstudies; die opsporing en ontwikkeling van grondwaterbronne; geohidrologiese studies en die modellering van spesifieke grondwaterstelsels; streeksgeohidrologiese studies; besoedelingsaspekte ; die uitwerking van mynbouaktiwiteite, en kunsmatige aanvulling.

Die navorsingsgebiede wat in die meesterplan vermeld word, asook die prioriteite wat daarmee geassosieer word, sal op 'n gereelde basis hersien word.

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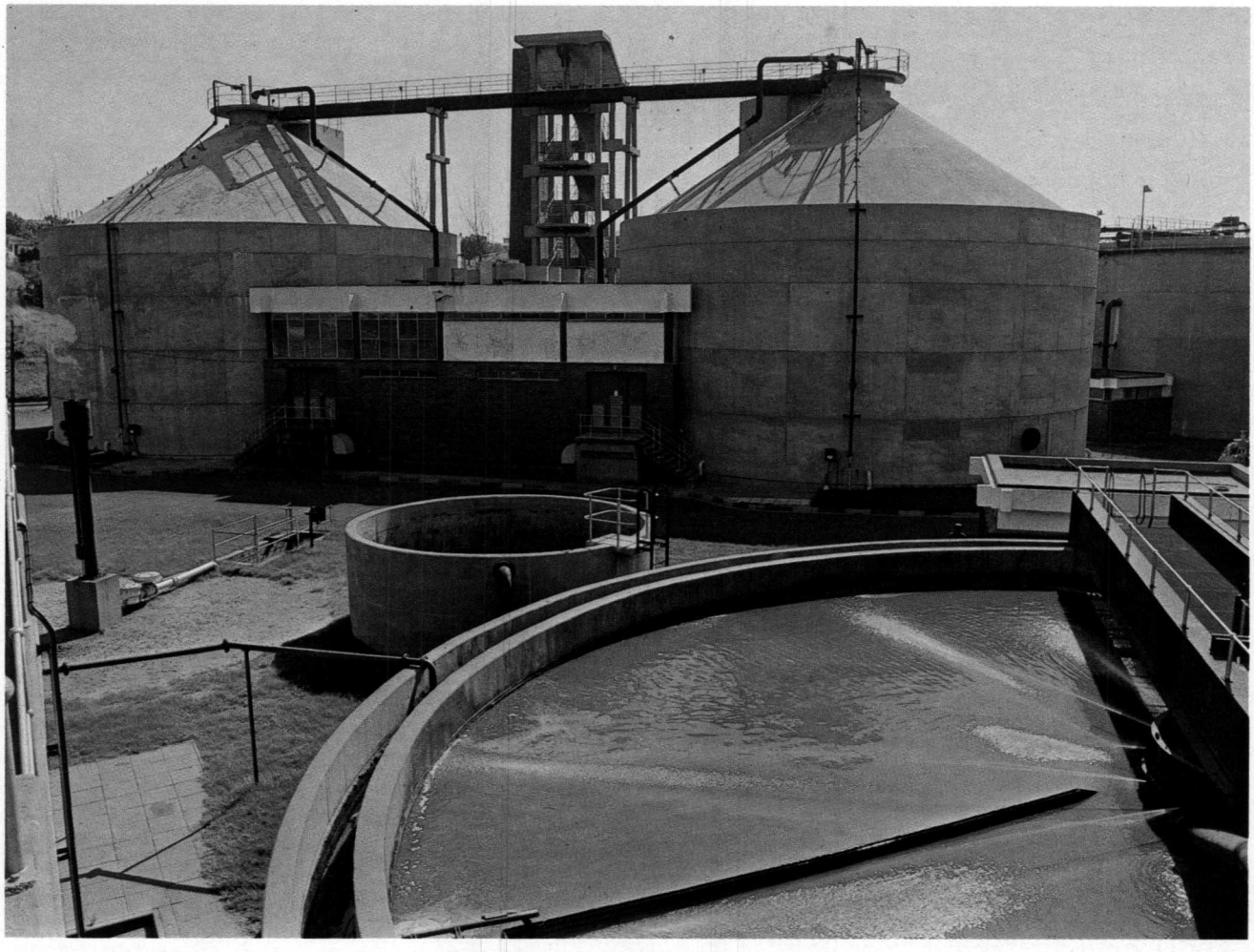


'n Kenmerkende toneel by 'n rioolsuiweringsaanleg in Durban.

RIOOLWATER-SUIWERING

Samesnoering van alle projekte oor rioolwatersuiwering onder een koördinerende navorsings- en ontwikkelingskomitee

Gedurende die jaar is 'n KNO-komitee vir Rioolwatersuiwering gestig. Die Komitee is in die lewe geroep om probleme in verband met rioolwatersuiwering op 'n deurlopende basis te identifiseer, meesternavorsingsplanne en prioriteitnavorsingsprogramme op te stel, navorsing te koördineer, vordering te evalueer en te besin oor die bekendstelling en toepassing van navorsingsresultate. Die komitee bestaan uit verteenwoordigers van die Department van Omgewingsake, die SABS, die Randwaterraad, verskeie stadsrade, die WNNR, verskeie universiteite en die WNK.

Die KNO-komitee sal ook as 'n loodskomitee optree vir die huidige navorsingsprojekte oor geaktiveerde slyk en sypelbeddings wat deur die Kommissie ondersteun word. Daar word verwag om met so 'n stap die koördinering tussen die verskillende projekte nog meer doeltreffend te maak. Vier van die huidige projekte handel oor die optimisering van die geaktiveerdeslykproses vir die verwydering van plantvoedingstowwe uit rioolwater, terwyl 'n verdere projek met die verwydering van voedingstowwe uit sypelbeduitvloeisels te make het. Die verwydering van hierdie stowwe kan grootliks daartoe bydra dat een van die bekendste simptome van besoedeling van die wateromgewing met plantvoedingstowwe, naamlik eutrofikasie, bekamp word.

Al die navorsingsprojekte is in hulle finale stadia en op die eerste vergadering van die nuwe KNO-komitee is veral aandag aan die bevredigende afronding van die huidige navorsingsprogram geskenk. Daar is ook 'n subkomitee aangestel met die opdrag om 'n meesternavorsingsprogram vir toekomstige navorsing op te stel.

Besonder goeie vordering is met die projekte gemaak en 'n handleiding oor die beplanning, ontwerp en bedryf van geaktiveerdeslykprosesse wat plantvoedingstowwe verwyder en 'n tegniese handleiding oor die verwydering van plantvoedingstowwe in sypelbedrioolwerke sal opgestel word.

WRC INFORMATION SESSION – PART II

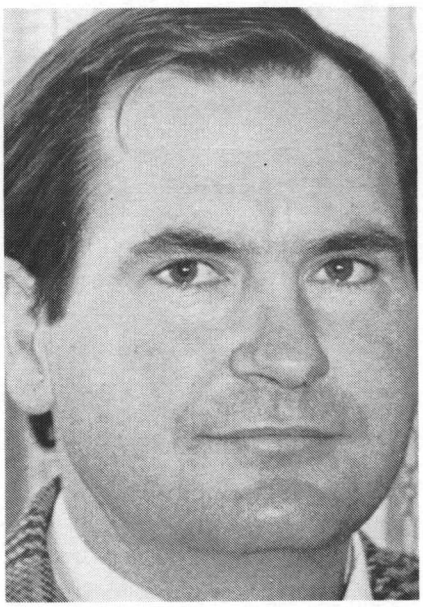
'The major objective of the hydrological and geohydrological studies supported by the Water Research Commission is to provide the information that constitutes the basis of water resource analysis, planning and management in South Africa,' said Dr PJT Roberts, senior adviser of the WRC, at the information session held earlier this year.

He said that the information required for adequate control of water resources could be regarded as being a knowledge of the quantity of water available, the quality, the distribution of both the quality and quantity in time and space; and the likely response of the various hydrological systems to change, i.e. the ability to predict changes in quality and quantity of runoff as a result of changes in urban or rural land-use and management.

Dr Roberts said that in the field of hydrology there had been what could be described as a revolution during the past 5 years in that hydrologists throughout the world now accepted that estimates of overland flow, interflow and baseflow were quantitatively very misleading when obtained from hydrograph separation. New concepts indicated that present models were far less deterministic than had initially been supposed and this realisation had important implications for some of the objectives that the WRC was trying to achieve in hydrology, but not necessarily for others.

As far as empirical hydrology was concerned, he said that this represented that group of objectives which could be achieved by means of empirical techniques without having a detailed quantitative knowledge of the various hydrological processes involved.

'One of the most important objectives of empirical hydrology is to provide methods of extending runoff records,' Dr Roberts said. 'There are only about 700 gauging stations in the country so that if a water resource engineer does have a record to work with for a particular problem he is fortunate, and even then the record is usually too short. As a result of the variability of flow in South African rivers it is sometimes necessary to have as much as 50 years of record in order to estimate the mean flow with 90 per cent confidence.'



Dr PJT Roberts, senior adviser, WRC.

He said that there fortunately were about 7 000 rainfall stations in the country and that many had records exceeding 50 years in length. These rainfall records could be used with models to extend runoff records.

The WRC had research programmes at the Universities of the Witwatersrand, Natal, Zululand, Stellenbosch and at Rhodes University. The programmes were orientated to producing empirical tools for the water resource engineer and planner.

Deterministic hydrology represents that group of objectives for which a knowledge of the important processes is a prerequisite for adequate prediction. One objective under this type of hydrology was to predict the quantitative and qualitative effects on water resources of changes in land-use such as irrigation, afforestation, cultivation, grazing practices, burning of veld and urbanisation.

'For example,' Dr Roberts said, 'adequate prediction of various changes in urban or rural land-use on the salt load being carried by a river system requires a basic understanding of the natural hydrological processes associated with mineralisation.'

He said that another objective was to predict the effects on runoff of weather modification programmes. Hopefully it would be possible in approximately 10 to 15 years to change various aspects of rainfall by weather modification ac-

This is the second article on the activities of the Water Research Commission and follows on the first which appeared (in Afrikaans) in the May issue of *SA Waterbulletin*. These articles are based on an information session which was held at the CSIR Conference Centre in Pretoria and attended by approximately 60 research scientists, engineers and technologists working in the field of water.

tivities. He said that the Commission was supporting research programmes in deterministic hydrology at the Universities of Natal, Zululand, Witwatersrand and at Rhodes.

There was also an important research programme at Bethlehem (run by the Directorate of Water Affairs) that had the task of assessing the effects on runoff of weather modification in the form of cloud seeding for rainfall stimulation.

Design aids

The objective of regional hydrological studies was to regionalise the hydrological information that had been collected at various points throughout the country and to present it to water resource planners in the form of design aids or manuals. The Commission had supported research programmes at the University of the Witwatersrand (Hydrological Research Unit) for this purpose since 1973 and Professor DC Midgley and his group had attained an international reputation for fine work in this field. The research programme at Rhodes University (Geography Department) was contributing information for the semi-arid areas and the University of Natal, Pietermaritzburg (Department of Agricultural Engineering) was concentrating on the regionalisation of rainfall statistics, he said.

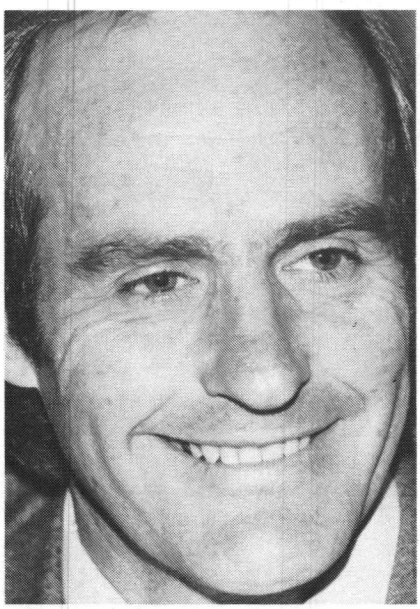
Turning to geohydrology, Dr Roberts said that in European countries the contribution of ground water to the total water supply was often as high as 80 per cent but in South Africa the contribution was of the order of 10 per cent. The actual amount of ground water used in South Africa was uncertain mainly because farmers throughout the country relied on boreholes but there was no control over amounts extracted in view of the fact that ground water was *res privata* under South African water law.

It was evident, he said, that South Africa was poorly endowed with suitable aquifers and most boreholes were in fractured hard rock. Under these conditions many boreholes were required to extract adequate volumes of water in a short period of time for urban, industrial or irrigation use. Consequently, the major thrust of ground-water programmes supported by the Commission in the past had been to improve techniques for determining the exploitation potential of ground water in areas where surface supplies were limited. All of these research programmes, which had involved the Universities of the Witwatersrand, Stellenbosch and Orange Free State as well as the CSIR, had terminated by the end of 1981.

The research priorities had been carefully considered during 1981 and a master plan formulated to guide future ground water research programmes funded by the Commission.

The master plan had been compiled by the WRC in collaboration with the Division of Geohydrology (Department of Environment Affairs) and consisted of 8 major sections, *viz:* instrumentation; process studies; location and development of ground-water resources; systems analysis of individual compartments; regional geohydrological studies; pollution aspects; the effects of mining; and artificial recharge.

Dr Roberts said that in both the fields of hydrology and geohydrology there was a great deal of research to be done in terms of understanding the dominant processes taking place (for prediction) and in terms of producing simple empirical methods as design aids. However, he said, it was clear that meaningful progress was being made and the research teams were both enthusiastic and optimistic.



Mr HC Chapman, senior adviser, WRC.

MINERALISATION & WATER ECONOMY

Speaking on problems of mineralisation and water economy measures Mr HC Chapman, senior adviser of the Commission, said that the Pretoria-Witwatersrand-Vereeniging-Sasolburg project (referred to as the PWV project) was one of the most ambitious and widely based projects ever undertaken by the WRC and, in his opinion, one of the most successful. The Hydrological Research Unit of the University of the Witwatersrand, a firm of consulting engineers (Stewart, Sviridov and Oliver), and the WRC had collaborated on the project which had, as main objectives, the following:

- **the identification and quantification of sources of mineral pollution.**
- **the development of mathematical models for simulating the mineral quality of water in the region and**
- **estimation of the economic impact of high levels of salinity in the water supply, on consumers.**

Mr Chapman said that recently the mineralisation of our water resources had escalated alarmingly and that this was without doubt the most serious pollution problem facing South Africa's water supply authorities at the present time.

There had been a dramatic upswing in the total dissolved solids (TDS) concentration in the Vaal River Barrage and in 1966 an all time high of 1 080 mg/1 had been recorded. Mr Chapman said that the World Health Organization had set the upper limit at 500 mg/1 for human consumption although many authors felt that this value was possibly high.

The reason mineralisation was such a threat lay in the fact that unlike organic pollution TDS could

(To page 36)

WRC INFORMATION SESSION

(From page 35)

not be treated out easily or cheaply. The problem was further aggravated in the PWV region by virtue of the semi-closed cycle system that operated there. The Rand Water Board drew 65 per cent of its supply from the Barrage, at a TDS in excess of 600 mg/1 and diluted this with 35 per cent from Vaal Dam at a TDS of 120 mg/1. In the system a further 200 to 300 mg/1 was added through usage and the additional salt load was then returned to the Barrage for the whole cycle to be repeated.

Solution

'Dilution in this region cannot be a long term solution', Mr Chapman said. 'Somewhere around 1992 supply will equal demand and the only possible solution, apart from reducing the demand significantly by massive industrial and population relocations, is the development of additional sources of water and the importation of water from outside the Vaal Dam catchment. As these additional water supplies will unavoidably be very expensive, mineralization must be combated at source rather than diluted to acceptable levels.'

He said that much had been written over the past 30 years about the increase in mineralization in the PWV region by many authors, but that the glaring question of what action to take had never been seriously tackled, largely because the catalyst had not been available until now — mathematical models.

The main achievement of the PWV project had been the development of a suite of mathematical models by the Hydrological Research Unit of the University of the Witwatersrand which could forecast what would happen in future if a certain scenario of events were to take place. The models had been handed over to the Directorate of Water Affairs who were giving attention to some of the questions of this problem. The models were not specific to any one region, but were easily adaptable to other river catchments as had been done in case of the Fish/Sundays River investigations by the CSIR.

Mr Chapman said that not only did we need to protect our meagre water resources, we also had to economise on its use as far as possible and this had led to a tripartite agreement to investigate ways of curbing water consumption.

The Water Economy Measures project with the National Building Research Institute (NBRI) and the South African Bureau of Standards (SABS) had as main objective the achievement of meaningful savings of water through the design and use of water supply fittings and to establish criteria which could be used in future updating of the relevant National Building Regulations.

He said that research went a lot further than the elimination of leaking garden taps. As an example, Mr Chapman pointed out that automatic flushing devices fitted to urinals in public buildings operated 24 hours per day, 7 days per week, but that the buildings were only occupied eight hours per day, five days per week or 23,8 per cent of the time. If it was assumed that the frequency of flushing was about twice the number actually required, then about 88 per cent of water used by automatic flushing urinals was wastage.

Other aspects being looked at by the NBRI were the effects on leakage or unaccounted-for water by pressure reduction; improved hot water installations; metering; garden irrigation, and other related tasks.

'One gratifying response has been the enthusiasm with which local authorities and manufacturing industries greeted this project,' Mr Chapman said. 'In many instances regarding meters, flow control and low flush water closets, the industry has already taken the initiative.'

The SABS was concerned with drawing up nationally applicable water supply regulations, as well as specifications for fittings and codes of practice for plumbing installations.

Mr Chapman said that five of the major local authorities were actively involved in the project by supplying statistical data, carrying out surveys and installing test facilities.

EUTROPHICATION & PHOSPHATES

'It is hoped that through the Commission's efforts in the research and development fields of eutrophication and sewage purification a significant contribution will be made to the preservation of South Africa's dwindling water resources,' said a senior adviser of the Commission, Dr HNS Wiechers, at the information session.

Eutrophication is the enrichment of the water environment with plant nutrients such as phosphates, nitrates and ammonia.

The process could be greatly accelerated by the activities of man, such as disturbances in river catchments by agriculture and industrial practices, urbanisation and the discharge of nutrient rich effluents into these water systems.

Dr Wiechers said that eutrophication resulted in the over-abundant growth of algae and water plants, which in turn gave rise to the following problems:

- increased water treatment costs.
- taste and odours in drinking water.
- deoxygenation of bottom layers of dams
- aesthetic problems.
- interference with recreational use of dams
- skin irritation and gastro-enteritis.
- loss of livestock.
- interference with irrigation.

Eutrophication problems were currently of a fairly localised nature, he said. Nevertheless, officials from the Directorate of Water Affairs had indicated that it was expected in the not too distant future that eutrophication would

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have significant economical, health, environmental and recreational effects which would be of national scope.

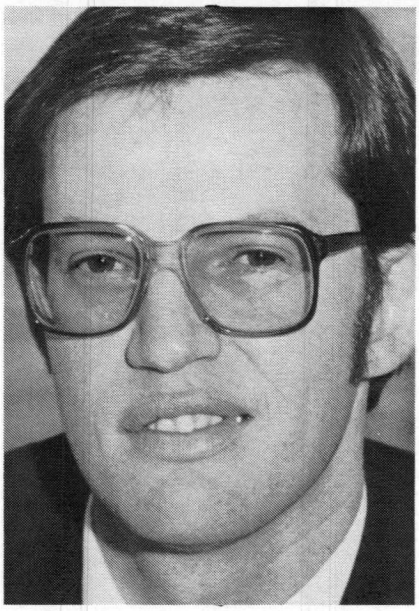
He said that the Commission had been involved with eutrophication research since its inception. During 1973 a project had been launched at the National Institute for Water Research entitled *Eutrophication of rivers and dams.* Two of the major achievements of this project had been the identification of the extent and nature of the eutrophication problems in South Africa and the preparation of guidelines for its control.

Against this background the Water Research Commission had drawn up, and was further refining, a master plan for research related to eutrophication. Three major areas of concern had been identified, i.e. nutrient sources, impoundments and water utilization. Specific problems and research needs had been defined for each of these fields.

Dr Wiechers said that ultimately the only way to prevent eutrophication was to prevent nutrients from reaching the water environment. The major source of nutrients to the water environment was through the discharge of nutrient rich treated sewage effluents to our rivers and dams. The WRC had sponsored a number of projects for the development of a suitable technology for the removal of these nutrients.

As far as research on the eutrophication process and its control and management in dams was concerned, the Commission had contracted the NIWR to undertake a study on eutrophication of the Hartbeespoort Dam with the following specific tasks:

- to evaluate the impact of the recently promulgated 1 mg/1 (PO_4-P) effluent phosphate standard on the Dam.
- to undertake feasibility studies of in-dam management techniques,
- to assess the Dam's fish production potential.



Dr HNS Wiechers, senior adviser, WRC.

The data generated with this project should be of considerable benefit to the authorities in managing existing eutrophication problems and planning for future prevention or control of eutrophication.

As far as sewage purification in South Africa was concerned, Dr Wiechers said that the aims could be classified as follows:

- ensuring and safeguarding public health.
- preventing or minimising pollution of the water environment.
- creating effluents suitable for reuse.

To meet these aims standards had been promulgated through the Water Act (No 54 of 1956) and various subsequent regulations. Sewage purification to meet standards was primarily the responsibility of local authorities. These authorities had severely limited funds, manpower and technical know-how. For this reason the Commission had allocated a high priority to research and development on sewage purification.

In 1974 the WRC had contracted the NIWR of the CSIR to evaluate and further develop a then novel biological treatment process developed by the Institute for nutrient removal from sewage. The potential of the process then prompted the Commission to accelerate this research.

The NIWR had extensively evaluated a variation of the process known as the Phoredox process at pilot scale over a period of three years. The encouraging results and findings are to be published jointly by the Commission and the NIWR in the form of a technical guide.

In 1974 the WRC also contracted the University of Cape Town to undertake research in the field of wastewater, in that case to investigate the more fundamental and engineering aspects of biological nutrient removal. That research, Dr Wiechers said, had culminated in the formulation of a generalised mathematical model for the process. The strength of such a model was that it could be used for design purposes and determining optimum process control strategies for specific sewage purification plants.

The two contract projects described above terminated towards the end of 1978. At that stage the then Department of Water Affairs had indicated that legislation to limit phosphate discharge to sensitive areas would soon be introduced, and the Commission, with the assistance of various other organizations commenced the dissemination of available information on phosphate removal and initiated two new research programmes.

Latest

During 1979 all available information on phosphate removal from wastewater had been synthesized in the form of review type reports and disseminated to interested parties in South Africa. In addition the WRC, in collaboration with other organizations, organized a technology transfer seminar at which the latest available information on nutrient removal had been presented.

Dr Wiechers said that the Commission had also launched two

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new projects to evaluate the full-scale implementation of various phosphate removal technologies under existing local conditions — the first dealt with the optimisation of the modified activated sludge process for nutrient removal and was being carried out by the City Council of Johannesburg, the NIWR and the Universities of Cape Town and Pretoria. The second dealt with the removal of phosphate and nitrates from biological filter effluent and was being carried out by the City Councils of Pretoria and Boksburg in collaboration with the NIWR.

Dr Wiechers said that both programmes were nearing completion and that a start had already been made with the compilation of technical guides.

Mr JE McGlashan, senior adviser, WRC.

SLUDGE TREATMENT & DISPOSAL

Mr JE McGlashan, senior adviser of the WRC, spoke on sewage sludge treatment and disposal. He said that throughout the world today considerable attention was being given to the treatment and disposal of sludge resulting from the purification of domestic wastewaters.

'In South Africa', Mr McGlashan said, 'there is no doubt that this question has become one of the major problems facing local authorities.'

Problem

He said that before adoption of the activated sludge process on a wider scale in South Africa, major interest in sewage purification had been directed at the biological filtration process. The generally adopted sludge treatment process had been anaerobic digestion followed by air drying in lagoons or drying beds for disposal in dried form. With the adoption of the activated sludge process for reasons of economics and the need for higher quality effluents, particularly in the more developed areas, the already large sludge residue problem was further aggravated by secondary sludges produced in the activated sludge process.

Mr McGlashan said that the WRC, in pursuance of its commitment to local authorities to assist in their water management and wastewater treatment problems, had embarked on a programme of national research in this field. The Commission had realised that sludge residue could not be disposed of willy nilly since it contained most of the polluting substances in the original wastewater.

A master plan for research in this field had been adopted and consisted of four categories: sludge processing and treatment; sludge disposal; health aspects; and beneficial sludge utilisation.

Research projects that commenced in 1980 were the following:

- sludge characterisation studies.
- sludge dewatering.
- pasteurisation and thermophilic anaerobic digestion.
- aerobic autothermal digestion.
- forced aeration composting of sludge.
- sea disposal of sludge.
- sludge stabilisation by means of photosynthetic bacteria.

He said that it was well known that the object of wastewater treatment was to remove the polluting matter so that the resulting effluent could be discharged to natural waters. This could be achieved in a number of ways. One of the processes involved was sedimentation, whereby the settleable material was separated from the liquid steam; the sedimentation basin underflow was withdrawn as a sludge.

Disinfected

Sewage sludge consists of inert particulate matter (sand and grit), oxidisable organic matter, nutrients, a variety of persistent substances and a range of pathogenic and non-pathogenic micro-organisms. Pathogenic micro-organisms include bacteria, virus and parasites, which include protozoa, nematodes and helminths. The eggs of the nematode *Ascaris lumbricoides* (roundworm), are amongst the hardiest known and can be used to assess the hygenic quality of sludge. If, after treatment, no viable *Ascaris* ova can be detected in the sludge then one can be reasonably sure that the sludge has been disinfected and that it is unlikely that any pathogenic bacteria and virus will be detected.

Concern

'We know that sludge must be disposed of and we know too that the costs of providing sludge treatment and disposal facilities at a sewage works can be as high as fifty per cent of the total cost of the works', Mr McGlashan said. 'Improved wastewater treatment results in an improved quality of the effluent discharged, but at the expense of creating a more concentrated effluent, sewage sludge.

'Sludge disposal can be effected

OFF THE PRESS

PROCEEDINGS OF THE BANGKOK SYMPOSIUM ON ACID SULPHATE SOILS

Edited by H. Dost and N. van Breemen
Softbound, 454 pages
ISBN 90 70 260719

With population growth and diminishing arable land reserves, population pressure on tropical coastal lowlands is increasing. The coastal swamps are generally well suited for reclamation for wetland rice cultivation, but often hide areas that with normal drainage abruptly develop into acid sulphate soils. Without special drainage and flooding provisions in these areas, recurrent acidification is apt to persist for years and acidulated drainage water may affect surrounding areas. Technological methods to recognize potential acid sulphate soils and to keep their acidification within bounds are being developed. Their application can already prevent or alleviate problems in many agro-ecological situations. Effective application is hampered however because publications dealing with these methods are not readily available. The relative information is dispersed in unpublished reports and a large variety of periodicals. To pool the up-to-date experience and information, the Second International Symposium on Acid Sulphate Soils was held in Bangkok this year. The result is now available as ILRI publication 31.

Selected articles

The publication contains 25 selected articles on the following subjects: directions of further research on acid sulphate soils; social and economic aspects of the reclamation of acid sulphate soils; factors influencing the formation of potential acidity in tidal swamps; quantitative models to predict the rate and severity of acid sulphate development; soil survey of tidal sulphidic soils in the tropics; problems of classifying soils with sulphidic horizons; acid sulphate soils of the mangrove areas of Senegal and Gambia; several papers dealing with the characteristics, fertility status and the effects of soil ameliorants on productivity of acid sulphate soils of Senegal, Thailand, Malaysia, Vietnam and The Philippines; traditional empirical solutions for acid sulphate soil problems in rice cultivation; varietal reactions of rice to toxicity phenomena; effect of water management on field performance of oil palms on acid sulphate soils in Malaysia; water-soil-rice plant interactions; problems met in reclaiming tidal lowlands in Indonesia.

Both these publications are available from the International Institute for Land Reclamation and Improvement/ICRI, PO Box 45, 6700 AA Wageningen, The Netherlands.

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in a number of ways, to land, sea, and by incineration, but the prime concern in any of these disposal options should be to avoid pollution of surface and underground waters, to avoid pollution of the sea and the atmosphere, and to avoid the creation of a health hazard.'

Solutions

Local authorities and other organizations involved in the sludge treatment and disposal programme in collaboration with the WRC were: the Municipalities of Cape Town, Johannesburg, Port Elizabeth and Durban, and the National institute for Water Research and the Institute for Environmental Sciences of the University of the Orange Free State.

Mr McGlashan said that the Commission, in promoting and financing research in these fields using both research and consumer organizations, hoped to find suitable solutions to the pressing problems of the disposal of this residue from the treatment of wastewaters.

CONFERENCES & SYMPOSIA

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will be speakers from UK and Europe and the symposium is organised by the Water and Environment Group of the Society of Chemical Industry.
Enquiries: Conference Secretariat, SCI, 14 Belgrave Square, London SW1X8PS.

WATER RESOURCES

The 18th annual American Water Resources Conference *Water — Are we running out?* will be held from October 10 to 14 in San Francisco, California, USA.
Enquiries: Dave Stephenson, Woodward-Clyde Consultants, Three Embarcadero Centre, Suite 700, San Francisco, California, USA.

DELTA BARRIER

A Delta Barrier symposium highlighting and discussing new developments in the field of concrete construction for shore and off-shore hydraulic engineering will be held from October 13 to 15, 1982, in Rotterdam, The Netherlands. Enquiries: Mrs JM Witte, Delta Barrier Symposium, Postbus 5003, 4328 ZV Burgh-Haamstede, The Netherlands.

PURIFICATION

The 7th biennial exhibition of technologies for water and air purification, ground decontamination, waste disposal and noise elimination *Disinquinamento/Antinquinamento '82* will be held in Milan, Italy from November 16 to 20.
Enquiries : Etas Prom, Via Mantegna 6, 20154 Milano, Italy.

CONFERENCES AND SYMPOSIA

NWWA

A symposium with the theme *Hydrovisions — a look into world water opportunities* will be held in Atlanta, Georgia, USA, from September 20 to 22, 1982.
Enquiries: NWWA, 500 W Wilson Bridge Road, Worthington, Ohio 43085, USA.

IWPC

The annual conference and exhibition of the Institute of Water Pollution Control will be held in Eastbourne, UK from September 20 to 24, 1982.
Enquiries: Executive Secretary, IWPC, Ledson House, 53 London Road, Maidstone, Kent.

HYDROLOGY

An international symposium on hydrological research basins and their use in water resources planning will be held in Berne, Switzerland from September 21 to 23, 1982.
Enquiries: Dr M Spreafico, International Symposium, Landeshydrologie, Postfach 2742, CH-3001 Berne, Switzerland.

GROUND WATER

A conference on *Groundwater: We're Making it Clear* will be held in Atlanta, Georgia, USA, from September 22 to 24, 1982.
Enquiries: K Butcher, Dept CN, NWWA, 500 W Wilson Bridge Rd, Worthington, Ohio 43085, USA.

GEOFLUID

The 4th Geofluid Exhibition will be held from September 30 to October 3, 1982, in Piacenza, Italy.
Enquiries: Ente Autonomo Mostre Piacentine, Piazza Cavalli, 32/3429100 Piacenza Italy.

WPCF

The 55th annual conference of the Water Pollution Control Federation will be held from October 3 to 8, 1982. Approximately 250 papers will be read and there will also be a large equipment exposition.
Enquiries: Conference Department, WPCF, 2626 Pennsylvania Avenue, NW, Washington, DC 20037, USA.

POLDERS

An international symposium on polders of the world will be held in Lelysted, Netherlands, from October 4 to 10, 1982.
Enquiries: Mrs WJM van Giersbergen, Symposium and Exhibition Secretariat, Congress Bureau of the Corporate Communication Department TNO, 148 Juliana van Stolberglaan, 2595 CL The Hague, The Netherlands.

CHEMICAL INDUSTRY

A symposium *The chemical industry and the environment in the 1980's* will be held in London, UK, from October 6 to 8, 1982. There

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Finally . . .

TACT, IN FACT . . .

Tact, it would seem, went out of fashion as long ago as 300 BC, when a chap called Theophrastus wrote his *Characters.* There is nothing new under the sun — the Greek's observations are as applicable now as they were then:

The tactless man approaches you when you have lost a small fortune selling second-hand chlorine containers without the superintendent's knowledge and asks you to bail him out for the same thing. He's the sort of bloke who knows that you're on trial for dumping sixteen barrels of oil in the Austin Roberts bird sanctuary and then arrives too late to testify in your defence.

Invite him to a wedding and he harangues on the fickleness of women to the bride's mother. Come back from a weary overseas trip and he has arranged a compulsory journey to the Fish River canyon to survey the ground water quality and quantity — on foot.

No sooner strike a bargain to sell somebody a defunct dissolved air flotation unit (at an immoral profit) than he happens to come along, telling of someone else who would have paid more for the same thing. He also delights in taking the floor and explaining the composition of the water molecule in detail to the delegates at a chemists' convention. He is quick to volunteer to do some business for you (at a fee, of course) which you do not wish to be done, but find hard to refuse.

Whenever you are low on funds from buying, for example, an electron microscope, he never fails to show up and demand the money you owe him for two dozen gross test tubes; when you have fired a plant operator for a serious misdemeanour, he looks on and describes how, after just such an action on his part, the employee went out and hanged himself.

Having little courage, very little finesse and no sense of timing, he is the bloke, towards the end of the party, who decides to dance and then grabs the hand of someone who is still cold sober.

In South Africa, tact died together with culture when Frik du Preez retired.

SA WATERBULLETIN

SA Waterbulletin **is 'n kwartaallikse nuusbrief 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.

Redaksie: WNK, Posbus 824, Pretoria 0001, Republiek van Suid-Afrika. Tel (012) 28-5461.

Redakteur: Anton Prinsloo
Asst-redakteur: Jan du Plessis.

SA Waterbulletin **is a quarterly newsletter on water and water research published by the South African Water Research Commission (WRC), a statutory organization 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, PO Box 824, Pretoria 0001, Republic of South Africa. Tel (012) 28-5461.

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