

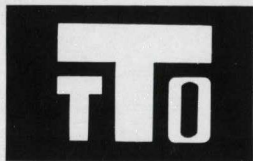
Warning to hydrologists re water resources:

HOBBS: FUTURE SUPPLY WILL POSE PROBLEMS

"The challenge facing hydrologists in South Africa is the early identification of those regions where water supply problems will become acute; the accurate assessment of the water resources available to meet future demands in these regions; and recommendations for the optimum management of these resources during exploitation." This was said by Mr LD Hobbs, Deputy Director-General of the Department of Water Affairs, Forestry and Environmental Conservation when he officially opened a workshop on the effects of rural land-use and catchment management on water resources held recently at the CSIR Conference Centre in Pretoria.

*In dié uitgawe
In this issue*

TO-rubriek: p 2



Reports on —

- IWPC conference (p 16)
- Groundwater '80 (p 10)

Hoogtepunte uit
WNK-verslag: p 28



Mr Hobbs said that South Africa had a semi-arid climate with the average rainfall being only 475 mm per annum compared with 735 mm in the USA and 860 mm per annum for the world as a whole. Using the total flow in the rivers of a country per head of population as a basis, it was found that the average river flow in South Africa was less

than 7 000 litres per person per day compared with 430 000 litres in Canada, 23 000 litres in the United States of America, 9 000 litres in Egypt and 2 300 litres in Israel. Another problem in South Africa was that the lower the rainfall the smaller the proportion of this rainfall that reached the river systems. It had also been found that the lower the rainfall the greater its variability from year to year.

Reliable

Mr Hobbs said that this fact could be illustrated by comparing the characteristics of the Breede River, which was one of our most reliable rivers, with the Hartbeest River which flowed into the Orange River near Kakamas and which had a catchment area nearly eight times that of the Breede River.

The average annual rainfall over the catchment area of the Breede River was 602 mm per year of which 25 per cent reached the river and 16 per cent could be made available for use by building a dam with a capacity equal to the mean annual runoff.



Mr LD Hobbs.

(To page 6)

00020098

TEGNOLOGIE- OORDRAG

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.



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.

Tekstieluitvloeiels:

Water bespaar by kleuring

Die Waternavorsingskommissie finansier 'n omvattende navorsingsprogram oor die behandeling van water en uitvloeiels in die tekstielbedryf. Dié bedryf is 'n groot verbruiker van water en lewer uitvloeiels wat moeilik is om te behandel en mee weg te doen.

Een van die projekte in die breë program is nou suksesvol afgehandel, naamlik 'n loodsskaalse ondersoek na die behandeling van uitvloeiels wat ontstaan by die kleuring van wol-/sintetiese vesels. Die navorsing is gedoen deur die Departement Chemiese Ingenieurswese van die Universiteit van Natal.

Die ondersoek is gedoen op die

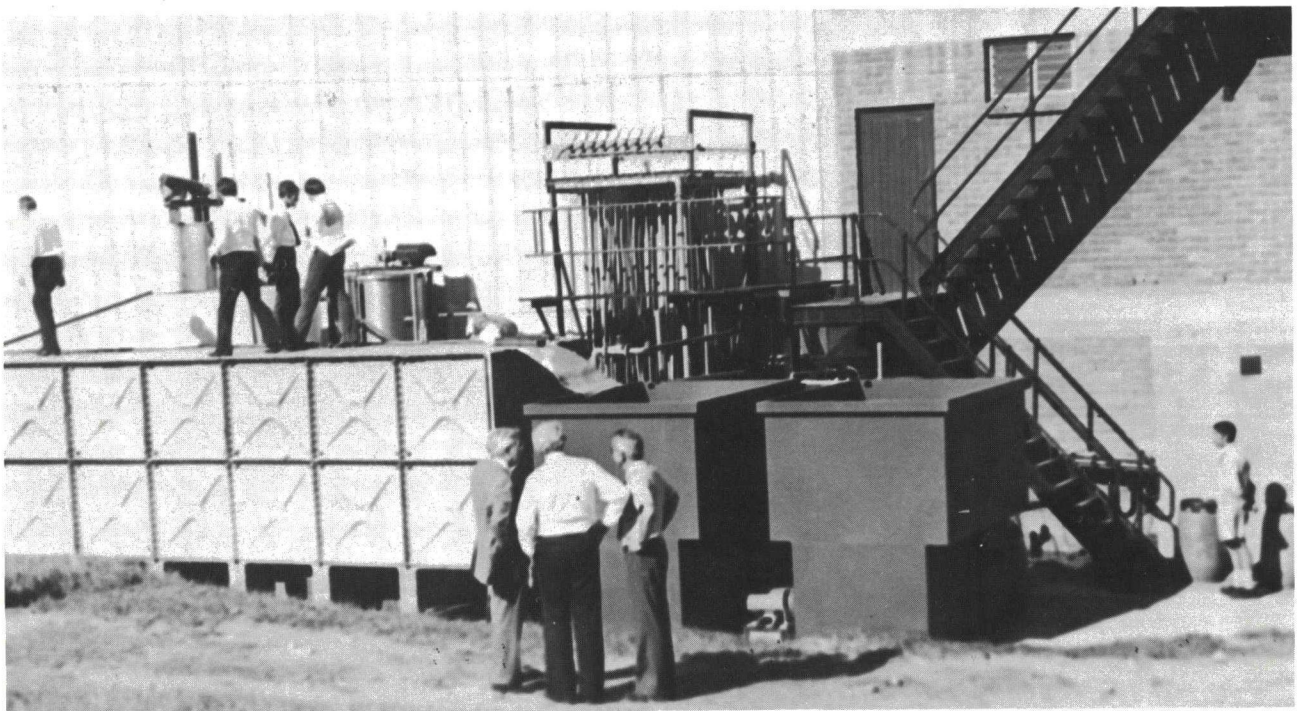
perseel van Veldspun (Edms) Bpk in Uitenhage. Die firma self het ook 'n bydrae gemaak in die vorm van fasiliteite en toesig.

By die afsluiting van die projek kon die proefaanleg deurlopend water en chemikalieë hersirkuleer op geslote-kringbaanbeginsels. 87% van die water en 94% van die anioniese oppervlakaktiewe stowwe is herwin. Waardes vir kleur, swaarmetale, geabsorbeerde suurstof en chemiese suurstofeis is bevredigend afgebring. Geen probleme is in die fabriek ondervind met die aanwending van herwinne water en chemikalieë in die kleuringsproses nie.

Alhoewel die werk in samewer-

king met 'n spesifieke fabriek gedoen is, is dit onderneem in belang van die Suid-Afrikaanse tekstielbedryf as geheel. Met hierdie doel is twee demonstrasies van die proefaanleg gehou. Die eerste demonstrasie was beperk tot verteenwoordigers van belanghebbende staatsdepartemente, statutêre liggame en navorsingsinstansies. Die tweede demonstrasie was oopgestel aan alle belanghebbende tekstielvervaardigers in die land.

'n Tegniese handleiding gegrond op die ondersoek is nou in voorbereiding en sal by voltooiing beskikbaar wees vir algemene verspreiding.



Die loodsaanleg wat ontwikkel is vir die behandeling van die kleuringsuitvloeiels van wol-/sintetiese vesel. Die aanleg is voortdurend bedryf met die hersirkulering van water en chemikalieë in geslote kringbaan.

Klein rioolwerke:

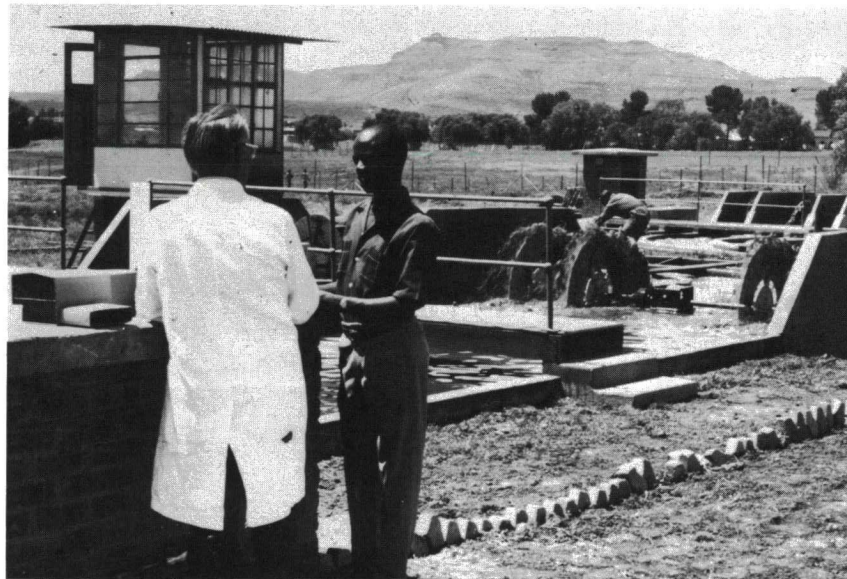
Handleiding vir operateurs

Die Nasionale Instituut vir Watervorsing se Afdeling Tegnologiese Toepassing is onder andere gemoeid met waterbehandeling en sanitasiedienste in ontwikkelende gebiede. Alhoewel suiweringaanlêe in dié gebiede betreklik eenvoudig is, het daar tog 'n dringende behoefte ontstaan aan riglyne vir die beheer en bedryf van die aanlêe. In die lig van hierdie behoefte het die Departement van Samewerking en Ontwikkeling versoek dat meer aandag gegee moet word aan die opleiding van operateurs. Dit het die Instituut geroep om 'n handleiding op te stel vir eenvoudige toetsmetodes wat deur die operateurs van klein rioolwerke gebruik kan word. Die handleiding is getiteld:

CSIR TECHNICAL GUIDE K51:
Simple control tests for operators of small wastewater treatment plants —
RJLC Drews

Die gids behoort van nut te wees vir operateurs van kleiner werke met beperkte laboratoriumruimte en -fasiliteite, asook vir operateurs met geen chemies-analitiese agtergrond nie.

Die gids bevat voorskrifte vir monsternemingsprosedures; die



meting van eienskappe soos temperatuur, pH, vloeï en turbiditeit; en die bepaling van slykeienskappe en van die gehalte van die inkomende rioolwater en die uitvloeisel. Elke toetsmetode word gevolg deur 'n verduideliking oor hoe om die resultate te interpreteer, met die klem op spoedige en noukeurige verslagdoening.

Eksemplare van die gids kan verkry word van die Direkteur, Nasionale Instituut vir Watervorsing, Posbus 395, Pretoria 0001.

'n Wetenskaplike van die NIWN verduidelik elementêre beheertoetse aan 'n gesondheidsinspekteur van die Regeringsdiens van Bophuthatswana by Moroka-hospitaal, Thaba N'chu.



Industrial waste survey

In any factory the management aims at producing at minimum cost. Pollution is the result of wastage of raw materials and manufactured products, and thermal pollution derives from energy losses.

Pollution has a negative impact on the environment. The authorities concerned can thus force the polluter to either pay high treatment charges for the acceptance of waste flows or to erect and operate costly treatment works. Prevention of pollution therefore saves money. Because of the capital outlay and operating expenditure, the principal cost factor in effluent treatment is usually the volume to be handled.

It is unlikely that all effluents within a factory will be heavily polluted. In order to keep down treatment or pretreatment costs heavily polluted wastewaters should be separated from less contaminated, or nearly clean, effluent streams, and treated separately. It is always easier to deal with a small volume of concentrated waste than with a large volume of diluted waste. By separating the waste streams, it is also possible to select effluents which can be directly reused within the factory, or possibly reused after simple treatment.

A properly conducted industrial waste survey will provide the

background information necessary for the introduction of corrective measures. Guidelines for conducting such a survey have been published by the National Institute for Water Research:

CSIR TECHNICAL GUIDE K49:
How to conduct an industrial waste survey — G Wentzel and JW Funke.

Methods to assess the water and effluent situation within a factory are described. The measurement of flow in open channels and in pipes is explained. Tables are given for the evaluation of flow over V-notches,

(To page 4)



(Continued)

(From page 3)

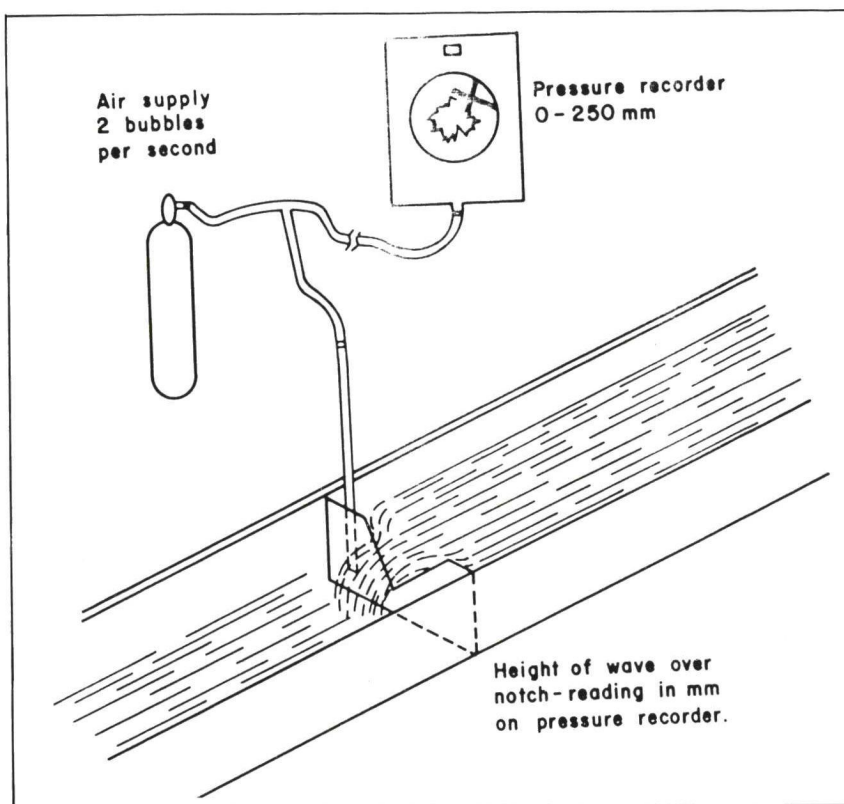
rectangular weirs and from open-ended pipes with free fall.

Different sampling methods and the interpretation of analytical data are reviewed. A summary of conversion factors into the metric (SI) system and formulae normally encountered in practice are also given.

Copies of the guide can be obtained from: The Director, National Institute for Water Research, PO Box 395, Pretoria 0001.

Set-up for flow metering with a pressure recorder. In order to assess pollution loads it is essential to meter the volume of the waste streams inside the factory.

WASTE SURVEY (cont.)



Akwakultuur in kollig

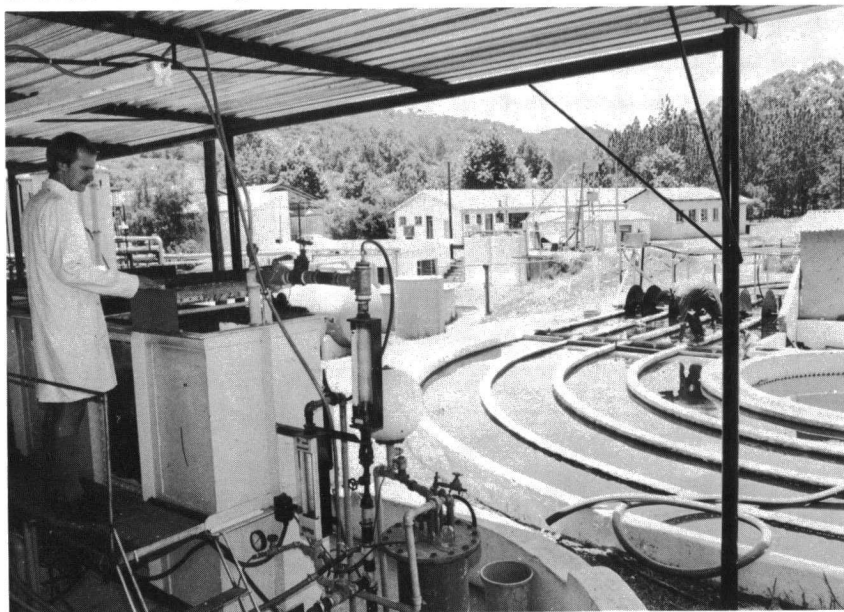
'n Simposium oor akwakultuur in afvalwater word 24-26 November 1980 in die WNNR se konferensiesentrum in Pretoria gehou. Die sim-

posium word gesamentlik gereël deur die Nasionale Instituut vir Waternavorsing, die Instituut vir die Bestryding van Waterbesoedeling

(SA Tak) en die WNNR se Koöperatiewe Wetenskaplike Programme.

Akwakultuur as metode om nuttige produkte uit afvalvloei-stowwe te produseer, is 'n onderwerp van toenemende belang vir Suid-Afrika. Akwakultuur vervul naamlik 'n tweeledige funksie: dit vul bestaande voedselsoorte aan deur 'n bykomende proteïenbron te voorsien en terselfdertyd vergemaklik dit die behandeling en disponering van uitvloeiels deur die verwydering en benutting van voedingstowwe.

Die toenemende belangrikheid van akwakultuur en die potensiaal daarvan as metode van afvalbenutting het aanleiding gegee tot die hou van hierdie simposium om die huidige stand van kennis te ondersoek en om toekomstige navorsingsbehoefte te identifiseer. Verskeie buitelandse leiers op die gebied van akwakultuur is genooi om tydens die simposium hul ondervinding met plaaslike navorsers te deel. Verskeie Suid-Afrikaanse gesaghebbendes op



Die Nasionale Instituut vir Waternavorsing se eksperimentele aanleg vir die groei en oes van alge, wat tydens die simposium oor akwakultuur in afvalwater besoek kan word.

hierdie gebied sal ook aan die simposium deelneem.

Drie ekskursies sal gereël word, elkeen sluit twee van die volgende sentra in:

- Die Orlandokragstasie waar prof HJ Schoonbee van die Randse Afrikaanse Universiteit besig is met viskultuur in koelwaterdamme; die koelwater is gesuiwerde riooluitvloei:

- Modderfontein waar AECI alge kweek om voedingstowwe uit industriële uitvloei te verwyder; en

- Daspoort Rioolwerke waar die Nasionale Instituut vir Waternavorsing eksperimente uitvoer op die groei en oes van alge in rioolwater.

Die registrasiegeld is R45 vóór

en R60 ná 30 Oktober. Geregistreerde studente wat bewys van registrasie lewer kan vir R30 registreer.

Navrae moet gerig word aan:

Die Simposiumsekretariaat S.236, WNNR, Posbus 395, PRETORIA 0001, Republiek van Suid-Afrika.
Telefoon: (012) 86-9211 x 3979 (Jeanne Beck), x 2077 (Elsie Coetzee)
Teleks: SA 3-630

Drakensberg hydrology



A familiar winter's scene in the Drakensberg Mountains of South Africa — the results of a survey of the hydrology and water resources of this mountain range have been published in a report which is discussed below.

In a country not endowed with an abundance of water, the Drakensberg as South Africa's major inland source of water supply, with large annual and seasonal supplies available to augment deficits elsewhere, is a region where careful water resources management deserves particular attention. It was *inter alia* for this reason that the Natal Town and Regional Planning Commission requested the Department of Agricultural Engineering at the University of Natal, through its Agricultural Catchments Research Unit, to undertake a survey of hydrology and water resources of the Drakensberg.

The results of the survey have been published as Natal Town and

Regional Planning Report, Vol 42: *Hydrology and Water Resources of the Drakensberg* — RE Schulze.

The report contains, apart from the introductory overview of South Africa's water resources, sections on mean monthly/annual rainfalls, co-efficients of variability of rainfall, probabilities of wet pentades, and raindays — all these rainfall-derived statistics being mapped by trend surface analysis. Magnitudes of flood producing rains of short, medium and long duration are further mapped for given frequencies of occurrence while the analysis of drought includes examination of the occurrence of dry spells, agricultural droughts and expected annual and

seasonal rainfalls in drought and severe drought years. A chapter on kinetic energy of rainfall underlines regional differences in erosion producing rain.

In the chapter on streamflow, a non-linear statistical relationship is derived between mean annual runoff and rainfall, this equation forming the basis of a map of MAR which dis-

(To page 6)



Drakensberg hydrology

(From page 5)

plays a wide range from over 900 mm in the High Berg to below 100 mm runoff in the east. Streamflows are further compared on an inter-river system and intrasystem basis using very large, large, intermediate, small and research sized catchments in the analysis.

With the water resources of the Tugela system being well utilized already, one of the significant findings from a planning aspect is the vast water potential of the Umzimkulu river system which displays not only



(continued)

high flows but also low variabilities of flow.

Because characteristics of climate, topography, soil and land use render large tracts of the Drakensberg susceptible to high erosion losses, a regional distributive survey of soil loss estimation is undertaken using the recently developed "Soil Loss Estimation Model for Southern

Africa". A distribution of mean soil loss estimates is shown to range from less than one tonne $\text{ha}^{-1} \text{ annum}^{-1}$ to over 70 tonnes $\text{ha}^{-1} \text{ annum}^{-1}$. Tests reveal that the model is particularly sensitive to the rainfall energy and soil erodibility inputs.

The author expresses the hope that this survey will provide more than a mere inventory of water resources and that results will contribute to objective decisions being made by the public and private authorities concerned with the hydrology and water resources of the Drakensberg.

Copies of the report are obtainable from: The Director, Town and Regional Planning Commission, Private Bag 9038, Pietermaritzburg 3200.

Hobbs: Future supply problems

(From page 1)

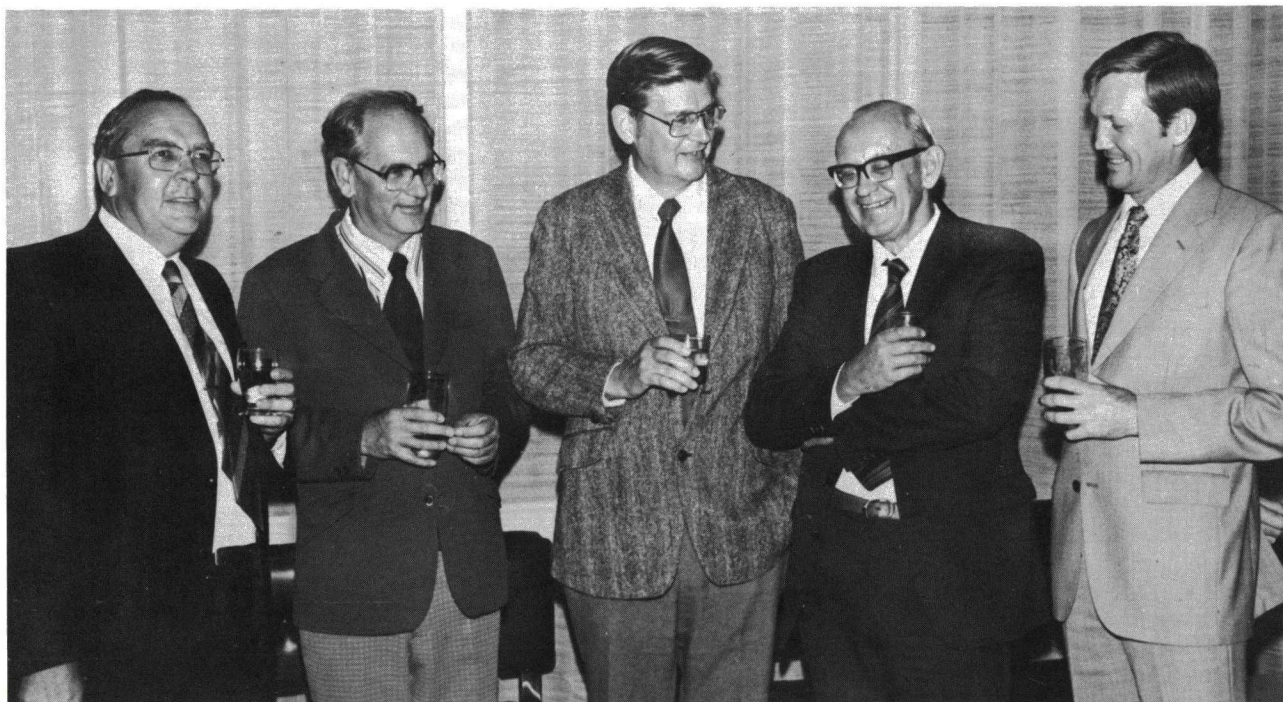
On the other hand, Mr Hobbs said, the average annual rainfall over the Hartbeest catchment was 144 mm of which less than half of one per cent reached the river as runoff. Only one-tenth of one per cent of this low rainfall could be utilised from a

dam of capacity equal to the mean runoff.

When it was realised that the maximum recorded runoff from the Hartbeest River in one year was 1 700 per cent of the annual average, the minimum in one year was only 9 per cent of the average and that in

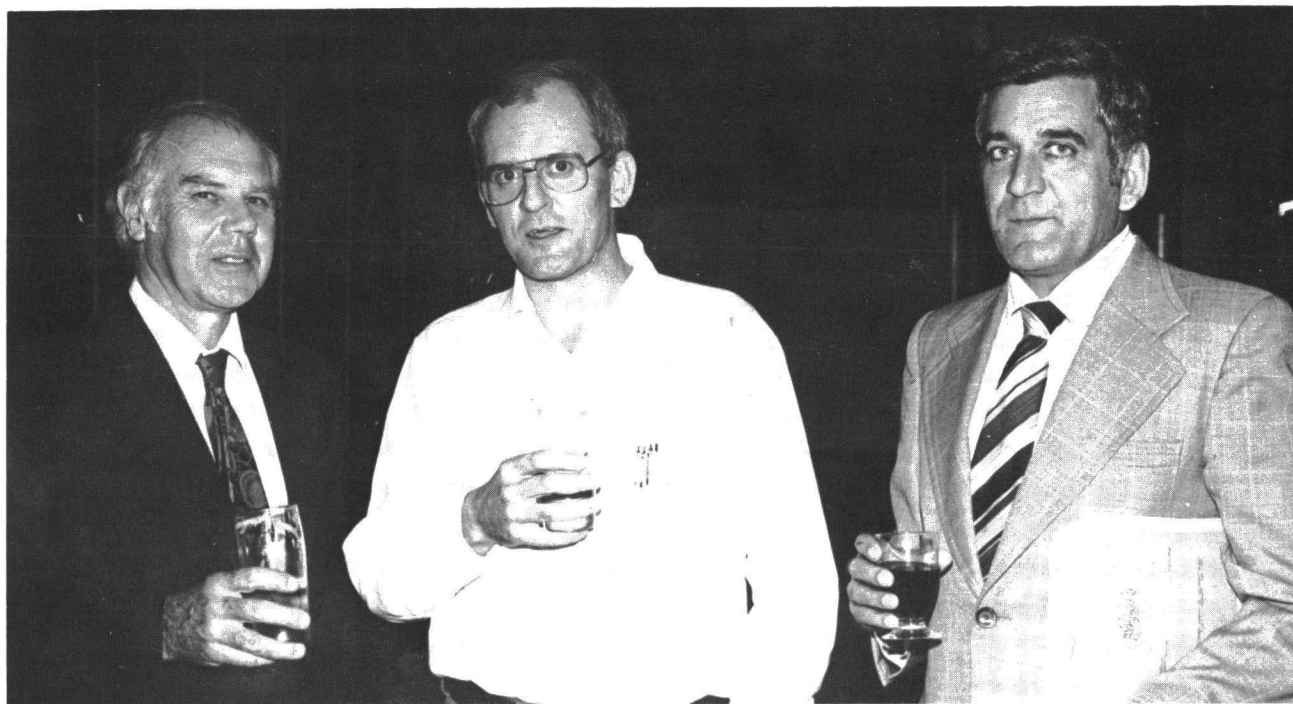
1961 alone, the runoff was more than the whole of the previous 27 years of record, it would be appreciated how difficult and expensive it was to produce an assured, steady yield from reservoirs on many of the country's rivers.

"The total annual consumption



Pictured in a relaxed mood after the symposium are (fltr): Dr W Hattingh (Director of the HRI), Mr CT Crosby (Division of Agricultural Engineering), Prof JD Hewlett (USA — delivered the key-note address), Prof PJC Vorster (Chief Adviser, WRC) and Mr F Kruger (Dept of Water Affairs, Forestry and Environmental Conservation).

Hobbs: Future supply problems



of water in the Republic will equal the amount economically available from natural water resources within the decade or so after the turn of the century. However, because of the uneven distribution of the available water supplies, some regions will approach full exploitation of the local resources well ahead of the more favourably situated areas," Mr Hobbs said. "This presented the challenge to hydrologists in South Africa".

Mr Hobbs said that in 1977 it had been decided to establish a committee to coordinate research on the hydrological cycle; the then Department of Water Affairs would provide the chairman and secretariat for the committee and the Water Research Commission (WRC) would play a major role in that committee since the WRC also had a coordinating function in the field of water research. At a meeting of the coordinating committee in June 1979 the effect of land-use and catchment management on water resources was identified as a major shortcoming in the current knowledge of such effects. It was therefore decided to call together a workshop to discuss the matter in depth, to identify the gaps in the present knowledge and to pro-

(To page 8)

These three professors also attended the workshop on land-use effects: In the usual order Prof JB McI Daniel, Professor of Geography at Rhodes University; Prof GGS Pegram of the Department of Civil Engineering at the University of Natal (Durban); and Prof LAV Hiemstra, Department of Civil Engineering at Stellenbosch University.

(Below): The workshop on land-use effects on catchment management afforded an opportunity for serious discussions. Two delegates pictured in such a tête-à-tête are Mr DS van der Merwe (left), senior adviser to the Water Research Commission, and Mr A Görgens, Department of Geography, Rhodes University.



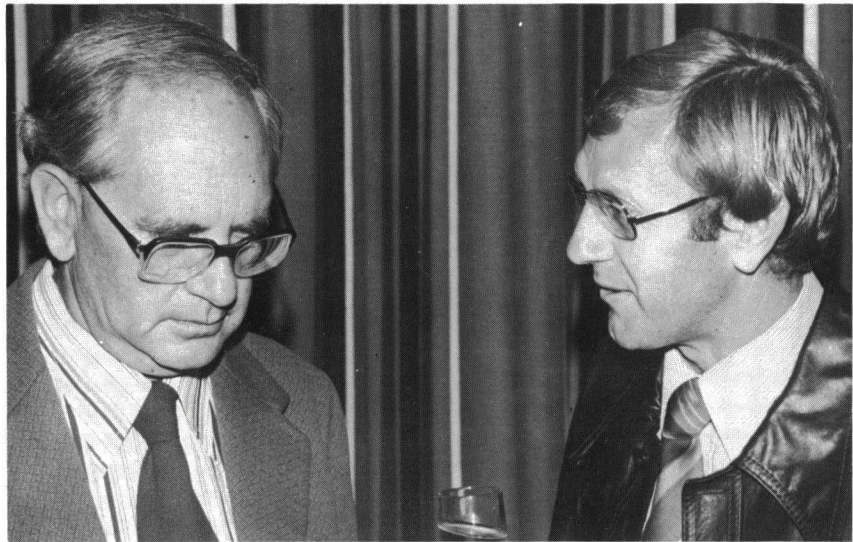
Hobbs: Future supply problems

(From page 7)

pose research projects to be undertaken to gain the required information.

Mr Hobbs then welcomed Professor John D Hewlett, professor of Forest Hydrology at the University of Georgia in the USA, who attended the workshop and read a paper on "Models in land use hydrology: the need for closing the gap between theory and practice."

Approximately 60 hydrologists from all over the Republic, some from as far afield as Stellenbosch (Prof Hiemstra) and Grahamstown (Prof JB McI Daniel), attended the workshop.



Two of the delegates (top) who read papers were Mr CT Crosby of the Division of Agricultural Engineering of the Dept of Agriculture and Fisheries and Dr Roland E Schulze (right) of the Agricultural Catchments Research Unit of the University of Natal (see also below)

(Left): A moment of lighter relief shared by Dr PJT Roberts (left) of the WRC and Mr P Stickells of the HRI.

SCHULZE TO USA

Dr Roland Schulze, of the Department of Agricultural Engineering at the University of Natal, Pietermaritzburg, is at present spending 6 months in the U.S.A. on hydrological research. While attached to the University of Maryland's Department of Civil Engineering as Visiting Scientist, he will be a member of a joint USDA and NASA team at the Hydrology Laboratory working on storm runoff prediction using remote sensing.

Dr Schulze is the Projects Leader of the Water Research Commission (WRC) funded research into applied hydrology at the University of Pietermaritzburg. His overseas stay is being supported financially by the WRC.



(Below): Prof JS le Roux (left) of the Dept of Geography of the University of the OFS and Prof Hewlett share a thought.



Die deelnemers aan 'n tweede beraadslagende vergadering oor die Internasionale Dekade van Suiwer Drinkwater (IDSD) het onlangs verklaar dat volgehoue en gekoördineerde aksie benodig word om die oogmerke van skoon drinkwater en doeltreffende higiënestandaarde vir alle mense voor 1990 te verwesenlik.

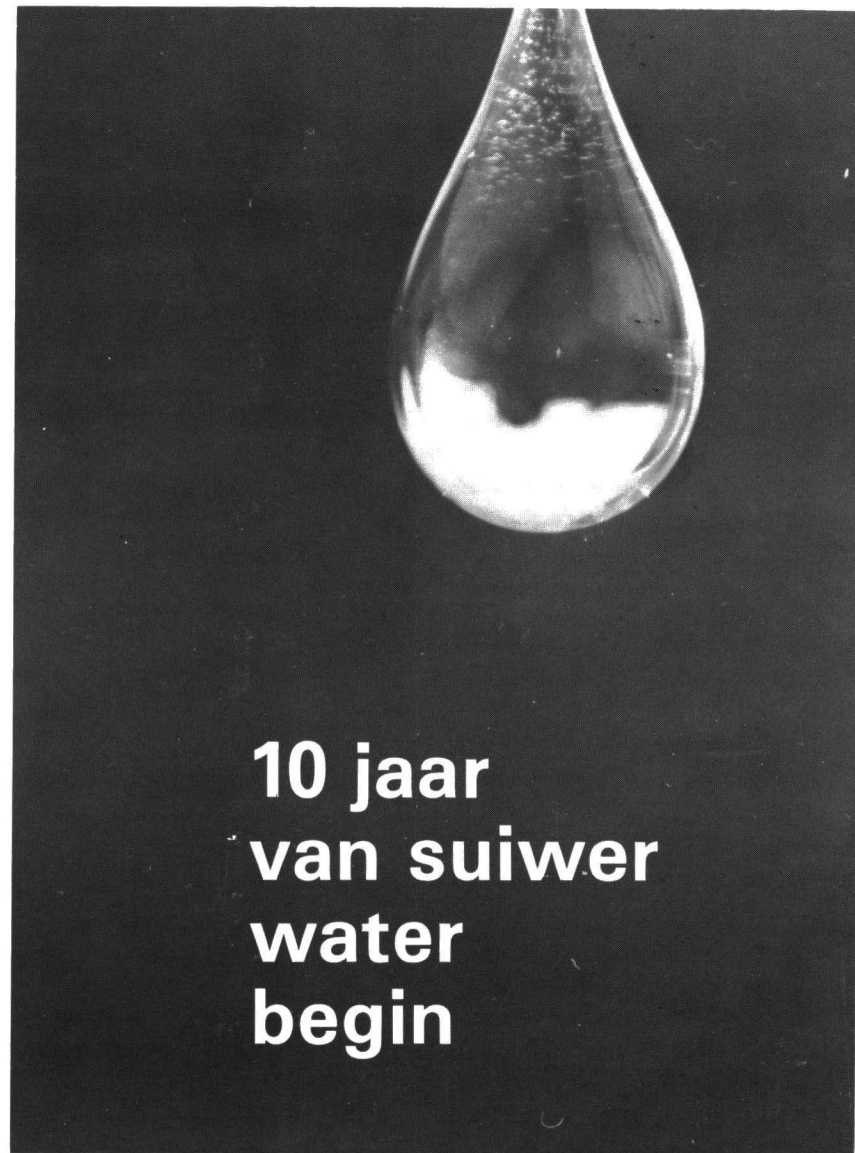
Dié oogmerke is by die VV se konferensie oor die mens en sy wonnings geformuleer en by die VV se konferensie oor water bevestig. Die veldtog sal tien jaar lank duur en sal op 10 November 1980 in New York van stapel gestuur word.

Europe Environment berig uit Brussel dat dr Halfdan Mahler, die direkteur-generaal van die Wêreld-gesondheidsorganisasie (WGO) die vergadering van 16 Junie in Genève geopen het. Bradford Morse, hoof van die VV se Ontwikkelingsprogram, het by dié geleentheid gesê dat suiwer drinkwater en doeltreffende higiënestandaarde voorvereistes vir beter gesondheid is. Hy het voorts daarop gewys dat meer as 13-miljoen kinders vanjaar sal sterf voordat hulle hul vyfde verjaarsdae vier en dat 96 persent van die kinders hulle in ontwikkelende lande bevind. Meeste van hierdie sterfgevälle sal toegeskryf kan word aan siektes wat deur water voortgedra is en wat voorkom kon ge-wees het.

'n Studie van drinkwater en higiënestandaarde wat dwarsdeur die wêreld aan die orde van die dag is, dui op die wye omvang van die taak wat die IDSD-groep in die gesig staar. Inligting wat in 53 lande deur die WGO versamel is, het die volgende aan die lig gebring:

- Slegs 14 lande kan daarmee spog dat meer as 65 persent van die bevolking die voordele van skoon drinkwater en doeltreffende higiëne geniet.
- In 25 lande is hierdie syfer tussen 30 en 65 persent.
- In 14 lande is dit minder as 30 persent.

Afgevaardigdes van regerings en internasionale en private instansies sal op 10 November onder die voorsitterskap van Douglas Lindoves van die Kanadese Agentskap vir Internasionale Ontwikkeling vergader. Daar is reeds ooreengekom dat daar



10 jaar van suiwer water begin

aan die volgende aspekte in die besonder aandag geskenk moet word:

- Kriteria wat toegepas moet word om projekte te formuleer

- Metodes om internasionale same-werking aan te wakker

- 'n Inligtingstelsel wat data oor projekte en programme kan verskaf.

... ook in Filippyne

'n Tienjaarprogram vir die ontwikkeling van watervoorsiening aan meer as 10 000 gemeenskappe in die Filippyne is deur dié land se regering van stapel laat loop. Die Waternavorsingsburo van die Ministerie van Openbare Werke het aangekondig dat die program die konstruksie van artesiële putte en die verskaffing van kommunale krane sal behels in gemeenskappe waar die voorsiening van drinkwater tot dusver probleme veroorsaak het.

Na verwagting sal meer as

2-miljoen diep putte, 130 000 vlak putte en 'n halfmiljoen kommunale krane teen 1989 in gebruik wees en sal die skema ongeveer R325-miljoen kos.

Die watervoorsieningsprogram op die platteland sal drie fases behels: die ontwikkeling van putte, fonteine en ander bronne; daarna die kommunale kraanstelsel (wat 'n voorsieningspyp en kraan vir elke vier tot vyf huisgesinne omvat); en laastens individuele wateraansluiting vir elke huis.

"The use of groundwater in an overall water plan requires extensive knowledge about its occurrence and extent — knowledge which is difficult to obtain, and which is often obtained late, and sometimes too late to be put to practical use," according to Mr TPC van Robbroeck, Chief Engineer (Planning) of the Department of Water Affairs, Forestry and Environmental Conservation.

Mr Van Robbroeck was speaking at the 'Groundwater 1980' symposium which was held from 7 to 9 July 1980 in Pretoria and organised by the Groundwater Division of the Geological Society of South Africa and the Division of Hydraulic and Water Engineering of the South African Institution of Civil Engineers.

Reading a paper on "The role of groundwater in the development of South Africa's water resources" Mr Van Robbroeck said that although groundwater played a relatively unimportant part in the overall water resource picture of South Africa, it was an extremely valuable commodity and opened up or had opened up vast areas of the country to economic activity.

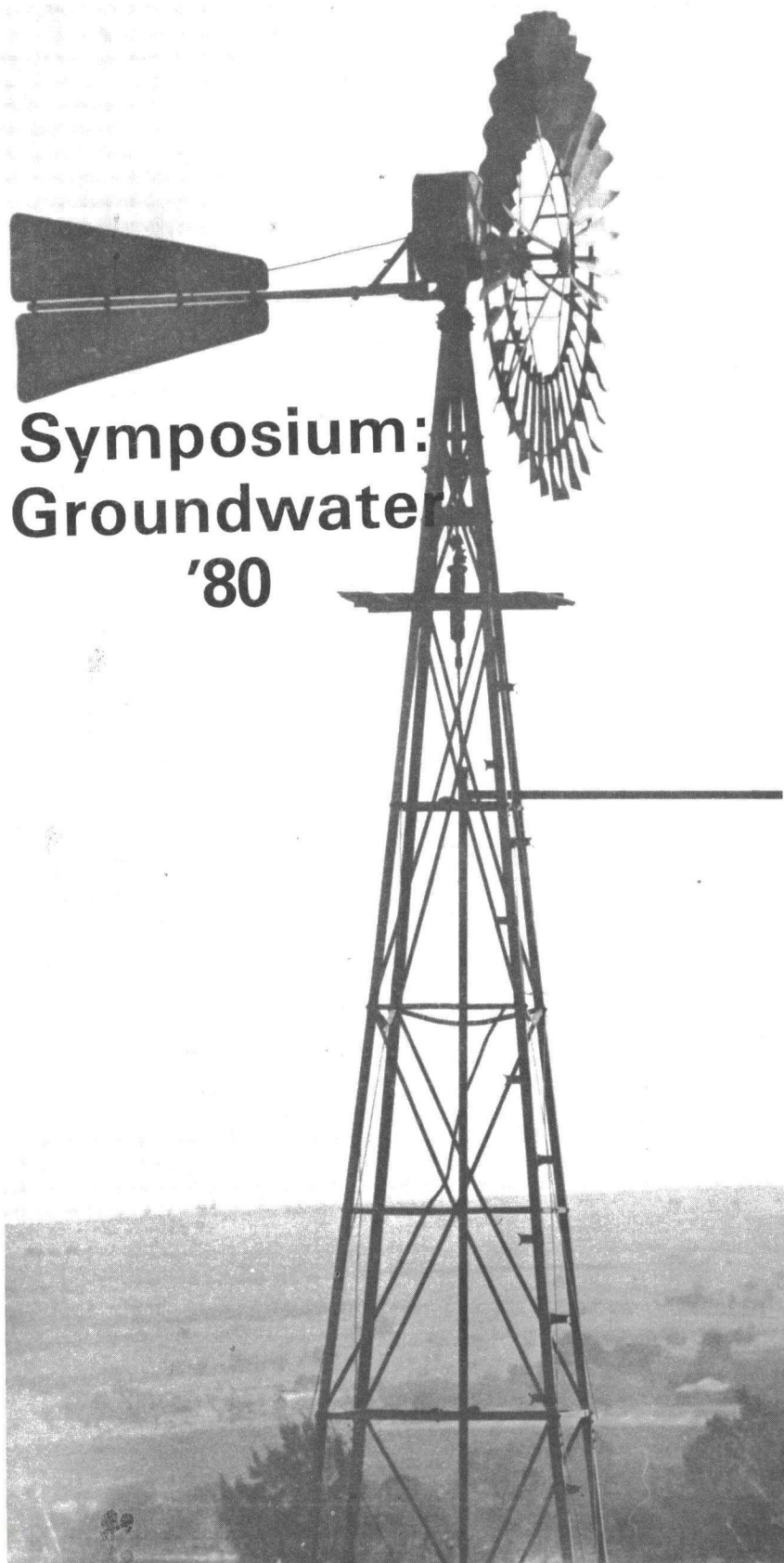
He said that in many countries of the world groundwater was the chief source of life-sustaining water. This was not surprising in view of the fact that 11% of the earth's fresh water occurred in the ground at 'extractable depth' compared to only 0,33% in lakes and rivers — the traditional source in South Africa.

"Only a small percentage of the country's demand for water is met from its groundwater resources," he said, "and this is mainly due to unfavourable geology." He said that of the 1980 water consumption of approximately 10,9 milliard m³ only about 10% was estimated to be derived from groundwater resources, and that as demand increased this percentage would probably decrease.

Excessive

With reference to an estimate of water use by the year 2000 as put forward by the Commission of Enquiry into Water Matters in 1970, Mr Van Robbroeck said that that Commission's figure of 29 milliard m³ per annum had probably been excessive and that the overall position was not quite that bad. With a colleague, Mr JG du Plessis, he had reviewed end of the century demand and arrived at a figure of 18,6 milliard m³ per annum.

"The projection of irrigation demand does not differ substantially



from that of the Commission, but those of urban and industrial use do," he said. Comparing the per capita use for the latter two categories yielded an indication that the projection of 18,6 milliard m³ per annum may be more acceptable than the Water Plan Commission's estimate.

Du Plessis and Van Robbroeck obtained a figure of 341 litres per capita per day (all races), in contrast to 1 005 litres per capita per day obtained by the Commission and which seemed to be excessive compared to the 1975 figure of about 230 l/c/d and present use in the highly developed PWVS area of supply of 503 l/c/d.

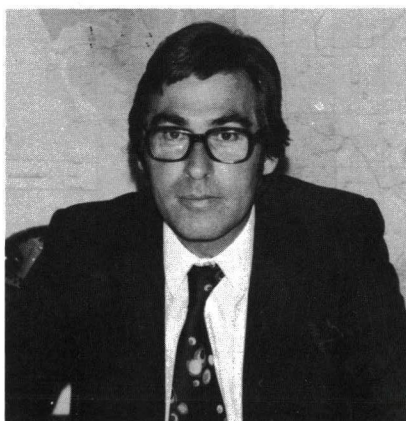
Available

Mr Van Robbroeck pointed out that all these figures were representative of water intake, and that a fair percentage of that water reached rivers as return flows available for reuse so that demand figures could not directly be compared to the available resource figures.

Turning to the matter of water resources, Mr Van Robbroeck said that it had now been fairly generally accepted that by judicious management of the country's water resources about 60% of the mean annual surface runoff could be made available for use and reuse and that this amounted to approximately 32 milliard m³ per annum. To this, he said, the exploitable groundwater resources had to be added. For the purposes of his paper a figure of 2 milliard m³ per annum had been accepted and this gave a total of 34 milliard m³ per annum.

"To this figure must be added return flow from urban use, from industries and from irrigation," he said, the exploitable groundwater reable enabling a reasonable estimate of future flow. At present, seventy-eight per cent of the water abstracted by the Rand Water Board for the area south of the continental divide reaches the rivers and is available for reuse. With a closed cycle the build-up of salts in the system will place an upper limit to the number of reuse cycles but by the time the country's resources are stretched to the limit desalination of the saline effluent might become feasible."

Mr Van Robbroeck said that



Mr TPC van Robbroeck (WAFEC) — some encouraging new figures for the year 2000.

actual figures for return flows from irrigation were even more difficult to obtain. However, with Mr Du Plessis he had accepted a figure of 10 per cent return flow from irrigation and 25 per cent from urban and industrial use, giving a total abstractable water resource of about 40 milliard m³ per annum — "this estimate is thought to be conservative", he added.

Referring to the role of groundwater, Mr Van Robbroeck said that from the figures quoted it could be seen that about half the country's exploitable resources would be utilised by the end of the century and that groundwater would play a relatively minor role in meeting the demand. It could meet approximately 10 per cent of the demand in the year 2000, decreasing to 5 per cent when all resources were fully committed. The importance of groundwater, however, far outweighed the significance of these percentages.

Erratic

He pointed out that 64 per cent of the surface area of South Africa yielded only 15 per cent of the total runoff. In these areas, flow was more erratic and evaporation higher than in the rest of the country, a fact which rendered the exploitation of surface water resources by creating storage hazardous and largely impractical.

Most of these areas were used for grazing stock and animal and human life depended almost exclusively on the availability of groundwater. "It is not generally recognized," Mr Van Robbroeck said, "that, but for the humble borehole

and windmill, these parts would be largely uninhabited."

He also pointed out that rural population concentrations in these parts depended largely on groundwater for their water requirements. A survey of water use and water resources of towns and villages in the Republic, conducted recently by the Department of Water Affairs, Forestry and Environmental Conservation, showed that 94 towns and villages, or 43 per cent of the total surveyed, were dependent exclusively on boreholes.

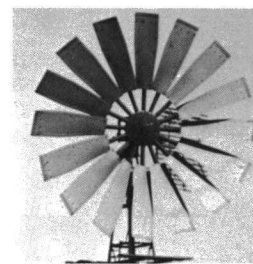
A large number of medium-sized communities and even larger towns, augmented their water supplies with groundwater. A typical example was Vryburg in the Northern Cape which abstracted 3 350 m³/d from boreholes — 68 per cent of its total supply as against 32 per cent derived from the Vaal River. Mr Van Robbroeck warned, however, that there were indications that these boreholes were being over-exploited.

Beneficial

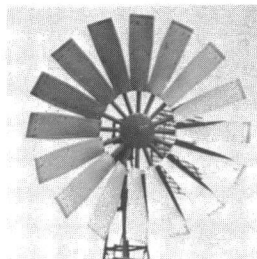
Another significant advantage of groundwater was that it could often be used as a first-phase substitute supply source for a large water consumption project in order to postpone major capital expenditure associated with surface water resource development. This allowed the water demand to increase with time and made it possible to utilise the beneficial effect of scale when the surface resource is eventually developed. Mr Van Robbroeck said that an excellent example of this course of action had been the water supply at Atlantis, north of Cape Town.

Eventually, this town will be served from the Withoogte purification works of the Berg River Government Water Scheme. The estimated (To page 12)

GROUNDWATER '80



GROUNDWATER '80



(From page 11)

cost of the 57 km pipeline was R15 m. Substantial groundwater resources had been discovered on the farm Silversands only 10 km distant from Atlantis. These sources would be sufficient until 1983, when the demand would be 15 400 m³/d, and this would allow the expenditure of a significant amount of money to be postponed for a number of years.

In this regard, Mr Van Robbroeck also said that the rate of development of a new town or mining venture was often uncertain and that major errors could occur if vast sums of money were spent too soon in the development of the infrastructure. He said that the development of a local groundwater resource allowed one to postpone a decision until more clarity about future development had been obtained.

Peaks

Turning to peak demand reduction, he said that groundwater sources may sometimes be used to substantially reduce capital expenditure on large pipelines and on purification works. If a surface water resource was situated far from the point of consumption, aqueducts such as pipelines and associated pumping stations had to be designed and built to a capacity substantially higher than the average rate of consumption. During the hot summer months sustained demand often reached twice the mean and provision had to be made for these peaks since it would be too expensive to create covered storage to cater for long-lasting peaks. In this respect a groundwater resource close to the consumers could be conserved and used only during times of maximum demand and therefore allowing pipelines, purification works and pumping stations to be reduced in size. A good example of this state of affairs was to be found in the case of Wit-

sand, a small coastal town near the mouth of the Breede River. Witsand will be subjected to a 2000 peak demand of 657 m³/d for a period of 10 days during the summer holiday, while the demand for the remainder of the year amounted to only 70 m³/d. Average demand was expected to be 151 m³/d. With boreholes yielding 532 m³/d the initial supply from the Duivenhoks rural water supply scheme could be postponed to at least 1990 and thereafter the pipeline could be substantially reduced in comparison with what would otherwise have been the case.

In some areas groundwater resources were used for large-scale irrigation. This occurred especially in the dolomitic areas of the Western Transvaal and the Northern Cape. Dolomitic areas such as Malmani, Grootfontein, Molopo, Groot Marico, Schoonspruit etc were used for the irrigation of fairly large tracts of land. Water was also abstracted from extensive sand deposits along the Crocodile and Limpopo Rivers and used for irrigation purposes.

Mr Van Robbroeck said that in the overall irrigation picture these sources could be regarded as of minor importance.

In conclusion he warned, however, that experience had shown that the integration of groundwater resources, in an overall master plan of water resource development of the country, was fraught with difficulties, mainly owing to the unpredictability of certain key characteristics of aquifers.

In a paper on "Pollution control relative to groundwater" Mr RT Rudd of the Department of Water Affairs, Forestry and Environmental Conservation said that on account of the relatively small areas of South Africa where it is possible to exploit groundwater of good quality in large volumes, pollution of our groundwater had probably not received the attention it merited. Moreover, with the mining industry having become and remaining the mainstay of South Africa's economy production of minerals had appeared to be the only driving force behind mining for many years and other aspects, notably pollution of both surface and groundwater, had tended to be overlooked.

However, with the promulgation of the Water Act in 1956 and the

widespread publicity given to the shortage of water supplies in this country especially during Water Year 1970, much more attention had been given to groundwater, its potential, exploitation and, of course, pollution.

Mr Rudd said that mining could pollute groundwater in a number of ways:

- **The exposure and subsequent shattering** of minerals containing pollutants such as heavy metals or fluorides caused the surface exposed to the action of water, air etc. to be much larger. Crushing to a high degree of fineness could cause an increase in specific surface of several orders of magnitude, and the water had a much greater chance of dissolving or reacting with the mineral.
 - **Water flowing underground** in mines tended to pick up mineral dust as a suspended solid load.
 - **The injudicious use of nitrogen based explosives** could cause water to be polluted by dissolved nitrogen compounds such as nitrates and ammonia.
 - **The water could be bacteriologically polluted** by faeces and urine contributed by human beings in mine workings.
 - **Acid mine drainage (AMD):** AMD was caused by the exposure, crushing and consequent natural oxidation of various pyrites, but especially iron pyrite (chemical formula Fe S₂) in the presence of air and water to produce sulphuric acid and various iron salts. The sulphuric acid, in turn, could react with various metals to form sulphates.
- The control of the modes of pollution mentioned under the second, third and fourth points above was relatively easy and involved obvious good housekeeping methods such as thrift and care in the use of explosives, provision of adequate sanitation, and simple physical separation or filtration to remove suspended solids.
- The control of pollution caused by dissolved matter, and especially of AMD was much more difficult, and could involve expensive engineering methods such as

drainage to reduce contact time between water and pollutant, Mr Rudd said.

Control of pollution of groundwater from surface sources could be difficult and costly. He said that these sources would include aqueous solutions containing pollutants such as raw sewage, spent chemical solutions from industries, surplus pesticides, used oils and such dangerous materials as polychlorinated biphenyls (PCBs), as well as various categories of solid wastes from which leachates could permeate underground especially after periods of heavy or prolonged rainfall.

"In the case of mining or industrial wastes in large volumes it is, as often as not, impossible to select an ideal dumping site, and it may be necessary to engineer the site in order to prevent pollution", he said. He pointed out, however, that there were other heterogeneous solid wastes which were generated in smaller quantities in urban and industrial areas. These wastes could be broadly classified into three groups as regards their impact on the water cycle:

- **Inert but unaesthetic materials.** Examples: Old car bodies, used tyres, builders rubble brick and pottery shards etc.
- **Wastes which could cause water pollution to a greater or lesser degree, but were neither toxic nor dangerous in themselves.** Examples: Domestic and garden refuse, sewage sludge, wastes from intensive animal feedlots, sawdust, food processing wastes, organic and mild chemical sludges from tanneries, etc.
- **Toxic and hazardous wastes.** Examples: Heavy metal sludges, cyanides, surplus pesticides, spent and contaminated solvents, acids and alkalis, acid oil sludges, paint residues, polychlorinated biphenyls (transformer and condensor oil), certain spent catalysts.

Mr Rudd said that in disposing of these wastes it was most often possible to select a site such that the wastes could be dumped with minimal risk to surface or groundwater, if

necessary after some treatment. The first two categories of waste mentioned above could be dumped on suitable ground, but the third category should only be placed inside suitable excavated sites where contamination of both underground and surface water could be virtually completely eliminated.

Dumped

It was obvious that the first category of wastes could be dumped practically anywhere aesthetic considerations allow. The only precautions which had to be taken involved the combating of nuisances such as mosquitos and rodents, but the potential for surface or groundwater pollution was nil.

For the second category of wastes, similar criteria would apply as for most mine and industrial wastes. Briefly, these were:

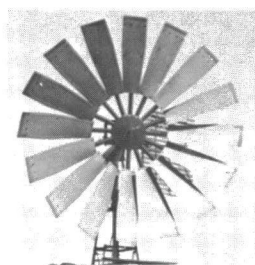
- The site should be carefully selected. It should be at least above the line likely to be reached by a flood in the nearest water course having an average frequency of 1 in 100 years. Where possible, the site should be on a ridge.
- The permeability required in the underlying soil and rock would depend on the material to be dumped.
- The site should, if necessary, be rendered sufficiently impermeable by treatment such as by providing an impervious underlay in the form of sheeting or layer of clay or suitably separated fine material, where geological formations were not sufficiently impermeable. In the selection of impervious materials due account have to be taken of the nature and reactivity of the wastes, and any possible deterioration of the impervious underlay due to exposure to the wastes or to water, air or solar radiation.
- The site had to be protected by cut-off drains on the upper and near upper sides designed to intercept the maximum flood likely to arise from the catchment area above the disposal site with an average frequency of one in a hundred years.
- Provision had to be made to catch and evaporate all rain falling on the dump, on its top. In this respect provision should be made to hold the maximum precipitation to be expected over a 24 hour period with an average frequency of one in 100 years.
- Rain falling on the side of the dump should be retained and evaporated in either impermeable paddock dams placed around the periphery, or a suitable evaporation dam.
- It was a wise precaution to provide underdrainage. The function of such an underdrainage system was twofold, firstly to add to the stability of the dump structure by keeping the downstream face dry under all conditions, and secondly to enable monitoring of any seepage which may take place to be carried out and to detect any leaks.

"All waste dumps should, if possible, be vegetated as an aid to wind and water erosion, which implies also dust control and some control over escape of solids. Vegetation not only makes dumps aesthetically more attractive but can provide a habitat for fauna which can complement the growth of the flora at a later stage by the provision of nutrients and humus in the form of manure, and prevent overpopulation of flora by cropping", Mr Rudd said.

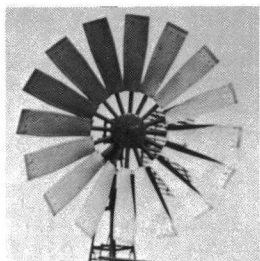
He pointed out that the term "solid wastes" included non-aqueous liquids such as oils, sludges, solvents and toxic solutions, which were absorbed into solid wastes and contained. However, the disposal of aqueous solutions of various types also posed problems — particularly to the groundwater regime. In many cases such solutions were placed in so called "evaporation dams" to prevent

(To page 14)

GROUNDWATER '80



GROUNDWATER '80



(From page 13)

them reaching surface supplies, only to contaminate groundwater by seepage.

In a paper on "Minimising groundwater pollution resulting from solid wastes disposal" Miss J Marsh of the Johannesburg City Engineer's Department put forward the following recommendations to minimise this type of pollution:

- The ingress of water to the refuse must be minimised: the groundwater table can be artificially depressed; stormwater from higher up in the catchment must be diverted around the landfill; the final shaping must encourage run-off; and the final covering should be a thick layer of impermeable material preferably with vegetation.
- Direct contact between the refuse and the groundwater should be prevented by the provision of an adequate buffer or interface of impervious material.
- If necessary a leachate drainage system should be installed to collect polluted seepage.
- Upstream and downstream groundwater monitoring stations should be established before the landfill operations commence. Sampling should continue during the after refuse deposition.

The second day of the symposium was devoted to groundwater modelling and offered papers, *inter alia*, by Mr DB Oakes of the Water Research Centre, Medmenham, England, on "A numerical model of a stream aquifer system subject to delayed rainfall recharge", and "Quantitative estimates of groundwater recharge by means of simple hydrological models" (presented in Afrikaans) by Dr DB Bredenkamp of the Department of Water Affairs, Forestry and Environmental Conservation.

Mr Oakes said that a number of schemes to use groundwater to regulate river flows had been proposed during the past 10 years in the UK and had been the subjects of detailed field investigations and model studies. The Anglian Water Authority was currently investigating the resources of the Chalk aquifer of the Great Ouse basin in eastern England with a view to meeting local demands by direct supply and to providing export yields from river flows regulated by intermittent abstraction of groundwater.

During his paper on quantitative estimates of groundwater recharge Dr Dave Bredenkamp said that in continuation of the successful simulation of groundwater recharge



Dr DB Bredenkamp (WAFEC) — some 'exciting' results reported on

on the basis of monthly rainfall and climatological factors the study had been extended to include models utilising annual data.

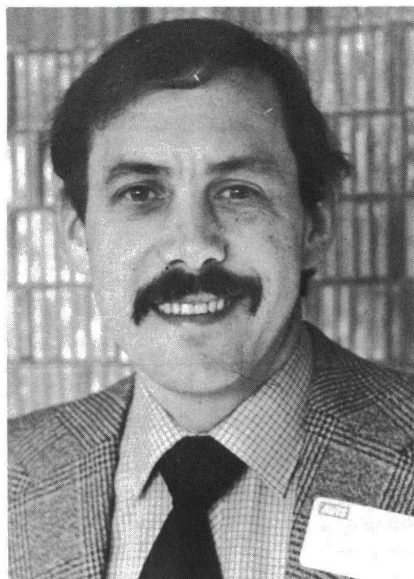
He said that the models had been developed with regard to the Upper Molopo dolomitic area where quantitative values for groundwater recharge could be determined. By interpreting the water level fluctuations in the "Wondergat" (near Slurry) the annual recharge could be deduced as an effective rise in water level. These figures were used in optimising the models.

'Exciting'

Dr Bredenkamp said that "astounding" results had been obtained with a very simple model in which recharge had been regarded as a direct function of rainfall, instead of it being the difference between rainfall and ineffective rainfall. One equation derived at showed the interesting result that the hydrological balance was determined mainly by the rainfall average.

He described this equation as an "exciting" result with definite possibilities for application in dolomitic areas. It also showed considerable promise as a method for estimating the potential recharge in unfamiliar areas with rainfall as the singular input variable.

The symposium, which was well-attended, was officially opened by the former Secretary of Water Affairs, Dr JP Kriel.



Mr DB Oakes, Head of the Groundwater Modelling and Geophysics Section of the WRC at Medmenham in the UK also attended the symposium and read a paper. He has been brought to South Africa by the Water Research Commission to assist with groundwater problems in the Crocodile River basin, the Breede and Hex River areas.

Obiit:

Dr C vd M Brink

Sedert die vorige uitgawe van *SA Waterbulletin* is 'n geëerde lid van die Watervorsingskommissie (WVK) oorlede in die persoon van dr C van der Merwe Brink.

Ten tye van sy oorlye was dr Brink president van die WVK. Gedurende sy loopbaan het hy talle toekennings ontvang, waaronder vier eredoktorsgrade en die Staatspresident se Dekorasie vir Voortreflike Diens.

Dr MR Henzen, Voorsitter van die WVK, het hulde gebring aan wyle dr Brink as 'n gewaardeerde lid van die Watervorsingskommissie. Hy het gesê dat dr Brink met sy wye wetenskaplike kennis en ervaring 'n omvangryke bydrae tot navorsing in Suid-Afrika en ook 'n besondere bydrae tot die werksaamhede van die WVK gemaak het.

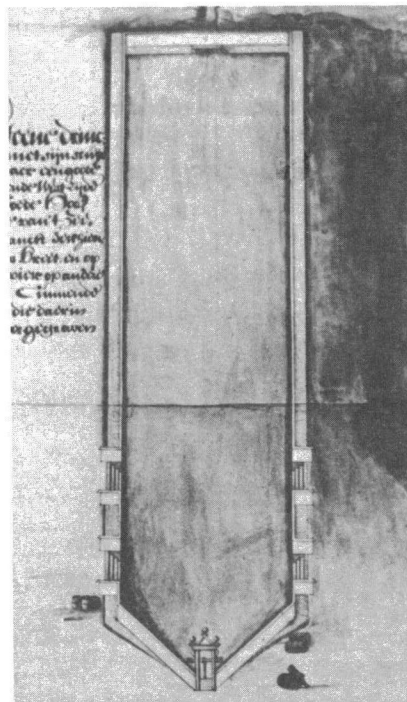
Dr Henzen het gesê dat die WVK bevoorreg was om dié kennis by sy besluitneming te kon benut het, en dat dr Brink se heengaan 'n leemte laat wat nie net by die WVK nie, maar ook in ander komiteekamers en raadsale dwarsdeur die Republiek as 'n gemis gevoel sal word.

"Namens die lede en personeel van die Watervorsingskommissie wil ek graag ons innige meegevoel met die naasbestaandes van dr Brink betuig," het dr Henzen gesê.

OU DAM NOU BEHOUE



Wagenaar se dam wat uit die jaar 1663 dateer en waaroor daar in die eerste uitgawe van *SA Waterbulletin* verslag gedoen is, is veilig agter glas behoue in 'n gesou in die Goue Akker in die Moederstad. Die foto bo toon 'n deel van die sluis en die foto regs die skets wat in die Kaapse Argief bewaar word en waarmee die dam geïdentifiseer kon word.



IBWB

Let asseblief daarop dat die nuwe hoofkantooradres van die Suider-Afrikaanse tak van die Instituut vir die Bestryding van Waterbesoedeling as volg is:

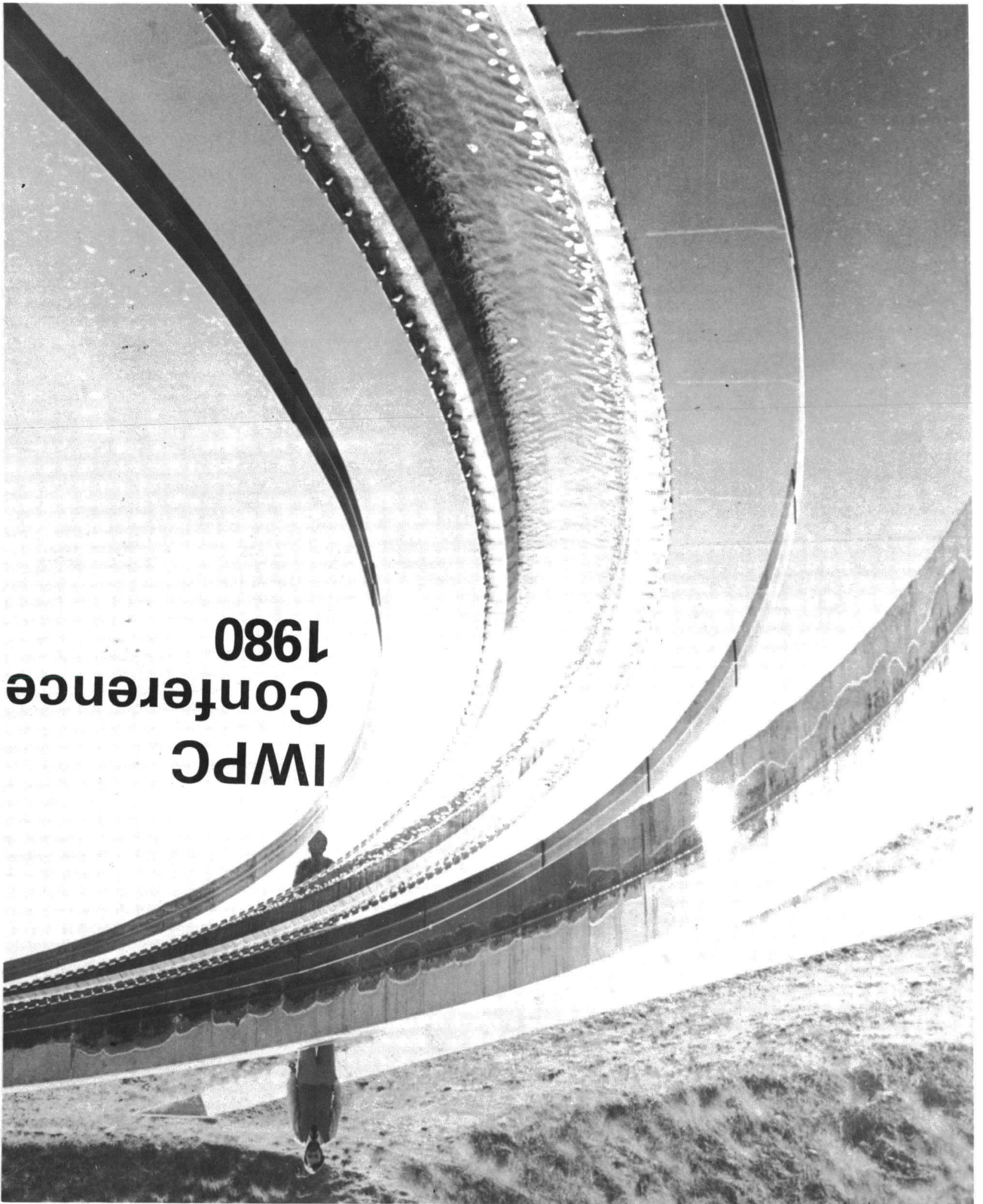
Posbus 81249
PARKHURST 2120

IWPC

Please note that the new head-office postal address of the Southern African branch of the Institute of Water Pollution Control is:

PO Box 81249
PARKHURST 2120

"I must pay tribute to the boldness of the scientists and engineers of the Institute of Water Pollution Control who, through their endeavours, have undoubtedly put South Africa in the forefront in the field of nutrient removal by biological means, both in theory and in practice. This was said by the Minister of Water Affairs, Forestry and Environmental Conservation, M. Braam Raubenheimer, when he opened the IWPC conference at the CSIR in Pretoria in June 1980."



IWPC Conference 1980

Mr Raubenheimer said that he wanted to acknowledge with great thanks the part the Institute had played not only in furthering the technology of nutrient removal, but especially in conveying the message to those organizations responsible for expenditure with regard to nutrient removal in the interest of the country as a whole.

"I think your Institute has done a tremendous job in this respect and I am sure that we shall all pick the fruit of your labours," the Minister added.

"It is an open secret that the standards that have been recommended and which are in the process of being promulgated will be 1 mg per litre of orthophosphate as phosphorus. I have warned that although the standard may be sufficient to arrest or prevent eutrophication of some of our dams it will almost certainly not be effective in other very heavily enriched waters where, in some cases, the influx of effluents already constitutes a large proportion of the total annual mean inflow. In these cases a standard of one milligramme per litre will almost certainly not suffice to reduce the nutrient levels below that required for explosive weed growth, especially where there are other sources of nutrients which cannot easily be controlled", he said.

Trial

The Minister said that he wanted to state categorically that the present nutrient standard was likely to be a temporary one in such areas and that it would probably be necessary to set mixed standards for nutrients in certain areas after a trial period of approximately ten years. Fortunately research on this subject was continuing and some very promising avenues were being explored, amongst others the use of certain troublesome mining waste products to produce suitable reagents for inexpensive chemical removal of phosphates to levels of an order of magnitude less than the presently intended standards.

Turning to water pollution, the Minister also said that he was con-



The Hon AJ Raubenheimer

vinced that the general approach of prevention being better than cure should apply wherever practically possible.

"During the past decade," Mr Raubenheimer said, "South Africa has seen a considerable growth in mining and industrial development. To name a few features: the harbour for exports at Richards Bay has been completed and expanded to handle not only aluminium, but also coal and fertiliser. The massive process units of Sasol II have come into partial operation. The harbour at Saldanha Bay has been built and the Saldanha-Sishen railway link completed and commissioned.

"The energy crisis of 1973 has had a twofold effect: the exploitation of our coal, on the one hand and mining in general, on the other hand, have moved along rapidly. By 1978 South Africa had become the sixth largest exporter of coal in the world with a 7,7 per cent share of the world market. Coal has also ousted oil as raw material in a number of industries. This has caused the establishment of a large plant in Modderfontein for the production of ammonia, and two advanced factories for manufacturing plastic and many other products have been erected at Sasolburg and Newcastle and are expanding. New coal fields have been discovered and exploited," he said.

Mr Raubenheimer also said that ESCOM had made excellent use of the country's coal resources and had developed modern power gene-

rating stations, the most recent of which will be able to generate 3 600 MW each and will use 800 000 tons of coal per month. Advanced techniques had been used in the mining of the coal and one of South Africa's coal mines will be able to produce 2,25 million t of coal per month.

Other mining activities had also expanded. The rise in the price of gold had led to the exploitation of old mine dumps for their gold, uranium and pirite. A single plant was already producing approximately 70 kg of gold, 400 t of uranium and 560 000 t of sulphuric acid per annum. The exploitation of iron, asbestos, tin, phosphates, copper, zinc, lead and silver had expanded.

"These developments led to an unprecedented demand for water and an exceptional potential for polluting water," the Minister said.

"In order to meet the water demands of industry my Department had to devise completely new measures in the form of the coupling of river systems to serve jointly as water resources for various areas. This commenced in the sixties with the Orange-Fish-Sundays River schemes and the idea was then extended to the Usutu-Vaal and the Tugela-Vaal. Currently we are also utilising the Usutu-Komati, the Tugela-Vaal and the Olifants as water supply sources for the Transvaal and Free State coal mining industries, Sasol I, II and III, the Pretoria-Witwatersrand-Vereeniging complex, the platinum and coal mining complexes of Rustenburg, Klerksdorp and Orkney. In spite of gigantic efforts the ghost of water shortages is already looming over the horizon," the Minister said.

He added however that on the positive side great progress had been made in the purification and reuse of effluents for industrial or other purposes.

Steady

"I assume that there will be members of your Institute present here today who have had a hand in improvements in the water and effluent regimes of the tanning industry, the wine and spirits, canning, sugar and meat industries, the various mining activities, the chemical and metallurgical indus-

(To page

metry of a secondary clarifier at Johannesburg's Works was captured during the post-conference tour.

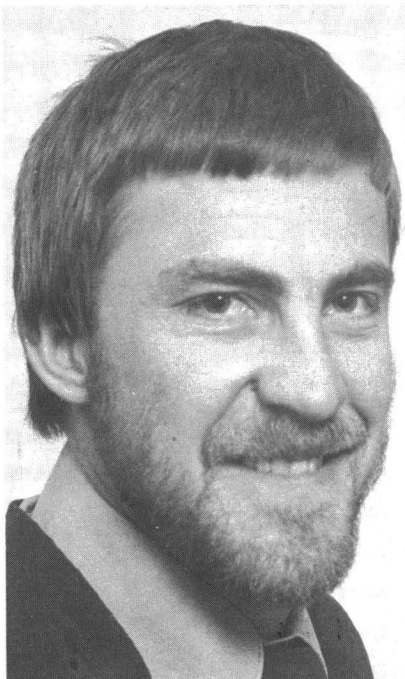
IWPC CONFERENCE 1980

(From page 17)

tries and many more. During the past decade steady and significant progress has been made in virtually all branches of sewage and waste water purification and the results achieved convince me that people such as your members will be able to ensure sufficient water supplies of good quality to our country in the times that lie ahead," Mr Raubenheimer said.

Other speakers during the opening ceremony were Mr GR Botha, chairman of the Conference Committee; the Mayor of Pretoria, councillor Fanie van Rensburg (who welcomed delegates to the city); and Dr Tony Downing, president of the IWPC, London. Speakers were introduced by the current chairman of the Southern African branch of IWPC, Dr Lukas van Vuuren.

In a paper on "Physical-chemical treatment of combined tannery wastewater to achieve acceptance for discharge to municipal sewer" (co-authored by MJ Hagger) Mr SD Roets, then of the Pretoria City Council, sketched the problems of a tannery near Pretoria which had for many years been compelled to dispose of its effluent to evaporation ponds because of the difficulties in complying with conditions required for discharge to sewer. The evapora-



Mr Sarel Roets

tion ponds, which occupied approximately 40 ha of land close to the factory, had both economic and environmental disadvantages. Mr Roets said that the odour arising from the ponds, probably as a result of the release of hydrogen sulphide gas, had given rise to continual complaints from nearby residential areas.

Furthermore, the area oc-

cupied by the ponds had become, with increasing development in the surrounding areas, an extremely valuable site. In addition, disposal to evaporation ponds resulted in loss of water which could otherwise have been reclaimed and there was a persistent risk of contamination of ground or surface waters through infiltration or leakage.

Mr Roets said that the most practical alternative to the use of evaporation ponds for wastewater disposal was discharge to sewer. However, the regulatory authority, i.e. the Pretoria City Council needed to be satisfied that if they allowed certain relaxations in the by-laws governing discharge of industrial wastewater to sewer, then the relaxed conditions would not prejudice compliance with the conditions attaching to the quality of the final discharge from the sewage treatment works.

Considerable

There was considerable evidence in the literature that tannery wastewaters were amenable to biological treatment particularly in combination with domestic wastewater if the proportion of tannery wastewater did not exceed 25 per cent of the combined total flow. However, certain characteristics of tannery wastewater and reported problems concerning its influence on treatment processes had created a reluctance on the part of authorities to accept tannery wastewaters into sewers. Mr Roets quoted, as an example, that high concentrations of sulphide presented special difficulties in the conveyance and in the biological treatment processes. For this reason pre-treatment on site was regarded as an essential part of tannery wastewater disposal.

He said that the extent of such treatment depended upon the ultimate method of disposal. The paper described investigations relating to the degree of on-site treatment required to achieve proposed conditions for discharge to municipal sewer.

As part of its overall pro-



The main table at the opening ceremony of the IWPC conference (fltr): Dr AL Downing (president of the parent IWPC in the UK); the Hon AJ Raubenheimer; Dr LRJ van Vuuren (chairman of SA branch of IWPC); the Mayor of Pretoria, Cllr Fanie van Rensburg; and Mr Tony Pitman (Treasurer).

IWPC CONFERENCE 1980

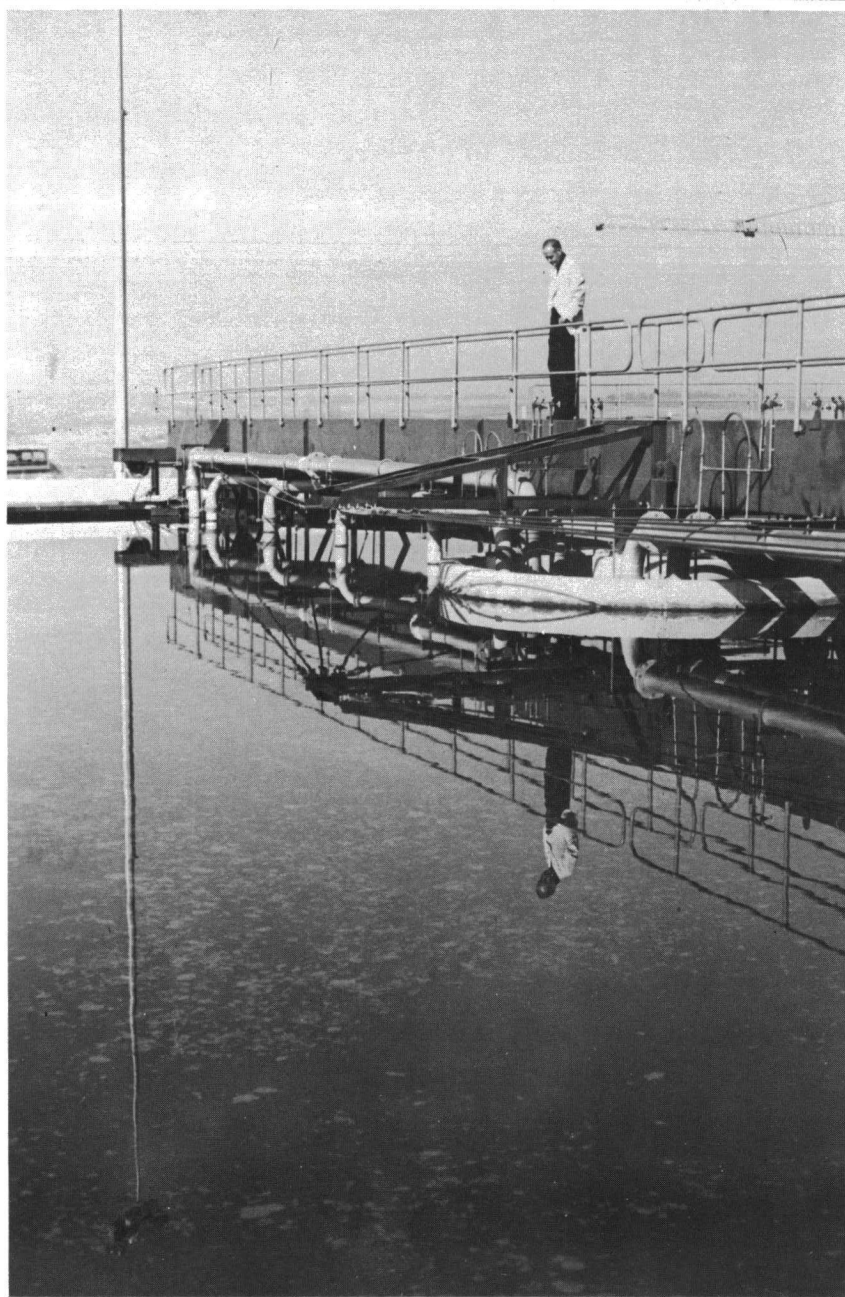
gramme on the development of guidelines and a code of practice for water and waste management in the hides and skins processing industries, the Water Research Commission entered into a contract with the tannery in question in terms of which a research and development programme would be carried out in cooperation with the Pretoria City Council and the Leather Industries Research Institute. The main objectives of the programme were:

- To determine the characteristics of the wastewater from a survey of flow and composition
- To carry out in-house process modifications (mainly the processing of green hides) and to determine the commercial practicability of such changes and their influence on wastewater composition
- To develop suitable methods of effluent pre-treatment to achieve the proposed limits for discharge to sewer
- To investigate the influence of discharging the tannery effluent into sewer, both in the sewer system itself and at the receiving treatment works.

Mr Roets said that the investigation had shown that the tannery could achieve the proposed limits set down by the Pretoria City Council for discharge of the process wastewater to sewer.

As far as total dissolved solids were concerned, he said that by processing at least 80 per cent of their raw material as non-salt cured hides it was possible to reduce the TDS concentration to about 7 500 mg/l. The influence of the quantity of salt hides processed was very significant and it was therefore imperative that the availability of 1 000 green hides per day was ensured (assuming that total production amounted to 1 200 hides per day). If production were expanded then the 4:1 ratio (green: salted) had to be maintained.

In the case of tannery wastewater "heavy metals" referred specifically to chromium, Mr Roets said. It had been shown that if an efficient solid-liquid separation stage were included in the pre-treatment facilities for tannery wastewater the



One of a battery of secondary clarifiers at the Northern Sewage Works near Johannesburg.

chromium concentration could easily be reduced to less than 10 mg/l.

He added that the proposed limit of 25 mg/l total sulphides could easily be achieved. It had been shown that the essential requirements to attain this were continuous aeration and prevention of anaerobic conditions developing at any point in the wastewater treatment facilities.

The use of ferric chloride as a coagulant required that the effluent

being treated had to be practically free from dissolved sulphides otherwise the formation of ferric sulphide would have occurred. This finely divided precipitate did not settle and could not be removed by the dissolved air flotation unit. The effluent would therefore have had a characteristic black colour and total sulphide concentration would have been exceeded.

(To page 20)

IWPC CONFERENCE 1980

(From page 19)

Mr Roets also said that the proposed limit for sodium could also be achieved providing the use of salt (NaCl) was limited wherever possible.

One of the invited delegates from overseas, Mr RD Heaton, read a paper on "water reclamation policies" which gave an interesting insight into the machinery of water pollution control in the United States.

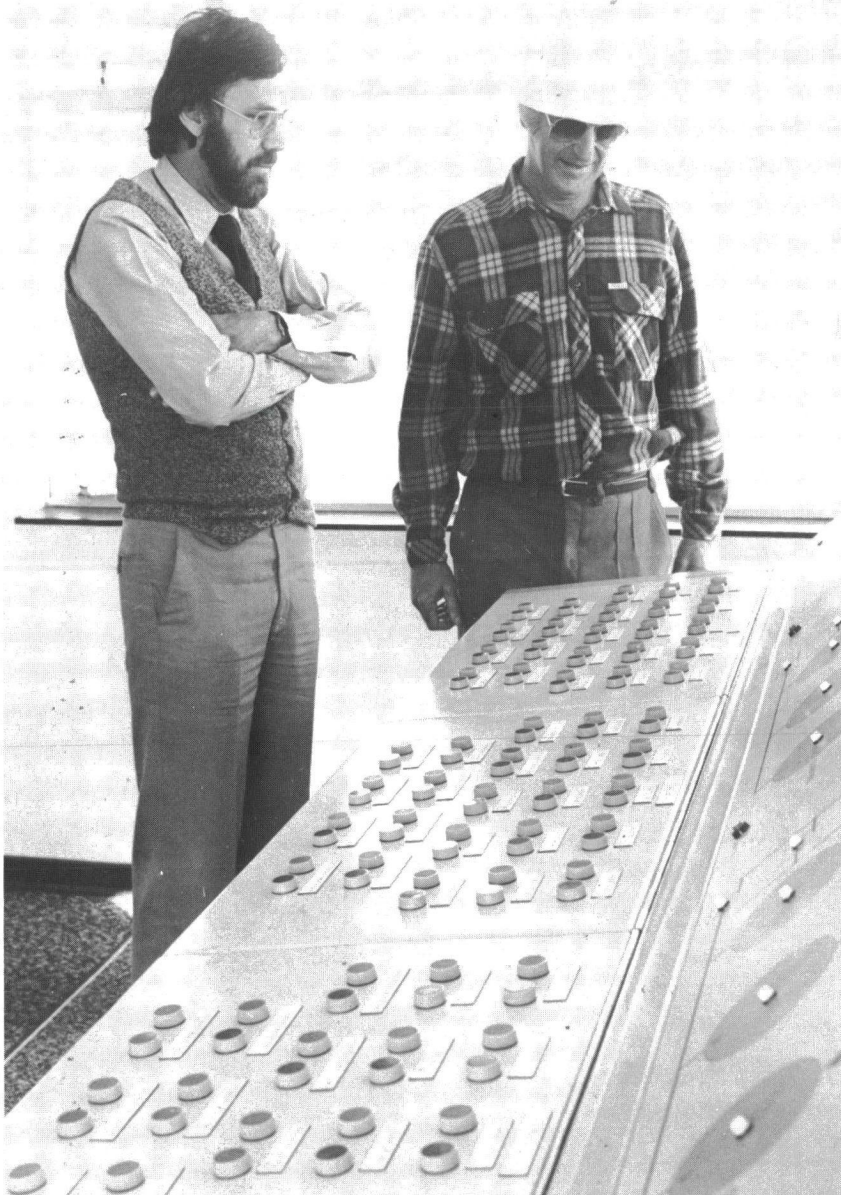
Mr Heaton, who is attached to the Research Foundation of the

American Water Works Association, said that in spite of national policy encouraging and mandating reuse there were several barriers in the way of project implementation. These were:

- Congress, the Federal Office of Management and Budget (OMB) and General Accounts Office had questioned the efficacy of advanced wastewater treatment (AWT) which increases reuse opportunities. There was a very serious question of logic of pouring bil-

lions of dollars into the construction grants programme when performances had not been exceptional, the plant capital and energy intensive or the removal of certain pollutants not warranted. Non-point pollution sources (stormwater runoff and agricultural return flows) may contribute more to the problem than the controllable effluent discharges. Any AWT project costing more than a million dollars had now to be personally reviewed by the Environmental Protection Agency (EPA) administrator for justification.

- There simply were not enough construction grant funds to bring the entire nation up to the desired secondary treatment level. This limitation in funding had caused OMB to state that water pollution control money could not be spent on water supply (water reuse) projects.
- Projects with any other benefit like conservation or reuse other than pollution control could not be funded under the present legislation and were called multi-purpose projects.
- If a reuse project were to receive federal acceptance and funding, archaic state laws in some instances still prohibited the use of human sewage on crops, etc in spite of health and technological advances.
- The majority of municipalities in California had received the national goal of secondary treatment and were now desirous of adding additional processes to reuse the effluent. These had now become organizations with water supply projects which were designated MP. Reuse projects funded under the construction grants programme in the past were said to have been contrary to the stated policy but had not been stopped because of liberal interpretation and sufficient funds.
- In essence, the federal govern-



Two delegates to the IWPC conference viewing the control console of Unit 3 of the Northern Works: Mr JE McGlashan (left) of the Water Research Commission, and Dr JJ Barnard of the Department of Health.

IWPC CONFERENCE 1980

ment encouraged conservation via reuse, but had not promised to pay for it or to make sufficient provisions to do so.

- EPA was reluctant to subsidise reclamation projects where the effluent had been sold by a purveyor.

Mr Heaton said that tragic as it seemed, the US needed another drought to spur new legislation and new reuse policies. Congress responded to crisis situations, but a concerted, unified effort from states, professional associations, and municipalities could influence the proper policy direction now. EPA was currently writing a ten-year plan and policy for the 1980's that could avoid a crash programme if influenced early in its formation. It was expected to be released in late 1980. Private monies were being expended but millions were needed and the demand justified federal participation.

"Reuse costs are relative," he said. "What appears expensive and infeasible today may not be when the well runs dry. If you want to implement a major water reuse project under current conditions, you have to do it yourself because the federal attitude is 'conservation via reuse is good, but we're not willing to pay the price yet.'"

The present approach in the United States was that water reuse was not motivated by water supply people. Reclamation was not a direct initiative of water purveyors but rather a by-product of pollution control programmes.

Mr Heaton said that there was no mechanism in the United States to resolve the conflicts between need, risk and economics, but there was an evolutionary process. When the need was so great, the choice would eventually be made by the public.

In a paper on "The treatment and disposal of toxic and hazardous waste" Dr PD Scott said that a philosophy of regional hazardous waste disposal had been developed, namely that the methods of treatment and disposal be both technically adequate to prevent environmental pollution, and cost effective.

He said that from a Code of



Two delegates from the USA discussing proceedings were Mr RD Heaton (left) of the Research Foundation of the AWWA and Mr GL Culp. Mr Heaton read a paper on "Water reclamation policies".

Practise presented one could derive an index of the requirements for establishing a regional waste disposal centre. In summary the index would contain information on:

- **Landfill site** — type of site, a geological survey, a surface contour map, a hydrogeological survey,

climatology, plan of the preparation and operation of the site

- **Waste specifications** — nature of wastes, acceptable and non-acceptable wastes, methods of treatment and disposal
- **Treatment plant specifications** (To page 22)



Wintry trees are reflected on the surface of this balancing tank at Northern Works.

IWPC CONFERENCE 1980



A group of delegates discussing the merits of the mechanical aerator in one of the activated sludge basins during the post-conference outing to Johannesburg's Northern Works.

(From page 21)

— nature of treatment processes, acceptable and non-acceptable wastes

- **Monitoring and control** — analytical procedures, registers and records

Dr Scott said that such an index should constitute the basis of a typical application for a waste disposal site licence. The application then provided a scientific evaluation of the waste problem and its solution. By putting such a proposal into practice, effective prevention of pollution could be achieved at a reasonable cost. However, this presumed that the principle of selection and operation of such waste disposal facilities were clearly understood and put into practice.

"Some sort of regulatory system is necessary to ensure this," he said. "The route followed by other countries has been waste disposal site licensing. Is it not also long overdue here?"

The fourth day of the IWPC conference was devoted to two post-conference tours for delegates. One tour included the Rynfield Sewage Purification Works, the Bethlehem

High Density Sludge Process and the ERGO project. The other took in the Northern Sewage Purification Works (Johannesburg) and the South African Breweries.

DEPT. WBO: MELD BESOEDILING AAN

Die publiek besef ongelukkig nie altyd hoe noodsaaklik dit is om gevalle van waterbesoedeling dadelik by die Departement van Waterwese, Bosbou en Omgewingsbewing aan te meld nie, luidens die jongste jaarverslag van dié Departement.

Die verslag verwys onder meer na twee gevalle van onopsetlike rivierbesoedeling wat aangemeld is en wat ernstige gevolge kon gehad het. In Natal het 'n insekgif wat per ongeluk in 'n takrivier beland het ongesteldheid veroorsaak by mense wat kort daarna van die water gedrink het. Verbruikers verder stroomaf het egter geen ongerief gely nie.

'n Vragmotor met insekgif het

in Lesotho die pad byster geraak en in 'n klein takrivier van die Caledonrivier beland. Gebrekkige kommunikasie het veroorsaak dat die nuus die Departement op 'n late stadium bereik het. Oewerbewoners is gewaarsku om op die uitkyk vir dooie visse te bly en om die water dan nie te gebruik nie. Geen nadelige gevolge is egter aangemeld nie.

Die verslag meld voorts dat 50 gevalle van onopsetlike en opsetlike besoedeling gedurende die jaar ondersoek is. In baie gevalle het die ondersoek geen positiewe resultate opgelewer nie aangesien die besoedeling ten tye van die ondersoek reeds uitgewis was.

Ozone:

S.A. STRENGTHENS CONTACTS ABROAD

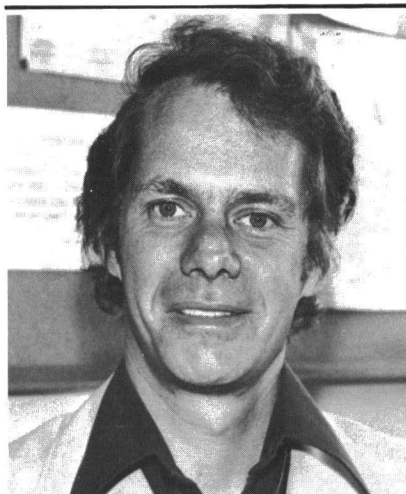
Mr Hans van Leeuwen, currently chief research officer of the National Institute for Water Research of the CSIR, has recently been elected to the Board of Directors of the International Ozone Association.

During an interview with *SA Waterbulletin* Mr Van Leeuwen said that he had for a number of years been active in the affairs of the International Ozone Association (IOA — see box) and especially so since 1978 when he was co-opted onto the Board of Directors of the IOA to succeed Mr Bill Ross (NIWR, Cape Town).

Since 1975 South Africa has been represented on the Board (of the then International Ozone Institute) when Mr Ross was elected a director. His election followed upon his presentation of a well-received paper at the Second International Symposium of the IOA in Montreal. Mr Van Leeuwen and Dr W.O.K. Grabow had been co-authors with Mr Ross.

What is ozone? It is an allotropic form of oxygen present in the atmosphere and can be generated by means of an electrical discharge. The potent oxidising effect of ozone (designated O_3) is utilized in the purification of water since it removes dissolved organic substances and suspended micro-organisms. Ozone is also freely present in the stratosphere where it acts as a shield against some ultraviolet rays emitted by the sun.

In addition, ozone supplements the efficiency of activated carbon in removing dissolved organic substances from water. The porous nature of activated carbon endows it with a very large surface area (1 000 m^2/g). Most of the molecules of undesirable substances in water can adhere to this surface (in a process called "adsorption") and are therefore removed from the water to be purified. Owing to saturation of the pores with molecules the life of the carbon is limited. The biological activity which is created on the activated carbon assists in breaking down the adsorbed substances and the life of the carbon is thereby extended. Pre-ozonation can play an



Mr Hans van Leeuwen

important rôle in promoting this biological activity.

In 1979 Mr Van Leeuwen attended the 4th World Congress of the IOA in Houston, Texas, and presented a paper on *The design and application of a packed ozone absorption column in water reclamation*.

This paper was well received and led to an invitation to read a paper at a conference on the treatment of combined industrial and domestic waste water held at the University of Texas in Dallas in March 1980 and organized by the University and the Environmental Protection Agency of the USA. This paper was co-authored by L.R.J. van Vuuren, J.F.J. van Rensburg, A.J.F. du Plessis, R. Smith and M.L. Siebert.

Mr Van Leeuwen, an M.Sc. (Chem. Eng) graduate of the University of Pretoria, is a member of the South African Institute of Chemical Engineers, the Engineers Association of South Africa, and registered as a professional engineer. He is also scientific adviser to the South African Filtration Society and is the author (or co-author) of 20 publications on ozonation, chlorination and active carbon.

WHAT IS THE I.O.A.?

The International Ozone Association (IOA) is a non-profit educational and scientific association which collects and disseminates ozone information; brings together through meetings and publications the scientists, engineers, systems designers, technologists, equipment manufacturers and users to share experience with, and research data about, ozone and the related oxygen species science.

The IOA covers such fields and technologies as:-

- generation of ozone from air or oxygen by corona discharge or by ionizing or non-ionizing radiation
- contacting of ozone in drinking water and waste water treatment applications
- chemical application of ozone on concentrated solutions for commercial organic syntheses
- treatment of air with ozone for deodorizing and preservation of foods
- stratospheric reactions for ozone formation and decomposition
- development of reliable analytical procedures for ozone
- effects of ozone on construction materials
- health and medical effects of ozone.

The IOA already boasts members in Austria, Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Italy, Israel, Japan, Netherlands, New Zealand, Norway, Poland, South Africa, Sweden, Switzerland, the UK and the USA.

More information on the IOA may be obtained from Mr Hans van Leeuwen, NIWR, PO Box 395, Pretoria 0001.

KOMMISSIE NEEM AFSKEID



Limnologie:

NAGRAADSE KURSUS AAN U.O.V.S.

Die Universiteit van die Oranje-Vrystaat wil graag besonderhede van die nagraadse opleiding in Limnologie wat dié Universiteit bied onder die aandag van lesers van *SA Waterbulletin* bring.

Die limnologiekomitee van die Fakulteit Natuurwetenskappe is verantwoordelik vir die opleiding op hierdie gebied, oefen beheer oor toelating uit en wys studieleiers of promotors aan. Die opleiding van wetenskaplikes in die honneurskursus (kyk onder) word deur ongeveer twaalf personeellede van die Departemente Dierkunde, Mikrobiologie en Plantkunde asook die Instituut vir Omgewingswetenskappe behartig.

Die Koördineerder: Limnologie van die UOVS, prof AJH Pieterse, het *SA Waterbulletin* meegedeel dat uitgebreide navorsingsfasiliteite beskikbaar is en dat pogings aangewend word om studiebeurse aan studente beskikbaar te stel. Reëlins sal ook getref word om Engelssprekende studente tegemoet te kom om studieprobleme wat as gevolg van taal opduik, uit die weg te ruim.

Kandidate wat in die graad honneurs Baccalaureus Scientiae belangstel, moet in besit wees van 'n BSc- of BSc Agric-graad met minstens een van die volgende as hoofvakke: Biochemie, Chemie, Dierkunde, Entomologie, Fisika, Grondkunde, Mikrobiologie, Plantkunde.

Die kursussamestelling is as volg:

- Fisies-chemiese limnologie
- Biologiese limnologie (primêre produseerders)
- Biologiese limnologie (sekondêre produseerders en ontbinders)
- Waterkwaliteit en waterbeheer
- Keuse uit toepaslike kursusse ter aanvulling van kennis
- Gevorderde praktika om by bogemelde kursusse aan te pas.

'n Meestersgraad en 'n doktorsgraad in die Limnologie word ook deur die Universiteit aangebied.

Meer besonderhede oor hierdie aangeleentheid kan verkry word van prof AJH Pieterse, Koördineerder: Limnologie, Departement Plantkunde, Universiteit van die Oranje-Vrystaat, Posbus 339, BLOEMFONTEIN 9300.

Sedert die verskyning van die laaste SA Waterbulletin het die Waternavorsingskommissie afskeid geneem van dr JP Kriel by geleentheid van sy amptelike aftrede as Sekretaris van Waterwese. Tydens dié funksie is dr Kriel (links) afgeneem saam met mev Kriel, mev Henzen en dr MR Henzen, voorsitter van die Kommissie. (Nuwe Kommissie word in die volgende uitgawe van die nuusbrieff bekend gestel).

GEELVISSE NA BUFFELS

'n Woordvoerder van die Natalse Parkeraad het onlangs gesê dat 500 Natalse geelvisse in die Buffelsrivier naby Newcastle deur Natalse Parkeraadpersoneel heringevoer is.

"Dit is die eerste keer, sover ons weet, dat 'n grootskaalse vangs en verplasing van warmwatervis van een rivier na 'n ander plaasgevind het."

Verlede jaar het die geelvisse in hierdie deel van die Buffelsrivier as gevolg van waterbesoedeling uit 'n plaaslike fabriek heeltemal uitgesterf. Op versoek van plaaslike hengelaars het die Raad onderneem om 'n paar visse gratis weer in te voer in 'n poging om 'n klein teelstapel te hervestig. Die geelvisse is oor twee dae in die Mweni-, eMlambonjwa- en Tugelarivier gevang.

"Baie mense weet nie dat waterbesoedeling so 'n drastiese uitwerking kan hê nie, en ons hoop dat hierdie voorval as voorbeeld vir hulle sal dien."

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



SA Waterbulletin
PO Box/Posbus 824
Pretoria 0001

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

INSTRUMENTS FOR USE WITH SLUDGE

Allied Colloids have been appointed sole agents for the supply of Triton Electronics equipment which includes the following:-

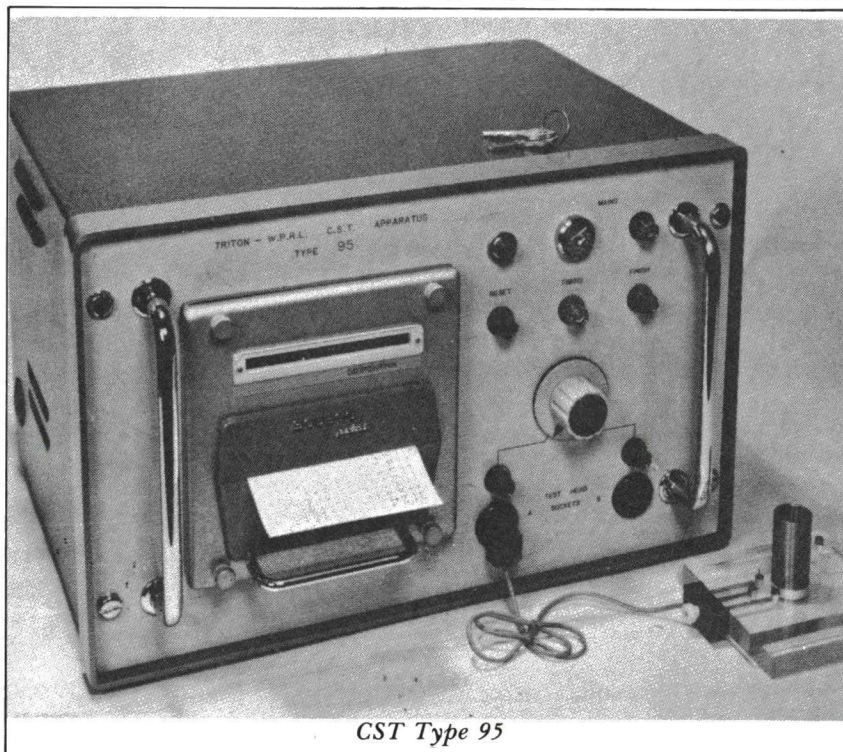
1. Triton - W.R.C. C.S.T. (Capillary Suction Time) Apparatus Type 92. This is an instrument invented by the Water Research Centre for measuring sludge filtrability. This model is ideal for use in the field as it operates from self contained batteries which can be recharged from Mains supply by means of the built in battery charger.
2. Triton - W.R.C. C.S.T. Apparatus Type 165. This is the new "Mains only" model of the above instrument.
3. Triton - W.R.C. C.S.T. Apparatus Type 95. A Mains model with a SODECO printer which records C.S.T. (in seconds and tenths of a second) together with date and time. It also incorporates dual test head facility.
4. Triton - W.R.C. Standard Shear Test Stirrer/Timer Type 133/131. This is an ancillary of the C.S.T. instrument and comprises a constant speed stirrer with process timer.
5. Triton - W.R.C. Settling Apparatus Type 162. This introduces a new settling parameter "The Stirred Specific Volume Index" (SSVI) which may successfully be used in the predictions of maximum solids loading which can be accepted by full scale secondary settlement tanks.
6. Triton - W.R.C. Frozen Image Centrifuge Type TW 161. This was developed

to perform the Water Research Centre sludge thickenability tests. In this sludge samples are subjected to centrifugal accelerations ranging from 10 G to over 100 G. As an example sludge in a 17,8 cm test tube subjected to 50 G for five minutes is regarded as having had the equivalent treatment of the same sludge in a 3,5 m deep thickener for one day.

Enquiries:

Pollution Control Division,
Allied Colloids (S.A.) (Pty.) Ltd.,
P.O. Box 48775,
ROOSEVELT PARK
2129.

Telephone: 46-5335



CST Type 95

EQUIPMENT



TOERUSTING

Fischer and Porter GmbH have announced that their existing magmeter range has been enlarged by the low cost compact Magnetic Flowmeter series "COPA". Thus, the installation of magmeters in many application fields has proved to be economical and arousing interest.

The type D10D1455 Magnetic Flowmeter of the "MAG-X"-System is a compact, volumetric, liquid flowrate detector that utilizes as the process transducing method the characteristic of a conductive fluid to generate an induced voltage when flowing through a magnetic field. The amplitude of the voltage, thus produced, is directly proportional to the flowrate of the metered fluid. By means of the characterized magnetic field technique compensating the weighing factor influences the magnetic flowmeter is independent of nearly all flow patterns. The meter's magnet coils are powered by an integrally mounted magnet driver unit. The magnet driver is used exclusively with magnetic flowmeters which employ the steady state magnetic field principle "MAG-X". This unique method of magnet coil drive, as utilized in the type D10D1455 provides total zero point stability. The magnet driver unit is controlled by a signal which originates in the associated MAG-X Flow Converter.

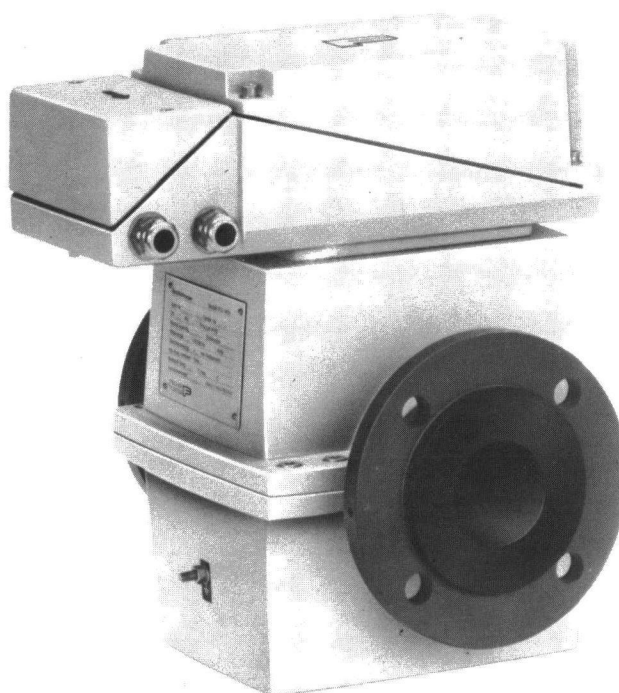
Particular design features of the compact magmeter series "COPA" are:-

- Signal converter with current and pulse output signals directly mounted on flowmeter primary.
- Absolute zero stability. — No zero adjustment. Factory set zero at time of hydraulic calibration will improve system performance. Eliminates shut off valves upstream and downstream of the "COPA" for zero alignment.
- High accuracy. Ensures at all times optimum production control and significantly reduces possibility of process waste.
- Extremely low power consumption (max. 16 Watts). — Saves energy and reduces energy costs.
- Handles fluids with low conductivities down to 5 $\mu\text{S}/\text{cm}$. — Applicable to most liquids.
- Linear and accurate flowrate measurement. Characterized inhomogeneous magnetic field assures a voltage output equal to continuous average flow velocity regardless of flow profile.
- Only 3 diameters straight pipe run required. Installation at any given point in the pipeline. — Minimizes pipe length and installation place.

- Short compact form. — Easy handling and installation.
- No pressure loss when meter tube and pipe diameter are equal. — Reduces pump size and saves energy.
- All solid state design. — No maintenance required.
- Output signal linear and proportional to the flow velocity.
- Junction box separate from electronic circuitry. — No need to open electronic section of the housing in order to connect the meter to power supply.
- Volumetric flowrate measurement independent of fluid viscosity, density and temperature.
- Analog and pulse output signals directly from magnetic flowmeter. — Reduces required cabling and saves costs.
- Galvanic separation of analog output and pulse output from input circuit.

- Accuracy of the system. — 15 to 100 % of flow: 1 % of rate. 0 to 15 % of flow: 0.15 % of full scale.
- Power supply. — 220 or 110 V + 10% - 15 %, 47 to 53 or 56 to 64 Hz.
- Output signal. — Analog 0 to 20 or 4 to 20 mA dc. Pulse output in addition to analog output 0 to 10 kHz with scaling factor 1:1 to 1:2097151.
- Liner materials. — Rubber, PTFE, Polyurethane. Electrode materials stainless steel, Hastelloy B/C, Platinum, Titanium, Monel. — Meter applicable to many fluids.

NEW FLOWMETERS



**New compact electro magnetic flowmeter
"COPA" type D10D1455**

Enquiries:

Mr B Marks
Data Measurement & Control (Pty) Ltd
PO Box 67285
Bryanston 2021.

Tel: 706-6123 (011)

CONTROL EQUIPMENT

The waste water plant of Borchers Quarry near Cape Town Airport is to be upgraded to cater for approximately three times the existing volume of effluent. The plant is designed to achieve removal of both phosphates and nitrates from the waste water and incorporates aerobic and anaerobic zones.

The entire system is monitored from a central control room, and L'Electron have been awarded the contract for supplying all the basic control room equipment, which consists of a large main control desk, with 300-mm modules enabling one operator to supervise the entire process. Full instrumentation giving informa-

tion on flow rates and depth together with pump electrical indications and loadings will be incorporated into the standard "Akaset" aluminium construction of the control room equipment.

The design of this equipment is significant in that the consultants insisted on a high quality finish matched with reliability factor for the total project and the "Akaset" type of construction from L'Electron was chosen for the main desk.

The Divisional Council of the Cape are the clients for this R2.5 million project, with the main consultants being Ninham Shand Inc. and the electrical consultants Binnie and Partners International of Cape

EQUIPMENT



TOERUSTING

Town. The total project is programmed to be commissioned this year.

Enquiries:

J.A. Dunbar
P.O. Box 10544
Johannesburg 2000

Tel.: 786-5150 (Jhb.)

"Unconventional sources of water"

The Division of Hydraulic and Water Engineering of The South African Institution of Civil Engineers is organising a one-day symposium on "Unconventional Sources of Water" to be held on Tuesday, 28 October 1980, at the Holiday Inn, Cape Town.

This symposium forms part of the "DECADE AHEAD" Programme undertaken by The South African Institution of Civil Engineers to increase the awareness of the public and of engineers of the role the profession can play in society today.

It has been said that the avail-

ability of water will be the main factor limiting development in South Africa. The symposium will review, against a background where conventional surface water resources are approaching full commitment, the possibility of developing other sources of water and will debate the adequacy of present research and planning work.

The proceedings will deal with such exotic prospects as icebergs towed from Antarctica, extraction of moisture from the atmosphere, desalination and the optimum use of purified sewage effluent, as well as means of improving efficiency in the

utilisation of water. Speakers will include authorities on public health, water research scientists, water resource planners and practising engineers from both the public and private sectors.

Full details of the symposium together with registration forms will be issued in due course. Information may be obtained from the Symposium Chairman, South African Institution of Civil Engineers, PO Box 3621, Cape Town, 8000, or by telephoning Ninham Shand Inc. Cape Town, telephone number (021) 21 4610.

Aquaculture:

Fish to augment Chinese protein

At the Pearl River Fisheries Research Institute in the Guangzhou (Canton) countryside four species of carp are being grown in stillwater ponds. In a program sponsored by the United Nations since 1975, 105 trainees have been at Pearl River, using technology applicable to Third World countries.

Grass carp feed on waste vegetation from nearby farms; silver carp consume phytoplankton; big head carp eat both plant and animal plankton; and mud carp, bottom dwellers, live on the detritus from the other species. To complete the chain, humus from the bottom of the ponds is returned to farmers as fertilizer.

According to *Science*, the key to current aquaculture practices came in 1958 when Chinese scientists found that injecting carp with hormones can induce them to spawn in freshwater ponds. Previously, fry had to be collected from running streams and transported to local ponds. Although breeder females can be injected with hormones extracted from carp pituitary glands or with chorionic gonadotropin extracted from the urine of pregnant women, in the past few years a synthetic luteinizing hormone releasing analog has become the principal agent for the induction of spawning. Synthesis

of LRH analog is noted as an example of Chinese basic research of practical value.

It is hoped that aquaculture will help meet the challenge of producing enough protein for China's population, currently estimated at one billion persons. Aquaculture now provides about 1.8 million tons of fish per year — approximately one-third of the country's total catch. Pearl River's deputy director, Chung Lin, looks forward to the expansion of fish production, as China has millions of acres of ponds and lakes that could be converted to aquaculture.

Hoogtepunte uit WNK-jaarverslag

GESONDHEIDSASPEKTE IN KOLLIG

'n Projek om waaktoetsing- en beheerprogramme gerig op gesondheidsaspekte vir die Stander-waterherwinningsaanleg by Daspoort in Pretoria te ontwikkel en in stand te hou, word deur die Waternavorsingskommissie gefinansier en deur die Stadsraad van Pretoria en die Nasionale Instituut vir Waternavorsing in samewerking met die Departement van Gesondheid uitgevoer, luidens 'n verklaring in die jongste jaarverslag van die Kommissie.

Met die waaktoetsing- en beheerprogramme word beoog om vereistes te formuleer indien die herwonne water vir menslike gebruik beskikbaar gestel sou word. Verder sal 'n program vir die identifisering en monitering van die uitstorting van stowwe met moontlike gesondheidsimplikasies in die rioolnetwerk wat die Daspoortrioolwerke bedien, ontwikkel en uitgevoer word.

Die verslag sê ook dat die Suid-Afrikaanse Instituut vir Mediese Navorsing, die Nasionale Instituut vir Waternavorsing, die Randwateraad en die Munisipaliteit van Pretoria saamgewerk het om die water van die Standaardaanleg vir mikrobiologiese gehalte te monitor. Daar is weer eens gevind dat die water deurgaans van hoogstaande gehalte was.

Ondersoeke na die mikrobiologiese gehalte van die water wat by die Windhoekse watgerherwinningsaanleg geproduseer is, het eweneens aangedui dat die water voortdurend van hoogstaande gehalte was. Volgens die verslag is daar tot dusver geen aanduiding gevind dat die inname van herwonne water die gesondheid nadelig beïnvloed het nie.



...EN STADSRAAD NEEM OOR

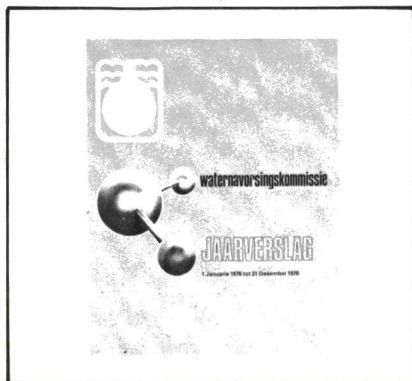
Die Stadsraad van Pretoria het die verantwoordelikheid geneem vir die bedryf van die Stander-waterherwinningsaanleg in Pretoria, luidens 'n verklaring wat in die jongste jaarverslag van die Waternavorsingskommissie vervat is. Hierdie projek word uitgevoer in terme van 'n drieledige ooreenkoms tussen die Kommissie, die Stadsraad en die WNNR.

Die projek het drie oogmerke, naamlik om 'n plaaslike owerheid die geleentheid te bied om 'n herwinningsaanleg as deel van die gewone pligte te bedryf; om waaktoetsing- en beheerprogramme vir die aanleg te ontwikkel en in stand te hou met die oog op die formulering van vereistes indien die herwonne water vir menslike gebruik beskikbaar gestel sou word; en om 'n program vir die beheer van stowwe met moontlike gesondheidsimplikasies in die rioolnet-

werk wat die Daspoortrioolwerke bedien te ontwikkel.

Die verslag meld dat die Stadsraad die aanleg sal bedryf in noue samewerking met die Departement van Gesondheid veral omdat laasgenoemde oogmerk deur die gesondheidsowerhede as baie belangrik beskou word. Deur middel van die program van beheer sal volledige kennis van spesifieke chemiese verbindings wat moontlik in die rioolnetwerk kan beland, verkry word.

Volgens die verslag kan daar dan voorsorg getref word om te verhoed dat stowwe wat moontlike nadelige gevolge op die gesondheid van die mens mag uitoefen en wat nie deur middel van die rioolsuiwering- of herwinningsprosesse verwyder word nie, in die rioolstelsel gestort word.



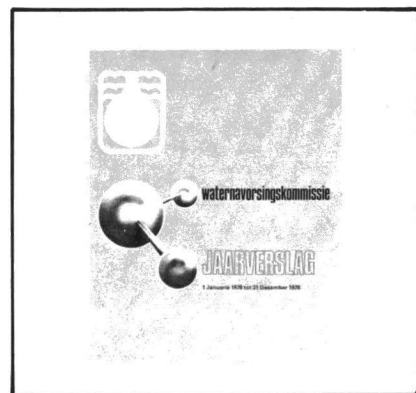
WATERBRONNE IN NATAL

As gevolg van die intensiewe landboubedryghede in Natal is dit noodsaaklik dat die provinsie se waterbronne oordeelkundig bestuur en gevolglik deeglik getakseer moet word. Hierdie verklaring word vervat in die jongste jaarverslag van die Waternavorsingskommissie wat 'n projek hieroor finansiële steun.

Aangesien die navorsingsprogram ook ondersoek na die landboukundige gebruik van water insluit, is 'n studie van die agrohidrologie van Natal in Junie 1979 van stapel laat loop. Hierdie studie word deur die Departement Landbou-ingenieurswese van die

Universiteit van Natal namens die Kommissie onderneem.

Die eerste taak wat in hierdie verband onderneem is, is 'n gedetailleerde waterbalans van Natal gebaseer op langtermynwaarnemings. By elkeen van meer as 1 000 punte op 'n rooster oor die provinsie is vir geselekteerde gewasse die potensiele evapotranspirasie en werklike evapotranspirasie vir gegewe gronddieptes en -teksture bereken. Verder word grondvogtekorte en besproeiingsvereistes vir die gewasse deur middel van die waterbalansbenadering bepaal. Resultate wat hieruit spruit sal by besproeiing-



skedulering en gewasbeplanning gebruik kan word.

Waarskynlikheidsstudies van reënval en droogtevoorkomste sal ook ingevolge dié projek onderneem word, aldus die verslag.

NAVORSING OOR ONTSOUTING VORDER

Op grond van projeksies van waterbehoefte wat daarop dui dat daar in die vroeë tagtigerjare 'n behoefte aan aanvullende waterbronne in die kusgebied van Suidwes-Afrika sal bestaan, het die Waternavorsingskommissie 'n projek by Swakopmund van stapel gestuur om noodsaaklike gegewens vir die ontwerp van 'n volkskaalse seewaterontsoutingsaanleg te verkry, luidens die jongste jaarverslag van die Kommissie.

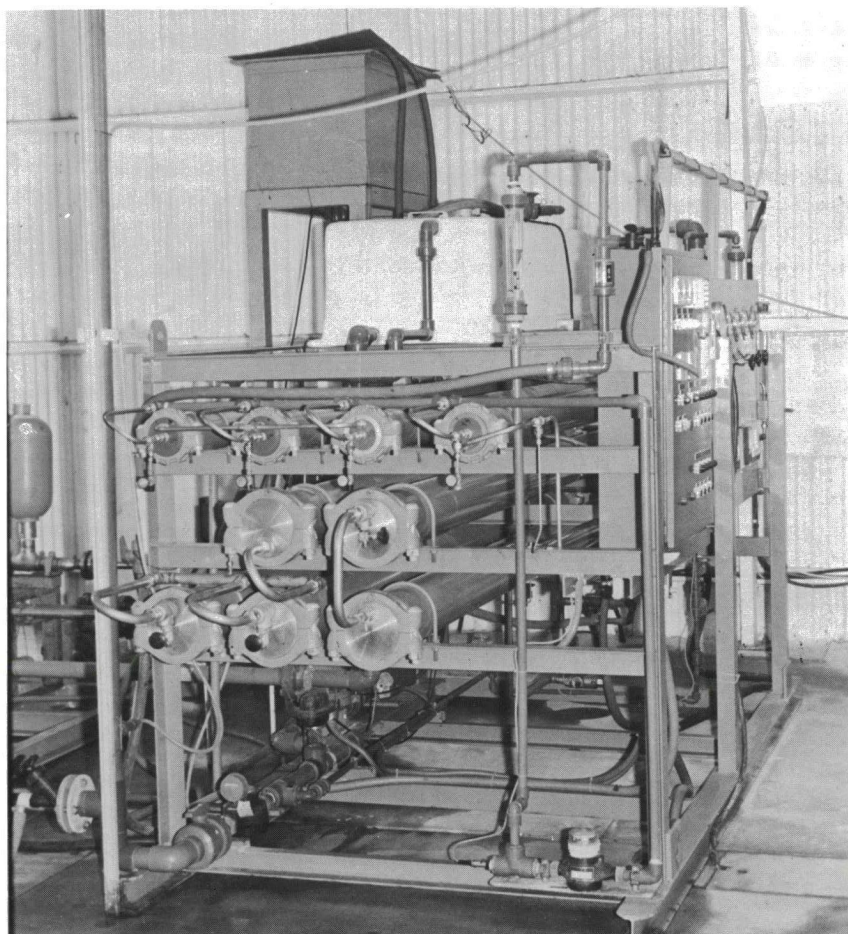
Daar word met die projek gepoog om ontwerp kriteria vir 'n eenvoudige en goedkoop voorbehandelingsmetode vir rou seewater daar te stel en om die werkverrigting en lewensduur van verskeie kommersieel beskikbare ontsoutingstoestelle te evalueer.

Voorbehandelingsstoetse het reeds twee jaar gelede 'n aanvang geneem en aanvanklik is bevredigende resultate met die voorbehandelingsmetodes bepaal. Na ongeveer ses maande wou dit voorkom asof die kuswaters 'n verandering ondergaan het wat moontlik met "opwellingstoestand" verband hou, en die toevoerwater kon nie langer die gehaltestandarde bereik wat deur die verskaffers van die ontsoutingsapparate neergelê word nie.

Die verslag meld dat dié probleem opgelos is deur seewater te chloreer en dit vir 'n tydperk van 3 dae aan sonlig bloot te stel waartydens die gehalte sodanig verbeter dat dit na eenvoudige filtrering geskikte

toevoerwater lewer. Die verslag meld ook dat twee damme gebou is om die bestraling van voldoende water

moontlik te maak om die ontsoutingseenhede op 'n kontinue basis te kan bedryf.



'n Tru-osmoseontsoutingseenheid te Swakopmund

Hoogtepunte uit WNK-jaarverslag (verv.)

AFVAL BY INMAAKFABRIEKE BEKYK

Doeltreffende tegnieke vir die bestuur van watergebruik en die wegdoening van uitvloeiels en vaste afval by inmaakfabrieke word tans ondersoek. So sê die jongste jaarverslag van die Waternavorsingskommissie wat ondersoek geïnisieer het na die probleme waarmee die vrugte- en groenteprosesseringsbedryf en die visnywerheid te kampe kry.

'n Firma konsultingenieurs wat vir dié doel aangestel is, skenk aandag aan die ontwikkeling van praktykskodes wat op die doeltreffende bestuur van watergebruik en die behandeling en beskikking van uitvloeiels in die betrokke nywerhede van toepassing sal wees. Nie net sal waterverbruik tot 'n minimum beperk word nie, maar baie van die metodes wat ondersoek word kan potensieel benut word om bruikbare stowwe uit die afval te herwin waardeur die voorbehandeling van afval ekonomies verantwoord word.

Die verslag meld voorts dat daar meer as 50 groot vrugte- en groenteprosesseringsfabrieke in die Republiek van Suid-Afrika is wat nagenoeg 830 000 t vrugte en 135 000 t groente per jaar prosessee. Hierdie fabrieke verbruik jaarliks meer as 7,5 miljoen m³ water en lewer sowat 300 000 t vaste afval per jaar.



'n Pyp vir die storting van inmaakfabriekafval in die see

Die prosesserings tegnieke wat vir elke vrugte- en elke groentesoort gebruik word, word bestudeer en die hoeveelheid en gehalte van die vloeibare en vaste afval van elke verbruiksmiddel word vasgestel ten einde die moontlike omvang van die herwinning van water en neweprodukte uit die afval te bepaal.

Die ondersoek word in noue samewerking met die betrokke nywerhede, die Departement van Waterwese, Bosbou en Omgewingsbewaring en plaaslike owerhede uitgevoer en omvat 'n evaluering van praktykskodes wat in ander lande ontwikkel is.

Die vismeel-, olie- en -inmaakbedryf bestaan uit 17 fabrieke wat gesamentlik meer as 300 000 t vismeel, 30 000 t ingemaakte vis en ongeveer 16 000 t visolie per jaar produseer. Die prosesseringsfabrieke is aan die kus geleë en omdat die see gerieflik naby is, word afval in die marine-ekosisteme gestort.

Metodes om varswaterverbruik te verminder, sal bestudeer word en die bedryf van dié nywerheid sal met soortgelyke nywerhede in ander lande vergelyk word om die mees geskikte tegnieke onder SA omstandighede te kan selekteer, luidens die verslag.

BESOEDILING IN DIE PWVS-KOMPLEKS

Vordering met die navorsing oor waterbesoedeling in die Pretoria-Witwatersrand-Vereeniging-Sasolburgkompleks (PWVS-kompleks) word in die jongste jaarverslag van die Waternavorsingskommissie

gerapporteer.

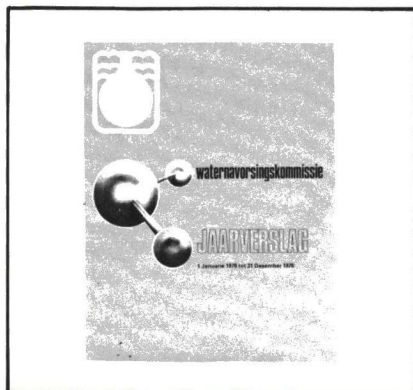
Dié kompleks is die digte bewoonde en hoogs geïndustrialiseerde streek in die Republiek en water wat in die kompleks benodig word (tans ongeveer 1,8-miljoen m³ per dag) word uit die Vaaldam en die studam van dié Randwaterraad verkry en na verspreidingsreservoirs aan die Witwatersrandrif gepomp.

Die suidelike opvanggebiede van hierdie kompleks met omvattende stedelike, industriële en mynbouontwikkeling dreineer direk terug na die Barrage-opgaargebied self en die aansienlike besoedelingsvraagte wat gegenereer word, is 'n aangeleentheid wat alle owerhede met belang in die gebied tot sorg stem.

Die projek wat die Kommissie

hieroor finansier, behels 'n omvattende ondersoek na alle aspekte wat die besoedeling van water in die suidelike opvanggebiede raak. Navorsing wat tot dusver voltooi is, omvat onder meer die samevoeging en verkryging van data in verband met alle bestaande besoedelingsbronne en die opstel van 'n volledige atlas van die gebied waarop alle ontwikkeling, riooluitlope, hoofwaterleidings en reservoirs, ens. aangedui is.

Ook is 'n studie gemaak van die huidige en voorspelde bevolkingsverspreiding in die verskillende gebiede; en 'n omvattende stel wiskundige modelle van die daaglikse wisseling van minerale soute in die wateromgewing is ook ontwikkel, aldus die verslag.



AWWA

The American Water Works Association Research Foundation is organizing Water Reuse Symposium II under the sponsorship of the Office of Water Research and Technology (U.S. Department of the Interior), Department of Defence, National Science Foundation, U.S. Environmental Protection Agency and Water Pollution Control Federation. This second week-long series of meetings devoted entirely to renovation and reuse of wastewaters from municipal, industrial and agricultural sources will be held in Washington, D.C. August 23–28, 1981.

Under the theme "Water Reuse in the Future" subjects to be covered include recent case histories, new water recycling research and practical applications. In the selection of papers special consideration will be given to innovative approaches; new, updated or unreported system design and performance data; and practical applications of water reuse as a method of satisfying pollution discharge requirements, as a conservation technique or as an economical and energy efficient water supply alternative. Special emphasis will also be given to the recycling of water by industry, municipalities and agriculture.

Calls for papers

The programme is directed to individuals from water/wastewater utilities; consulting firms; federal and state research/regulatory agencies; divisions of manufacturers and departments responsible for water supply, reuse and recycle; universities; and other water organizations. The goal of the symposium is to transfer the latest technology between users and from researchers to users by means of formal papers given at technical sessions or poster presentations designed for one-to-one communication.

Interested parties should submit

10 copies of an abstract *no more than two pages long* by December 15, 1980, to and along with an Abstract Information Sheet obtainable from: Richard D. Heaton, Water Reuse Symposium II, AWWA Research Foundation, 6666 West Quincy Avenue, Denver, Colorado 80235 U.S.A.

Water Ind. '81

Water Industry '81, the International Conference and Exhibition, will be held at the Metropole Convention Centre, Brighton UK from 15–19 June 1981.

The Conference will present an extensive international programme of economic and technical developments affecting the industry worldwide, within the framework of water cycle management.

The Conference will include invited papers from leading specialists, outlining the international scene and highlighting the main areas of concern. This will be supplemented by contributed papers from industrialised and developing countries, reflecting the views and findings of industry, government agencies, water authorities, water utilities, national and international organisations responsible for water management and research centres active in this field.

Themes for the first Conference will cover, water resources – conservation and development, water supply – treatment and distribution, water quality and health, sewerage and sewage treatment, sludge treatment and disposal, industrial waste treatment and control, process technology development, monitoring and instrumentation, river quality management, fisheries and amenities.

Contributed papers will be welcome within the themes outlined and intending authors should submit abstracts of 200–300 words to the Secretariat as soon as possible. The deadline for abstracts is 31 October 1980.

This event is already attracting wide interest with the support of national and international bodies, including the co-sponsorship of the National Water Council and the Institution of Public Health Engineers.

For further information contact the Secretariat – Water Industry '81, 26 Albany Street, Edinburgh EH1 3QH, UK (Tel: 031 557 2478).

CONFERENCES AND SYMPOSIA

(From page 32)

Water Research, PO Box 395, Pretoria 0001.

WATER RESOURCES

An International Symposium on Water Resource Systems will be held from December 20 to 22, 1980, in Roorkee, India.

Enquiries: GN Yoganarashimhan, Organising Secretary, University of Roorkee, Roorkee 246 672, India.

SOIL SEDIMENTATION

The South East Asian regional symposium on problems of soil erosion and sedimentation will be held from January 27 to 29, 1981, in Bangkok, Thailand.

Enquiries: Division of Water Resources Engineering, Asian Institute of Technology, PO Box 2754, Bangkok, Thailand.

HYDRAULIC ENGINEERING

The 19th International Association for Hydraulic Research Congress: Hydraulic Engineering for Improved Water Resource Utilisation will be held from February 1 to 8, 1981, in New Delhi, India.

Enquiries: Secretary General IAHR, PO Box 177, Delft, The Netherlands.

OZONE

The fifth World Ozone Congress will be held from March 30 to April 4, 1981, in West Berlin.

Enquiries: AMK Berlin, Messedamm 22, POB 19 17 40, D-1000 Berlin 19, West Germany.

STORM DRAINAGE

The Second International Conference on Urban Storm Drainage will be held from June 14 to 19, 1981, in Illinois, USA.

Enquiries: Dr Ben Chie Yen, Department of Civil Engineering, University of Illinois, Urbana, Illinois 61801, USA.

CONFERENCES AND SYMPOSIA

WATER SUPPLY

A seminar on water supply and drainage services in developing countries will be held from September 30 to October 2, 1980, in Pretoria, South Africa.

Enquiries: National Building Research Institute, PO Box 395, Pretoria, 0001, South Africa.

DESIGN OF DAMS

A conference on the design of dams to resist earthquakes will be held from October 1 to 2, 1980, in London, UK.

Enquiries: The Conference Office, Institution of Civil Engineers, Great George Street, London SW1P 3AA, England.

WATER WELLS

The National Water Well Association Convention and Expo "New horizons for the '80s" will be held from October 5 to 8, 1980, in Las Vegas, USA.

Enquiries: NWWA, 500 West Wilkinson Bridge Road, Suite 135, Worthington, Ohio 43085, USA.

AQUATIC TOXICOLOGY

The Fifth Symposium on Aquatic Toxicology will be held from October 7 to 8, 1980, in Philadelphia, PA, USA.

Enquiries: J Gareth Pearson, US Army Medical Bioengineering Research and Development Laboratory, Ft Detrick, Frederick, MD 21701, USA.

COASTAL DISCHARGE

A conference on coastal discharges — engineering aspects and experience will be held from October 7 to 9, 1980, in London, UK.

Enquiries: Conference Office, Institution of Civil Engineers, Great George Street, London SW1P 3AA, England.

MAN'S USE OF WATER

A specialised conference of the International Association on Water Pollution Research on the environmental impact of man's use of water will be held from November 3 to 7, 1980, in Brighton, UK.

Enquiries: G Lee, Water Data Unit, Reading Bridge House, Reading RG1 8PS England.

TROPICAL MEDICINE

The tenth International Congress on Tropical Medicine and Malaria will be held from November 9 to 15, 1980, in Manila, Philippines.

Enquiries: Edito G Garcia, 10th International Congress on Tropical Medicine and Malaria, PO Box EA-460, Manila, Philippines.

WASTEWATER

A symposium on "Aquaculture in Wastewater" will be held from November 25 to 27, 1980, at the CSIR Conference Centre in Pretoria.

Enquiries: National Institute for
(To page 31)

SA WATERBULLETIN

Information contained in this publication does not necessarily reflect the considered opinions of the chairman or members of the Water Research Commission.

SA Waterbulletin is published by the Water Research Commission, PO Box 824, Pretoria 0001, and subscription is free. Correspondence and views dealing with water topics are invited.

Editor: Anton Prinsloo

Inligting in hierdie publikasie ver-
vat weerspieël nie noodwendig die
oorwoë menings van die voorsitter
of lede van die Waternavorsings-
kommissie nie.

SA Waterbulletin word deur
die Waternavorsingskommissie,
Posbus 824, Pretoria 0001, gepu-
bliseer en intekening is gratis.
Korrespondensie en menings ivm
wateraangeleenthede sal verwel-
kom word.

Redakteur: Anton Prinsloo

finally ...

HOPPING MAD

"The trouble with weak, watered-down beer," Oom Louw Schalken said whilst walking his mongooses amongst the aspidistras, "is that, as a pick-me-up, it lets you down."

He hit at the *moketsane* fly that had been in orbit around his head all morning.

"It is very dangerous to water down a man's drink — and if you don't believe me, ask Magrieta van Rooy of the Molopo. She diluted her husband's best *mampoor*. The doctors of two towns had to attend to her — after they had lifted the coal-burning stove off her left femur, patella and whatever else you may care to mention in polite company. (Magrieta later died of a cracked skull during her second marriage to a cognac distiller).

"The whining of this *moketsane* is worse than that of Joos Schutte's third wife. He almost got killed in his own bar in the bush when he watered-down a modest but perfectly honest six year old whisky with brackish borehole water. This he served to a bearded gentleman visitor with a skirt (weird, that!). This man took one sip, climbed over the bar counter, hit Joos with the cocktail shaker, jumped on him, smashed him into the mirror, slapped him twice and then hurt him. 'Next time you spile me dram,' the man hissed, 'I cud loose me temperrr, Yuss'. I've been wary of skirt-wearing men ever since," Oom Louw said, slapping at the mongoose tails.

"Take these mongooses, now. You notice how they have been yipping at your fancy pair of city shoes? They do not like the dew on them. Some people think they're rabid — nonsense, of course. They simply hate water — even the vet calls it *hydrophobia*. And if your beer was watered-down, you'd also be mad..."