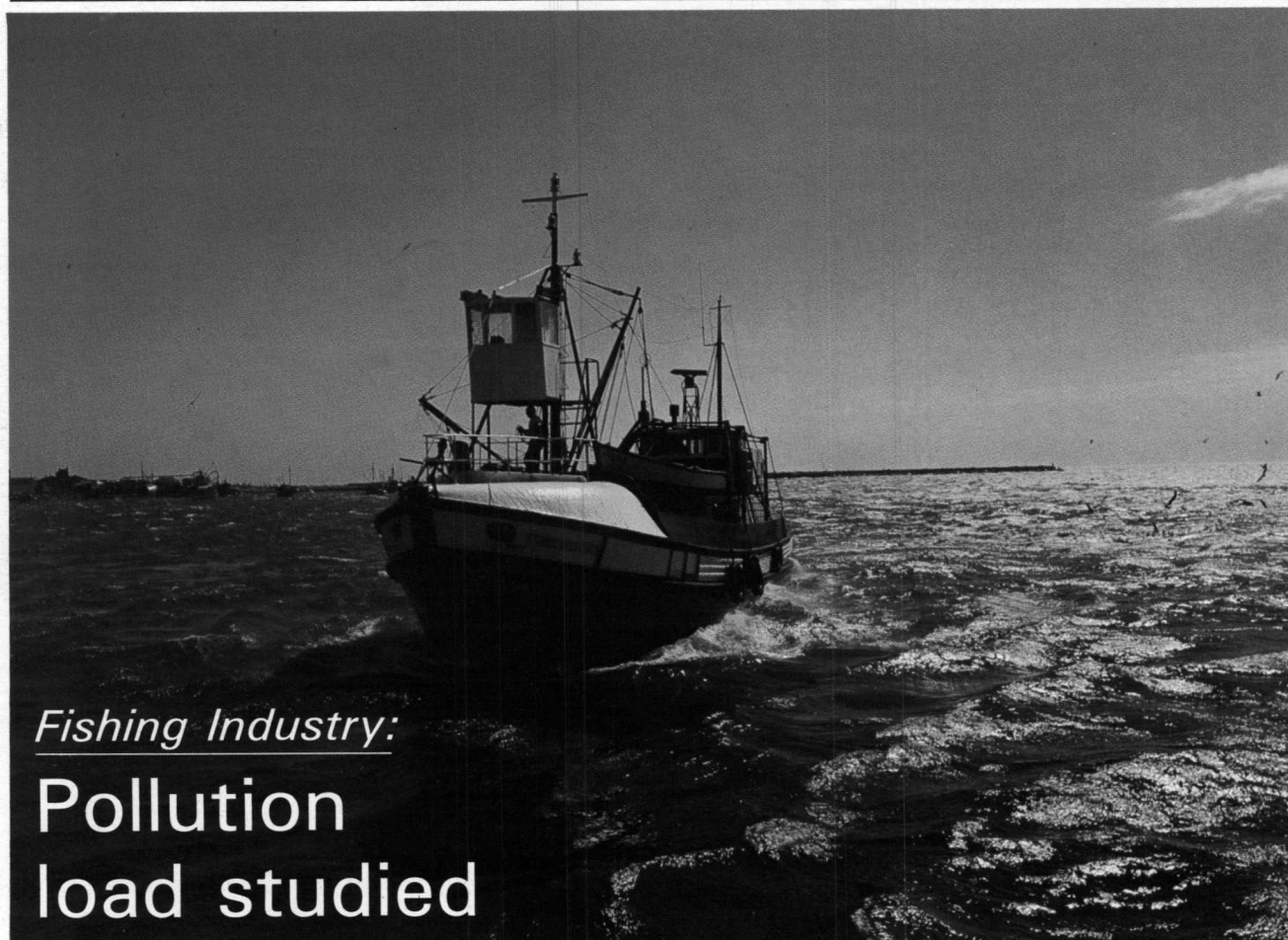


WATERBULLETIN

Nuusbrief van die Watnavorsingskommissie
Newsletter of the Water Research Commission

MEI/MAY 1982



Fishing Industry:

Pollution load studied

Effluents from the fish oil, meal and canning plants situated along the coasts of the Republic have long been of concern and are to be investigated, according to an announcement by the Water Research Commission.

An investigation into the extent and causes of this pollution load has been undertaken during which 21 fish processing factories were visited, their water consumption estimated and the pollution loads generated quantified from samples

collected and analysed. The investigation revealed that during the season of approximately six months 338 000 t of fish were processed into about 218 000 t of fish meal, and the remainder canned.

The fishing industry in South Africa was found to use 490 MI of fresh and 7 800 MI of sea water during the season. Sea water is used at a rate of between 5,35 and 30 kl/t of fish processed. Fish meal plants reject between 5,2 kg COD per t to 90 kg COD/t processed and from 1,3 kg suspended solids (SS)

per t to 27,6 kg SS/t processed, depending on the plant, the management and the quality of the fish.

It was found that the sources of effluent generation were limited to a few relatively low volume streams such as the bloodwaters which have COD concentrations of over 370 000 mg COD/l.

Preliminary trials on site during the survey indicated that dissolved air flotation could substantially reduce the organic loads discharged in the effluent and that

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POLLUTION LOAD STUDIED

(From p. 1)

Pilot plant for the treatment of fisheries effluent at St Helena Bay. Also pictured is project leader, Mr Bruce McDonald.



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water consumption of both fresh and sea water could be optimised. Accordingly the investigation will proceed during the 1982 fishing season at two selected processing plants to determine how the water and effluent should be managed to produce the minimum consumption and pollution generation.

This investigation will examine each step of the process and develop the optimum water usage and effluent handling systems to enable a manual of practice to be written for use by the industry.

It has also been announced that shortcomings in dry offloading systems for unloading fishing vessels are also to be studied. A firm of consulting engineers have been contracted by the WRC for both investigations.

Unloading of fish used to be accomplished by fluidising the hold with water and pumping out the load which was then dewatered over a rotating screen. However, this produced a severe pollution load comprising bloodwaters.

The industry then adopted a vacuum system which utilises a suction nozzle connected to a

vacuum pump via a cyclone and air lock, enabling the fish to be sucked dry out of the hold. However, experience has shown that many of these systems in use still add water to assist or speed up removal of the fish, thereby defeating the object of the system and still cause a pollution hazard to the water environment.



The suction pipe used for offloading an anchovy harvest at the Suid-Oranje factory, St Helena Bay.

Eleven factories have been surveyed to examine and compare the leading technical features of the different systems installed and to identify what factors governed the need to add water to these 'dry' offloading plants, and how this need might be overcome.

The survey revealed a wide variation in the designs of the plant with air velocities in the suction nozzles ranging from 15,5 to 49 m/s, suction pipe velocities between 11,5 and 31 m/s and a wide range of suction nozzle designs.

During the 1981 fishing season, the operation of these systems was closely studied and the quality and type of fish being unloaded was also shown to be of major significance in the operation.

SA Waterbulletin on these pages attempts to pictorially reconstruct some of the aspects mentioned in this short article by means of a photographic record procured at St Helena Bay.

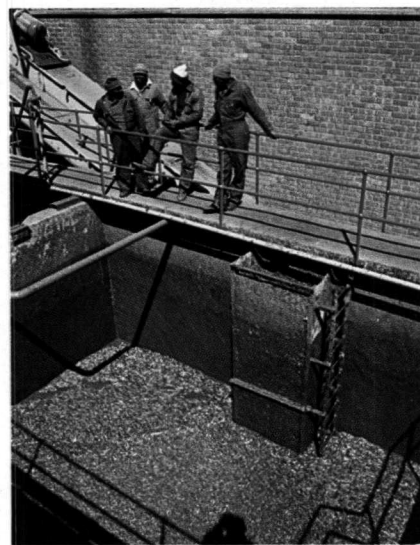
(Below) At Suid-Oranje Fisheries the catch is offloaded onto a conveyor belt for transporting into the factory. (All pictures in this article taken by the editors with the kind permission of the company).



(Top) The weight of the suction nozzle is reflected in the strained bodies of the seamen. Experiments with the nozzle is currently under way.

(Above) Bloodwater being discharged to sea after the catch has been taken ashore. The consumption of water in this industry is to be studied.

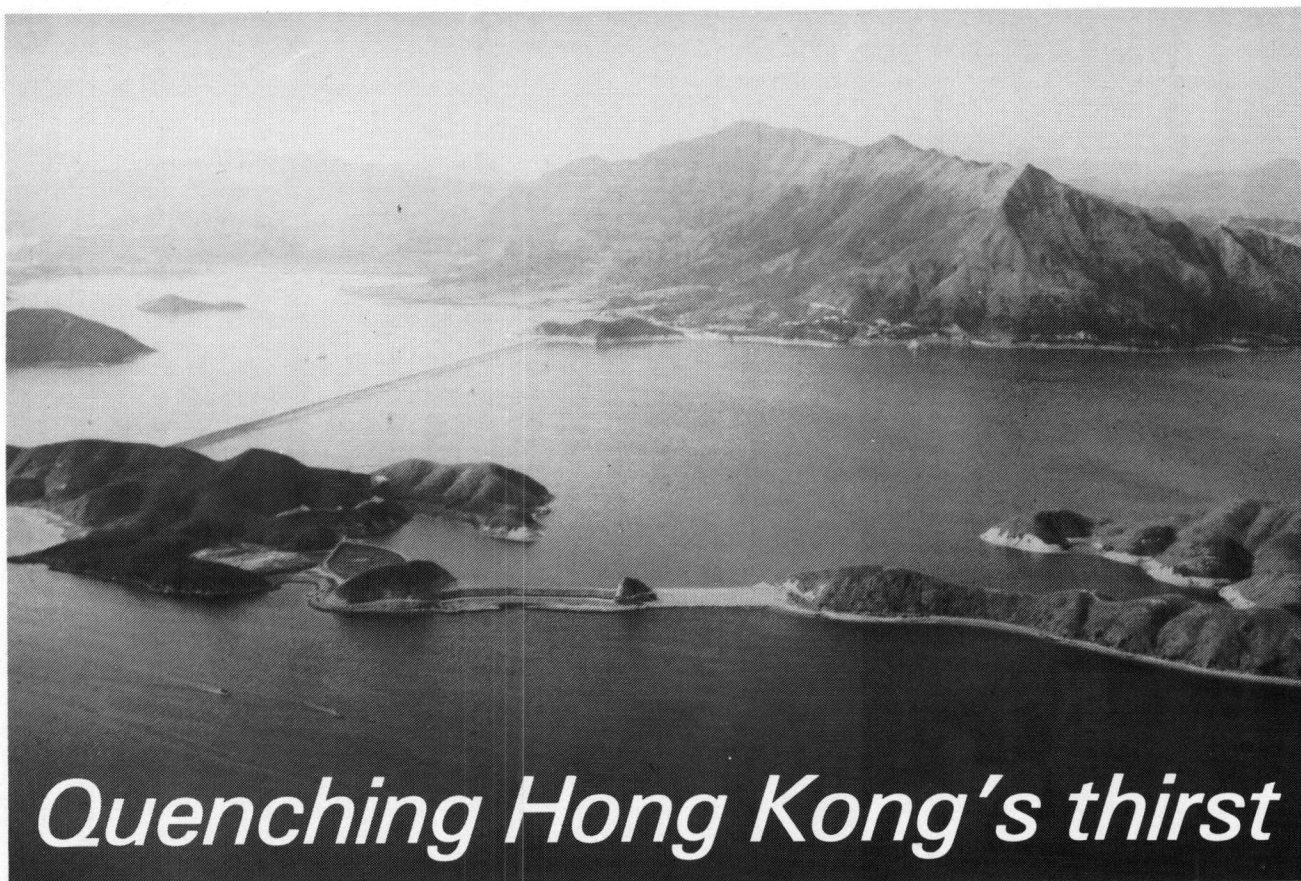
(Right) After cleaning the anchovies are collected in pits capable of holding 100 tons of fish.



To many of the residents of Hong Kong the dragon, symbol of eternal life and the most honoured of Chinese pantheistic deities, is also the master of water and rain. According to their belief, floods are caused by movements of the dragon, and sometimes they say they can see him swooping up to heaven in a column of cloud amidst thunder and lightning, or dipping his tail into the water where mountain ridges descend into the sea.

When the dragon is too quiet, it is said, there is drought. To prevent this, every summer in Hong Kong dragon fights are simulated between colourful boats in the harbour in the hope of inducing a real confrontation in the heavens, which is always accompanied by heavy rains.

It is a charmingly picturesque folk myth, but the reality behind the symbolism that the eternal life of mankind on earth is inexorably tied to the continued supply of fresh water ironically has pertinent meaning for Hong Kong today. This article looks at . . .



Throughout its history, the tiny territory of Hong Kong has faced a stark geographical reality — an almost total lack of natural resources. Much of the territory's land area is spread over some 230 islands and islets, many of which are uninhabited. Population and land factors have been the cause of Hong Kong's water supply problem — too many people and not enough catchment area. As a result, quenching Hong Kong's thirst for water has been a continuous challenge for the government — a challenge it has successfully met.

Its present efficient water supply system is the result of over 120 years of effort by the government in conjunction with international consultants and engineers. They have, together, been able to overcome the difficulties faced by Hong Kong once disparaged by Lord Palmerston, the British Foreign Secretary, as "a barren rock with barely a house upon it".

**By YLV Sharma,
Hong Kong**

As direct catchment areas are limited, extensive catchwaters are a vital feature of the waterworks development and probably nowhere else in the world have they been so highly developed. Con-

structed around hillsides, the catchwaters collect water from areas where it would normally drain more or less directly to the sea or into valleys unsuitable for reservoirs.

To avoid unsightly scarring of the hillsides caused by catchwater construction, and to reduce the possibility of blockage through landslips, the two major and most recent water schemes have dis-



Work in progress for upgrading a water treatment plant at Tuen Mun, one of the seven new towns being developed in Hong Kong.

(Opposite page): The Plover Cove reservoir. This was created by the dredging, draining and damming of an inlet in Tolo Harbour. Storage is now 230 million cubic metres.

pensed with catchwaters except on a minor scale. In these schemes, water is collected from stream courses by means of intakes and shafts discharging into a main tunnel which carries the water either to an impounding reservoir or a treatment works. There are in all about 225 kilometres of catchwater channels and tunnels.

Hong Kong's water supply system now includes two "reservoirs in the sea", 16 conventional reservoirs, one of the world's largest desalination plants, 14 treatment works, and a third (i.e. about 350 square kilometres of the total 1 060 square kilometres) of its land mass as catchment. In addition there are tunnels, sub-marine pipelines, pumping stations, service reservoirs, and a network of mains required to distribute the fresh water to the ever-thirsty territory. A separate system supplies salt water for flushing purposes in the urban areas.

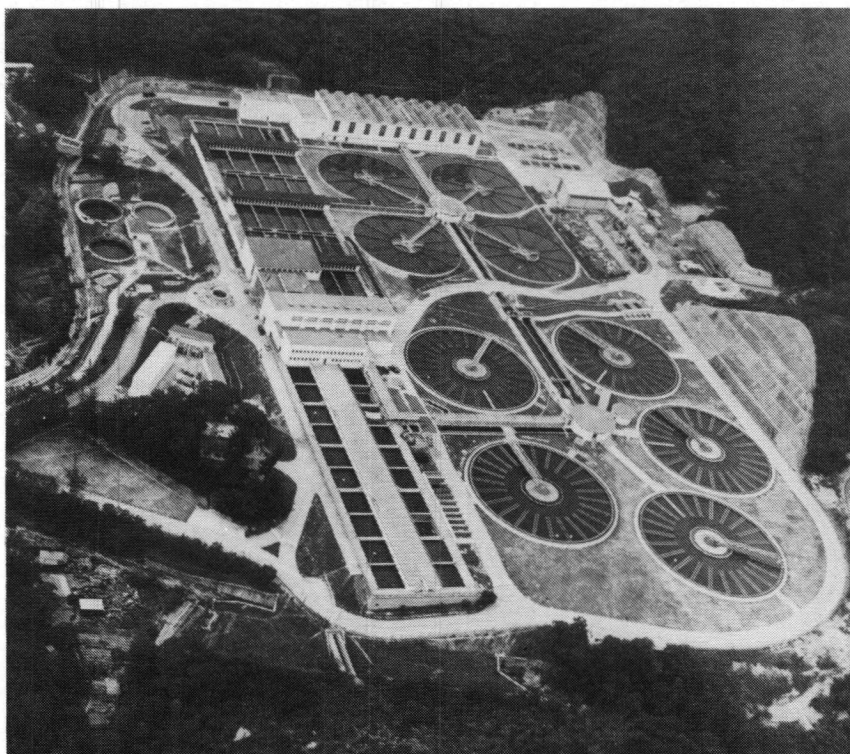
The story of Hong Kong's waterworks began in the 1850's when the government, headed by Sir John Bowring, came under severe pressure from the population and was forced to recognise its responsibilities for public water supply.

In late 1859 Sir Hercules Robinson, Governor from 1859 to 1865, accepted a proposal for a scheme to supply Victoria City with water piped from a reservoir at Pok Fu Lam. In 1860 the first construction works were started and so began the struggle by the waterworks to keep pace with ever-increasing demand. Supplies began to reach the city at the end of 1863. This scheme proved hopelessly inadequate and a new and much larger reservoir at Pok Fu Lam was completed in 1871, and was fully operational by 1877.

The rise in population quickly necessitated the planning of further schemes and after many problems, mainly economic, the first Tai Tam reservoir project (in the south-east of Hong Kong Island) was completed in 1889. This scheme included the construction of filter beds near the built-up northern shore and gave Hong Kong its first supply of filtered water.

The next 60 years saw the construction of many new reservoirs but it was not until 1965 that Hong Kong enjoyed a complete year

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The water treatment works which serves the fast-expanding town of Shatin in Hong Kong's New Territories.

Quenching Hong Kong's thirst



(From page 5)

without restrictions. Up to late 1967 restricted water supply was the rule rather than the exception; in 1929/30 water had to be imported by lighter from Macau — the nearby Portuguese territory. Similarly in 1963/64 severe restrictions necessitated water being imported by tanker from the Pearl River to a specially constructed terminal at Sham Tseng in the New Territories from where it was pumped to the Tai Lam Chung Reservoir.

Novel idea

In the 1960s, to keep pace with the growing need for water to overcome the problem of dwindling availability of land sites, the government hit upon a novel idea. It constructed the first "reservoir in the sea" at Plover Cove in the New Territories. This reservoir, created by dredging, damming and draining an inlet in Tolo Harbour,

had an initial storage of 170 million cubic metres, increased in 1973 to 230 million cubic metres. The construction of the Plover Cove Reservoir virtually doubled the available water storage.

During this time work also progressed on extending and upgrading treatment works at Sha Tin from 432 000 to 798 000 cubic metres a day.

In 1971, the success of the Plover Cove scheme spurred the government to go ahead with an even more ambitious scheme at High Island. This entailed the construction of two rock dams at the eastern end of the Sai Kung Peninsula. The reservoir, completed in 1979, has a capacity of 273 million cubic metres and raised the total storage capacity to 579 million cubic metres. (See boxed table for reservoirs)

As part of the continuous search for additional fresh water, eyes turned again to the sea in 1972 and the government decided to con-

The High Island reservoir. Two rock dams block the eastern and western entrances of a narrow straight running between High Island and the eastern edge of the Sai Kung Peninsula. The reservoir has a capacity of 273 million cubic metres.

struct a 181 800 cubic metres a day desalting plant at Lok On Pai. The first of the six units, each with a capacity of 30 300 cubic metres a day and operating on the multi-flash evaporation process, came into operation in 1975. By 1977 all units had been commissioned. However, the completion of the High Island water scheme and the favourable rainfall in succeeding years have allowed the plant to become a standby source.

While the territory was developing its own water sources it also looked to its giant neighbour, China, for help in meeting the ever increasing demand. Its request was

complied with and water was first obtained on a regular basis from China in 1960. On November 15 of that year an agreement was made with the People's Council of Po On County under which 22.73 million cubic metres would be bought annually from their Shum Chun Reservoir. This agreement carried a minimum rainfall clause, and during the drought year of 1963 the quantity was substantially reduced.

Improved

On April 22, 1964, the 1960 agreement was replaced by one reached with the People's Council of Guangdong Province, under which 68.2 million cubic metres would be provided annually between October 1 and June 30 the following year. The improved supply became available on March 1, 1965.

In November 1972 the supply of an additional 15.91 million cubic metres was negotiated within the general provisions of the 1964 agreement, and in 1976 a similar amendment provided for the sup-

ply of another 25 million cubic metres.

A later agreement signed in November 1978 provided for an initial increase in the annual supply to 145 million cubic metres with increases to 168 million cubic metres per annum commencing October 1, 1979 and a yearly supply of 182 million cubic metres by 1982.

The latest agreement, made in May 1980, ensures sufficient water supplies for Hong Kong with an average annual increase in supply of about 35 million cubic metres from 1983. This means that China will be supplying 620 million cubic metres of water per annum by 1995. Work has been initiated on this scheme.

The Chinese authorities extract the water from the East River in Guangdong Province and pump it over a series of dams built across one of its tributaries. The water flows in the reverse direction to the natural flow of the tributary. It eventually discharges into the Shum Chun Reservoir before being fed by pipeline across the border at Muk Wu to Hong Kong.

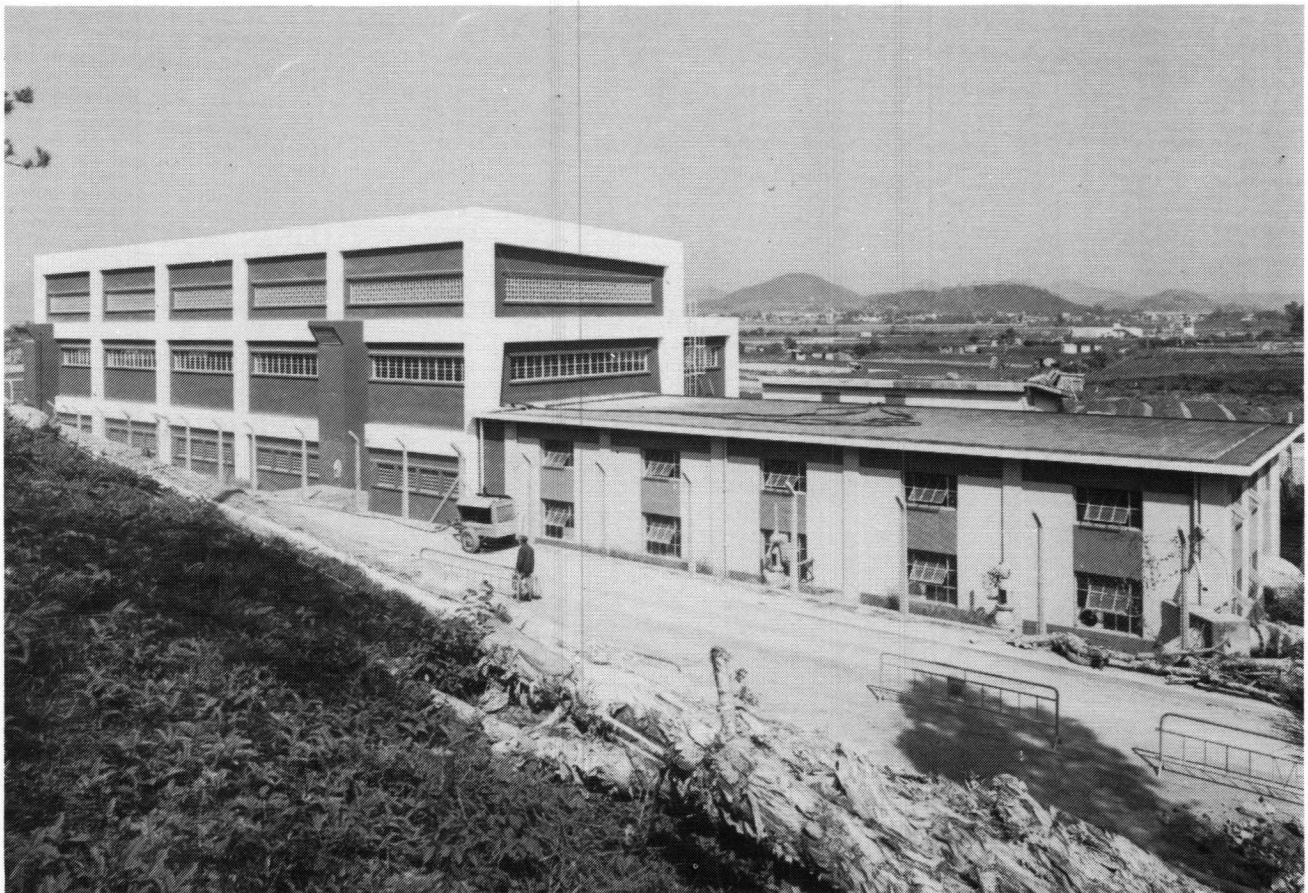
During 1980 water from China represented over one third of the total demand. The demand for fresh water has increased steadily over the years and in 1979/80 the daily average was over 1.3 million cubic metres — the maximum daily consumption being 1.52 million cubic metres.

By 1995 the estimated demand (by projection) will be 1 022 million cubic metres per annum.

While this large demand would be a challenge to any water authority in a similar sized area, Hong Kong can at least face it with the confidence derived from knowledge of its past achievements.

Its close ties with China, its constant readiness to develop any possible sources using modern technology, and its close monitoring of the overall water situation have enabled the government to assure its over 5 million population a reliable water supply — not an easy task considering that it started with only five wells in 1851 to quench the thirst of its early settlers.

(To page 8)



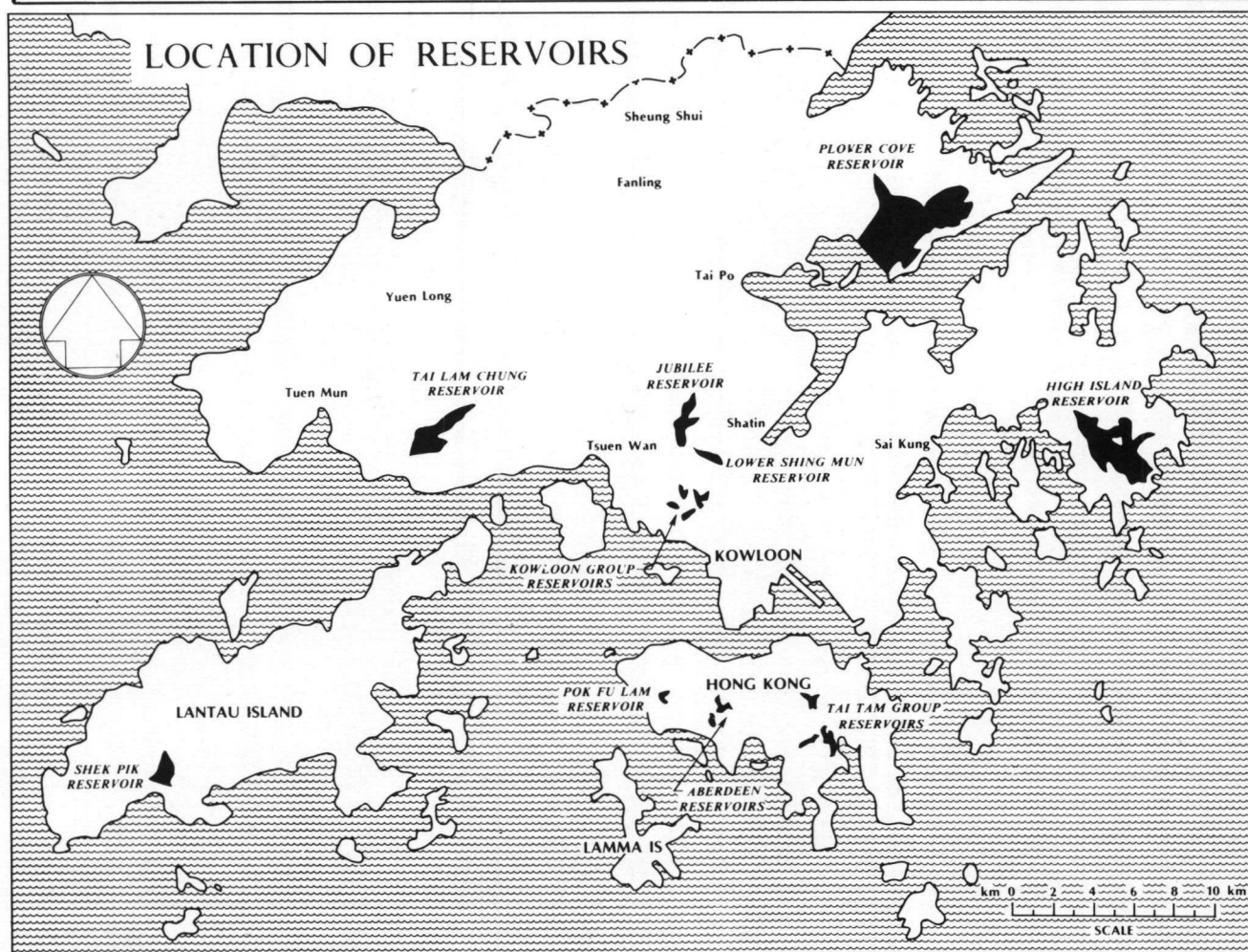
The Muk Wu pumping station on the border which pumps water from China.

Quenching Hong Kong's thirst

(From page 7)

TABLE: RESERVOIR CAPACITIES

Reservoir	Date on Supply	Reservoir Storage m ³
Pok Fu Lam	1877	261 000
Tai Tam	1889	1 417 000
Tai Tam Increased	1897	227 000
Wong Nai Chung	1899	138 000
Tai Tam Bye Wash	1904	102 000
Tai Tam Intermediate	1907	906 000
Kowloon	1910	1 578 000
Tai Tam Tuk	1917	6 219 000
Shek Li Pui	1925	458 000
Reception	1926	151 000
Aberdeen (2 Res.)	1951	1 259 000
Kowloon Bye Wash	1931	843 000
Shing Mun	1936	13 279 000
Tai Lam Chung	1957	20 490 000
Shek Pik	1963	24 462 000
Lower Shing Mun	1965	4 299 000
Plover Cove	1968	169 924 000
Plover Cove (after dam raised)	1973	229 729 000
High Island	1978	272 500 000



WRC: New Contracts:

CO-OPERATION INVITED . . .

The Water Research Commission has awarded a research contract to the Pollution Research Group, Department of Chemical Engineering, University of Natal, for the preparation of a situation report on water management and effluent treatment in the processing of pulp and paper, metals, fermentation and pharmaceutical products.

The main objectives of the project are to collate the existing knowledge on water and effluent problems of these industries and to recommend, on a coordinated basis, the scope for improved effluent treatment, water management and the disposal of effluents.

Similar survey projects on various industries have been successfully completed in the past and have provided the Commission with the information needed to compile master plans for research and priority research programmes. The investigations are carried out on a national basis and in close cooperation with the relevant trade associations, government departments, local authorities and the industries concerned.

Further information on the project can be obtained from Prof G.R. Groves of the Pollution Research Group and organizations willing to cooperate in the project are asked to contact him at the University, King George V Ave, Durban 4001; tel (031) 25-3410.

. . . and high organics . . .

The Water Research Commission has entered into a contract with Binnie & Partners, consulting engineers of Johannesburg to investigate the potential for applying physical/chemical effluent treatment processes to industrial waste waters with a high organic content.

This investigation is directed at assessing the performance of membrane and other processes such as flotation and ion exchange when applied to the various waste streams encountered in the meat, dairy, brewery, glucose-starch, bakery yeast processing and margarine industries.

Contact will be made with all major producer associations rep-

resenting the various industries. In this way it is proposed to arrange contact with the industries to determine the quantity of water and the quality and quantity of all effluents produced, together with the present costs of purchasing water and disposal of effluents.

Interested associations or industrial undertakings within the above industries are invited to make their interest known to Binnie & Partners, PO Box 23040, Joubert Park, 2044.

JOINED WRC



Mr DWH Cousens who recently joined the Water Research Commission as adviser on hydrology matters. He was educated at Michaelhouse and the University of Natal. His M Sc Eng was done on hydrological modelling.

Mr Cousens joined the (then) Department of Water Affairs in 1976 and left as Principal Engineer at the Hydrological Research Institute in November 1981.

Mr Cousens also holds a B Sc Eng (Agric). He is a Fellow of the South African Institute of Agricultural Engineers and a Member of the Engineers' Association of South Africa and the South African Irrigation Institute.

PROGRAMME

The following programme of activities has been received by SA Waterbulletin from the SAICE's Division of Hydraulic and Water Engineering.

JUNE/JULY. Visit to DWA's Brandvleidam, Cape Province.

28 JUNE — 2 JULY. HYDRO 82 Course. (Course in English on hydrological analyses), Pretoria. Enquiries: Prof. A. Rooseboom, Dept. of Civil Engineering, University of Pretoria, Pretoria, 0002.

29 JUNE. "Appraisal of the extreme 1981 floods". Lecture in English by Zoltan Kovacs (Directorate of Water Affairs), 16h45, Hall G.6, "Geesteswetenskappe gebou", University of Pretoria.

5-7 JULY. Short Course: Planning, Design and Construction of Smaller Dams. (Lectures in Afrikaans and English), Pretoria. Enquiries Mr. GW Annandale, tel. (012) 436051 x 180, Dept. of Civil Engineering, University of Pretoria, 002.

12-16 JULY. Short Course "Coastal Ecology for Engineers". (Lecture notes in English), Stellenbosch. Enquiries: Prof. G. de F Retief, Dept. of Civil Engineering, University of Stellenbosch 7600.

JULY/AUGUST. Visit to R21 million Sandile Dam. The works comprise a 3 million cubic metre earth fill embankment, diversion tunnel, concrete lined spillway, prestressed road bridge and 12 km of road relocations.

Enquiries may be directed to TH op ten Noort, Department of Civil Engineering, University of the Witwatersrand, 1 Jan Smuts Ave, Johannesburg 2001. Tel 716-2532.



UOVS HOU BESPROEIINGSDAG

“Bykans alle ontwikkelings op die gebied van gemeganiseerde besproeiingstelsels in Suid-Afrika is in ’n groot mate te danke aan die deursettingsvermoë van privaatinisiatief,” het Sy Edele dr CV van der Merwe, Minister van Omgewingsake, gesê in sy openingsrede op ’n besproeiingsdag wat deur die Fakulteit Landbou op die Universiteit van die Oranje-Vrystaat se proefplaas, Leeuberg, naby Bloemfontein, gehou is.

Die besproeiingsdag is gereël om die instelling van ’n kursus vir die opleiding van besproeiingstegnoloë aan die UOVS amptelik bekend te stel. Tydens die geleentheid is besproeiingstoerusting en beurse van ongeveer R350 000 deur mnr AP Rootman, voorsitter van die direksie van die Vrystaatse en Transvaalse Sentrale Aankoop-koöperasie (Bpk) (VETSAK) aan die rektor van die UOVS, prof WL Mouton, oorhandig. VETSAK en sy lede-koöperasie het ’n leidende rol gespeel in die totstandkoming van die B. Agric-kursus in besproeiingstegnologie.

Die Minister het in sy toespraak beklemtoon dat in ’n waterarm land soos Suid-Afrika waar besproeiingsgronde van geskikte gehalte

beperk is, dit noodsaaklik is dat daar baie nou samewerking tussen die privaatbedryf, die weten-

skaplike en die ingenieur moet wees sodat besproeiing ’n nasionale bate kan bly en nie ’n onnodige las vir die nageslag word nie.



Die Minister van Omgewingsake, dr CV van der Merwe, lewer die openingsrede tydens die Boeredag.

WATERBENUTTING

Dr van der Merwe het ook gesê dat sedert die Waterjaar 1970 die beperktheid van die Republiek se waterbronne al by herhaling beklemtoon is. Die Kommissie van Onderzoek insake Wateraangeleenthede het in sy verslag van 1970 aanbevelings gemaak oor metodes om die verwagte watertekorte in die toekoms die hoof te bied. In hierdie aanbevelings wat nog steeds as ’n basis en rigshoer dien vir beleidbepaling en beplan-

ning met betrekking tot die land se water hulpbronne, word gepleit vir 'n beter balans tussen waterbenutting en die toepassing van besproeiingstegnieke, asook doelgerigte en stelselmatige voorligting op 'n intensiewe grondslag aan besproeiingsboere en die navorsing van besproeiingsvraagstukke.

Volgens die Minister is hierdie pleidooi vir doeltreffender waterbenutting egter gelewer gedurende 'n era waarin die land op ekonomiese gebied geweldig vooruitgegaan het en toe fondse vir die finansiering van Staatsondersteunde en privaatprojekte redelik maklik bekombaar was. Gepaard hiermee was daar in die ooreenstemmende tydperk nie ernstige probleme met watertekorte in meeste van die land se vernaamste beproeiingsgebiede nie.

"Dit is altyd moeilik om mense in tye van voorspoed tot spaarsaamheid aan te moedig," het die Minister gesê, "en moontlik is dit ook die rede dat waterbeparing in baie besproeiingsgebiede tot dusver nie aan verwagtings voldoen het nie."

Die Minister het gesê dat hoewel die koste van water steeds betreklik laag bly in verhouding tot ander insette in die boerdery-onderneming, verskeie faktore daarop dui dat die posisie in die voorsienbare toekoms heelwat kan verander en dat 'n gunstiger klimaat vir doeltreffender waterbenutting — veral in die landbousektor — genoodsaak sal word.

Van die faktore wat deur die Minister genoem is, is:

- Die stygende ontwikkelingskoste namate water oor langer afstande na nuwe besproeiingsgebiede gevoer moet word. Dit sal tot gevolg hê dat alleenlik skemas waar die optimum produksie verkry kan word in die toekoms oorweeg sal word.
- Die daling in winste, veral in die landbousektor, vanweë die feit dat die koste van arbeid, goedere en dienste vinniger gestyg het as die inkomste wat uit die bedryf verkry word. Hierdie winsdaling kan nie voortdurend uit die prysstygings van goedere verhaal word nie, maar wel in 'n groot mate deur doeltreffender bestuur en



Mnr PJ de Jager, hoofbestuurder van VETSAK Koöperatief Beperk, aan die woord.

beter benutting van hulpbronne.

- Die moontlikheid dat, hoewel dit nie wetenskaplik gestaaft kan word nie, daar 'n langtermyn siklus van relatief nat en droë jare voorkom. Die nat jare het ons gehad en die vraag moet gevra word of die droë jare nie voor die deur lê nie?
- Die feit dat die beproeiingsboer in die dekades wat voorlê op verhoogde produksie per eenheid water sal moet konsen-

treer om 'n groter opbrengs op die land te verseker ten einde sy lewenstandaard op dieselfde peil as dié van sy landgenote te kan hou.

BESPROEING

Die Minister het voorts gesê dat hoewel sprinkelbesproeiing reeds aan die einde van die twintigerjare in Suid-Afrika bekend gestel is die gebruik van meganiese besproeiingstelsels eers in 1969 met die installering van 'n sentrale spilpuntstelsel op die plaas Soetvelde in Transvaal momentum begin kry het.

Na raming het die jaarlikse verkope van meganiese besproeiingstelsels gestyg van ongeveer ses tot sewe miljoen rand in 1969, tot meer as R100-miljoen in 1981. Verder word bereken dat daar nou ongeveer 450 spilpunt-, 250 kantrol-, 200 kruipspuitstelsels en 100 stelsels met roterende arms regdeur die land in bedryf is.

Hierdie syfer dui daarop dat Suid-Afrika tans 'n bloeiperiode op die gebied van gemeganiseerde besproeiingstelsels beleef soortgelyk

Besproeiingstegnologie

GRAADKURSUS BY UOVS

Die instelling van 'n B. Agric-graad in besproeiingstegnologie by die Landboufakulteit van die Universiteit van die Oranje-Vrystaat stel die voornemende besproeiingstegnoloog nou vir die eerste keer in staat om hom ten volle vir die unieke loopbaan te bekwaam.

Agronomie en Grondkunde is die hoofvakke van die studierigting terwyl sewe semesterkursusse in Landbou-ingenieurswese toegespits op besproeiing, aangebied word. Ander toepaslike kursusse soos Boerderybestuur, Tuinbou en Plantsiektes word ook ingesluit.

Wat Landbou-ingenieurswese betref word aspekte soos hidroulika, meganika, grondbewaring, en plaasstrukture behandel asook die beginsels en toepassing van opmeetkunde, fotogrammetrie en ingenieursplanne vir die ontwerp van besproeiingstelsels en hidrouliese masjiene. Voorts word 'n studie gemaak van die kragbronne wat by die onderskeie besproeiingstelsels gebruik word. Die ontwerp, bestuur, toetsing en onderhoud van besproeiingstelsels kry ook aandag.

In Agronomie word onder meer gewasfisiologie en -produksie, besproeiing, dreinerings en onkruidbestryding behandel, terwyl in Grondkunde aandag gegee word aan grondvrugbaarheid, bemestingsleer, grondopnames en die interpretasie van lugfoto's, grondsistematiek en -fisika, asook hidrologie, grond en grondwaterbestuur en mineralogie.

Toelatingsvereistes vir die driejaarkursus is matriekvrystelling en matriekwiskunde (standaardgraad: minstens 40%).

Voornemende studente kan by die Registrateur, Posbus 339, Bloemfontein 9300, aansoek doen vir meer inligting oor die studierigting.



Demonstrasie van 'n kantrolstelsel aan die belangstellendes by die Boeredag.

aan die oplewing wat in 1976 in die VSA begin het en nog steeds onverpoos voortduur. Die besproeiingsnywerheid verwag dat daar binne die volgende vyf jaar meer as R70-miljoen net in die installering van spilpuntstelsels alleen belê sal word.

Die Minister het gesê die ver naamste redes hoekom boere al hoe meer van permanente meganiese besproeiingstelsels begin gebruik maak, is om plaasbestuur te verbeter, meer veelsydig te raak met die toediening van die korrekte hoeveelheid water op die regte tyd en hul afhanklikheid van hande arbeid te verminder.

Die Minister het ook gesê dat hoewel die staatsdepartemente, navorsings- en opvoedkundige instansies 'n betekenisvolle bydrae gelewer het om die kuns en die praktiese toepassing van besproeiing in Suid-Afrika te bevorder privaatondernemings en veral besproeiingsmaatskappye en koöperasies geloof moet word vir die rol wat hulle gespeel het met die ontwikkelings op dié gebied. Privaatondernemings was vir etlike jare amper alleen verantwoordelik vir die installering van besproeiingskemas op plase, het die Minister gesê. Hierdie toestand is baie gekritiseer en daar is dikwels gehoor van foute wat begaan is en swak ontwerpte stelsels en selde van die oorgrote aantal stelsels wat suksesvol bedryf word. Volgens die Minister dui verslae van ampte-

nare van die Departement van Omgewingsake en van Landbou en Visserye wat talle oorsese kongresse bygewoon het en kennis en inligting oor besproeiingspraktyke in ander lande versamel het, daarop dat die gehalte van besproeiing in die Republiek van 'n hoë standaard is.

PROBLEME

Die Minister het gesê dat 'n bekende besproeiingsdeskundige eenkeer by 'n internasionale simposium opgemerk het dat besproeiing eenvoudig die kuns is om te weet wanneer om die kraan oop te draai en wanneer om dit weer toe te draai. Groot waarheid lê opgesluit in hierdie eenvoudige stelling en baie van die probleme wat ondervind word in die moderne besproeiingspraktyk is waarskynlik te wyte aan onkunde aangaande hierdie besondere aspek wat besproeiingsdeskundiges 'besproeiingsskedulering' noem.

„Ten spyte van al die moderne hulpmiddels wat die besproeiingsboer tot sy beskikking het, bestaan besproeiingsskedulering feitlik glad nie in die praktyk nie”, het die Minister gesê. Die gebrek aan die toepassing van selfs die basiese beginsels van skedulering het aanleiding gegee tot grondversuipting en dreineringsprobleme. Dit is waarskynlik die ernstigste besproeiingsprobleem regdeur die wêreld, en het soos die geskiedenis

toon, al dikwels daartoe gelei dat groot stukke grond permanent vir enige landboudoeleindes ongeskik raak.

Die Minister het voorts gesê dat die beste besproeiingstelsel, onverbeterlik ontwerp en met al die arbeidsbesparende en ander moderne hulpmiddels nutteloos is as die boer nie die toerusting reg gebruik nie. Hy het 'n beroep op boere gedoen om weer na die bestuursaspek van hulle besproeiingstelsels te kyk, veral met die klem op skedulering om sodoende probleme vroegtydig uit te skakel.

OPLEIDING

Dr van der Merwe het gesê die vorige Departement van Waterwese, en nou die Departement van Omgewingsake, het hom oor 'n lang tydperk beywer vir die opleiding en opvoeding van mense ten einde kennis op die gebied van waterboukunde allerweë te bevorder. Wat opleiding betref het die destydse Departement gedurende 1975 en 1976 'n leidende rol gespeel met die ontwikkeling en aanbieding van 'n gespesialiseerde kort kursus in besproeiing. Hierdie kursus was ontwikkel om dringende opleidingsbehoefte te bevredig. Tegnieke personeel uit die private sektor het ook die kursusse bygewoon en dieselfde kursus is later deur die Departement van Landbou en Visserye oorgeneem en tot 1980 aangebied.

Die Minister het gesê die Departement het ook 'n wesenlike rol gespeel in die totstandkoming van die M.Sc-kursus in Besproeiingsingenieurswese by Stellenbosch Universiteit, die B.Sc-(Honneurs) kursus in Geohidrologie by die Vrystaatse Universiteit en in 'n mindere mate, by die Hoër Nasionale Diplomakursus in besproeiing wat tans nog net by die Pretoriase Technikon aangebied word. Die UOVS het ook gedurende 1980 en 1981 kort kursusse in besproeiing aan ingenieurs en tegnisi van die Departement aangebied en langs hierdie weg het die Departement ook 'n bydrae gemaak in die totstandkoming van die nuwe B. Agric-graadkursus in besproeiingstegnologie.

UOVS

Op die gebied van beproeiingsnavorsing het die Fakulteit Landbou van die UOVS ook sy bydrae gelewer. Volgens die "Register van Besproeiingsnavorsingsprojekte" wat deur die Koördinerende Komitee vir Besproeiingsnavorsing opgestel is, het die Departement Akkerbou, Grondkunde en Landbouweerkunde sedert 1970 gesa-

mentlik 12 besproeiingsnavorsingsprojekte afgehandel. Tans is dieselfde drie departemente elk besig met 'n besproeiingsnavorsingsprojek wat finansiële deur die Waternavorsingskommissie ondersteun word. Hierdie drie projekte dek die faktore wat by wetenskaplike skedulering van besproeiing ter sprake is, naamlik gewas-kundige, grondkundige en klimatologiese faktore.

Die Minister het gesê die Departement van Omgewingsake is aktief betrokke by menige navorsingsprojekte wat met die benutting van water verband hou. Die Departement was onlangs in die gelukkige posisie om van die grootste lisimeters in die land aan die Vrystaatse Universiteit beskikbaar te stel ten einde navorsing in besproeiing te help bevorder.

Onder Suid-Afrikaanse toestande waar beperkte mannekrag vir navorsingdoeleindes beskikbaar is, is dit noodsaaklik dat alle besproeiingsnavorsing direk of indirek daarop gerig sal wees om inligting vir verbeterde besproeiingsbestuur te voorsien. Die navorsingsprojek in verband met die besproeiingstoedienings vir koring wat tans deur die Departement Landbouweerk-

kunde uitgevoer word, is 'n stap in hierdie rigting en daar word met belangstelling na die resultate van hierdie projek uitgesien. Betekenisvolle verhoging is in die buiteland met verbeterde besproeiingsbestuur verkry en daar is geen rede waarom dit nie plaaslik ook die geval kan wees nie, het die Minister gesê.

Die Minister het ten slotte gesê dit is verblydend om te sien dat die koöperasie VETSAK en sy verspreidingskoöperasies ook die noodsaaklikheid van opvoeding en navorsing in besproeiingstegnologie erken het: eerstens met 'n baie belangrike bydra tot die totstandkoming van die nuwe B. Agric-kursus deur vir 'n tydperk van vyf jaar die koste van 'n dosent in landbou-ingenieurswese te dra; tweedens deur studiebeurse beskikbaar te stel en laastens die skenking van spilpunt- en kantrol-besproeiingstelsels vir navorsingsdoeleindes. Veertien studente het al verlede jaar se kursus bygewon maar die vraag na opgeleide mannekrag om aan die behoeftes te voldoen is veel groter. Daar word op die oomblik nie minder nie as 300 opgeleide persone in die besproeiingsbedryf benodig, het die Minister gesê.



Teetyd: (Van links) Prof PJC Vorster (hoofadviseur, WNK); mnr T van Robbroeck (Dept van Omgewingsake); dr MR Henzen, voorsitter, WNK; en mnr DS van der Merwe (senior adviseur, WNK).

Water Supply:

NEW RESEARCH PROGRAMME

The University of the Witwatersrand has recently announced the formation of a Water Systems Research Programme within the Department of Civil Engineering at the University. The research programme under the directorship of Professor David Stephenson is undertaking research in the fields of water resources, urban hydrology, water supply and water pollution. The emphasis is thus on urban and industrial water supplies although some research will continue in the field of Hydrology.

The research programme is sponsored by the University Senate Research Committee, The Council for Scientific and Industrial Research, The Water Research Commission and research con-

tracts from the Chamber of Mines. The offices are within the Department of Civil Engineering and a computer centre and library are included in the suite of offices. The present staff includes five engi-

neers, a technician and secretarial staff and the number of fulltime staff will be twelve by the end of the year. A number of post graduate students are also working within the research programme.

On-going research projects in conjunction with the Chamber of Mines at present include pollution of mine service water in gold mines. Here water management and desalination are being investigated in order to improve the quality of water underground.

In parallel with this the research programme is looking at reticulation of water at high pressures in order to power mining machinery. These projects are primarily in the field of water supply and hydraulic engineering whereas other topics are more related to water resources and hydrology.

The programme has also been awarded a research contract by the



Prof David Stephenson, B Sc (Eng), MSc (Eng), Ph D, is Professor of Hydraulic Engineering, University of the Witwatersrand and director of the Water Systems Research Programme.

He was born on 1 March 1943 and is married with two children.

From 1965 to 1972 he was engineer, then planning engineer with the Rand Water Board. From 1972 to 1979 he was a partner and engineer with a firm of consulting engineers. In 1977 he became Professor of Hydraulic Engineering at the University of the Witwatersrand and in 1981 director of the Water Systems research Programme.

Prof Stephenson has published three books.

Water Research Commission in the field of urban hydrology. The researchers are advancing in particular in the field of kinematic hydrology. This relatively new but hydraulic based form of estimation of runoff is well suited for computer modelling and is also emerging as an accurate method of estimating floods as an alternative basis to the rational method. Although the theory was developed in the United States a number of years ago it has not been applied on a practical scale owing to the higher mathematics involved. The water systems research programme staff are developing methods of application of the technology and also design guides for estimating floods. Computer modelling of urban drainage systems, that is for predicting storm water flows, and water management studies in urban areas are also to form part of the research contract.

In the field of water resources the group is looking at water systems analysis and planning methodology. Some of the papers issued by the group in the last year include those on research into optimum allocation of water resources subject to quality constraints. Linear programming, decision making theory, dynamic programming and simulation methods will be developed and applied in this field.

WATERTEKORT IN EUROPA

'n Hele aantal Europese lande sal binne vyf-en-twintig jaar 'n tekort aan drinkwater ondervind. Die feit is vervat in 'n verslag wat onlangs deur die VV se Ekonomiese Kommissie vir Europa gepubliseer is.

Die vraag na drinkwater sal waarskynlik die meeste toeneem in lande soos Tsjeggo-Slowakye, Hongarye, Pole, Portugal, Roemenië en Turkye, waar oorgeskatte sal word van dorpsputte na pypleiding-stelsels. In België, Oos-Duitsland en Luxemburg sal die vraag na verwagting in die komende tien jaar verdubbel.



VVO OP SOEK NA NUWE HANDPOMP- ONTWERPE

Volgens 'n paneel VV-deskundiges bestaan daar 'n dringende behoefte aan 'n nuwe soort handpomp wat deur opgeleide persone in ontwikkelende lande gebruik en in stand gehou sal kan word. Die ontwikkeling van 'n VLOM ("Village level operation and maintenance") handpomp is een van die sake wat voorrang geniet in 'n Wêreldbank/VVOP-projek om bestaande en nuwe handpompontwerpe in die laboratorium en in die praktyk te toets.

Bedryf- en instandhoudingskoste, veral vervoerkoste van mobiele diensspanne, is bo-aan die lys van uitgawes vir nuwe platelandse watervoorsieningsprojekte, sê die projekteier, Saul Arlosoroff, van die Wêreldbank. In sommige gevalle vorm die instandhoudingskoste tot soveel as 85% van wat dit kos om die pompe op te rig.

Indien 'n geskikte ontwerp gevind kan word, sal die uitwerking op die koste vir die Waterdekade, met 'n potensiële mark van tot 20-miljoen handpompe, verrekend wees. Arlosoroff wil hê dat handpompvervaardigers moet konsentreer op ontwerpe wat nie swaar hystoerusting benodig wanneer die ondergrondse dele versien moet word nie.

Laboratoriumtoetse is uitgevoer

op 'n aantal bestaande ontwerpe by die Verbruikersassosiasie in Brittanje, en verdere proewe is tans nog aan die gang. Na aanleiding van die resultate van hierdie toetse en verslae uit ontwikkelende lande beplan die paneel nou veldtoetse om die handpompontwerpe wat gekies is te monitor saam met pompe wat tydens nasionale geïnstalleer is. Monitors onder leiding van die VV Vrywilligerskorps sal toesig hou oor die oprigting, bedryf en instandhouding van die pompe vir 'n periode van tot twee jaar. Hulle sal gebruik maak van standaardvorms wat ontwerp is om koste, aanvaarbaarheid en ander sosio-kulturele faktore te vergelyk.

Intussen sal die span ook kyk na maniere om standaardontwerpe te ontwikkel vir verskillende gebiede en waterdieptes, met instandhouding deur die dorpsbewoners as die belangrikste oorweging. Arlosoroff hoop om ongeveer tien moontlike VLOM-handpompe binne 'n jaar gereed te hê vir toetsing.

Tans word gereken dat die maksimum gebruik van plastiekdele onder die grond die beste oplossing sal bied.

Kyk ook artikel op
bladsy 20 →

IAWPR:***Scenes of the 11th Biennial Conference****The Civic Centre, Cape Town.*

The lingering echo of the farewell function's voices seeped into the deserted halls in the Civic Centre, Cape Town. One may reflect, with the last canapé consumed and the summer's evening light having paled in the wine, that the fabric of the 11th Biennial Conference of the International Association on Water Pollution Research (IAWPR) was to be found here — where every paper had been read, every social function attended, every conversation concluded.

But that would certainly have been too casual a view. The conference had been four years in the making, as chairman of organizing committee Odendaal had pointed out at the opening ceremony, before the Governing Board members arrived in South Africa, to be followed by delegates from 32 countries concerned with the pollution of that one substance which truly flows across international boundaries.

The essence, one may think, was to be found in the hustle of activities of the Governing Board during the week preceding the conference: Dick Engelbrecht (USA) re-elected as president for the next two years, along with vice presidents Poul Harremoës (Denmark) and Ernst Kunze (West Germany);

a momentous decision on a change of name (C for Control to be added to IAWPR); or, in contrast, the relatively relaxed atmosphere of a trip to nearby Paarl where the language monument grabbed at a leaden sky; or the warmth of sherry at a cosy lunch.

But that, too, was merely a facet.

Perhaps the essence was to be found in the aura of expectation permeating the registration hall on Sunday afternoon when the corners of the globe met again in the form of acquaintances from any of ten previous conferences. That, too, would merely be a single frame in the film.

Perhaps one may tender impressions: a cacophony of sound at the meet and greet on Sunday night when old faces and newly remembered names fell into place, an agony of accents collected in a hall; the singing of strange voices at a braai; the banter between colleagues. (Governing Board member Jones of Canada being photographed with colleague Harremoës of Denmark: 'I say, why *must* I be pictured with this guy from Denmark, *always?*' An onlooker: 'Because he's a great Dane').

One may have tried to grasp the spirit of this conference at the opening ceremony — the backdrop of flags reflecting the international



The very beginning of events: Mr PE Odendaal at the rostrum: Mayor of Cape Town Van Zyl; Dr CF Garbers (CSIR) and Conference President Dr GJ Stander, pictured at the opening ceremony.

character of the assembly; warm welcoming applause for groups of delegates from each separate country; one may have discerned something of the nobility of purpose of this meeting in the honouring of Prof Iwai (Japan), with honorary membership for devotion to the Association's objectives. For, as Prof Engelbrecht had said, dedication and devotion had brought the IAWPR to this, its 21st year.

Then again, there were those moments when, at the banquet, the warmth of camaraderie and appreciation pervaded the Good Hope centre when Stander and Jenkins were honoured — founder members and men who had also served the cause with dedication . . . and distinction.

However, in the final analysis this conference in essence existed in the impressive facts surrounding it: 63 original research papers presented, 6 different state-of-the-art sessions, and 34 poster presentations: these constituted the 11th IAWPR conference held from 29 March to 2 April 1982 in the Civic Centre, Cape Town, Republic of South Africa.

Countries represented at the conference were: Australia, Austria, Belgium, Bophuthatswana, Botswana, Brazil, Canada, Chile, Denmark, Finland, France, Germany, Greece, Israel, Italy, Japan, Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, South Africa, Spain, Sweden, Switzerland, Taiwan, Thailand, Venezuela, United Kingdom, USA and Zimbabwe.

And then, it is on to Amsterdam in 1984.

Seen/scene at meet 'n greet

(Right) President Dick Engelbrecht, Mrs Henzen, Mrs Engelbrecht and chairman of WRC, Dr MR Henzen, sharing a joke prior to the meet and greet function.



(Left) Mr G Mabale, Dept of Health of Bophuthatswana, (left), and Dr JP Kriel, special adviser to the Dept of Environment Affairs.



(Top) Commission members Dr Garbers (left) and Prof DJ Schoeman (right) with Mrs Schoeman.



(Below) Prof J Masumoto, Mrs Betty Stutterheim, Mr and Mrs J Pinto, and Commission member Dr N Stutterheim.

(Top) Vice chairman of WRC and DG of Dept of Environment Affairs JF Otto (left) with Mr DC McLeod, City Engineer of Durban, and Mr GDJ Atkinson, City Engineer of Pietermaritzburg.



(Left) Mr and Mrs J Joughin and Mr Tony Pitman. Mr Joughin represented the Bateman Company and Mr Pitman Cydna Laboratories in Johannesburg.

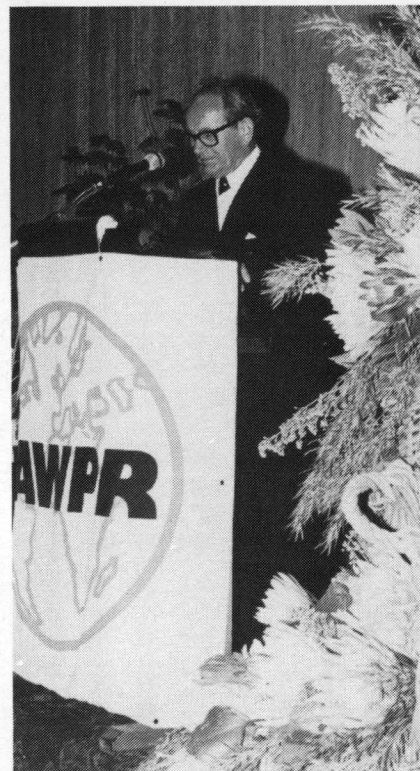


Messrs B. Bergman, Osborn (City Council of Johannesburg) and JS Wishart (Canada).

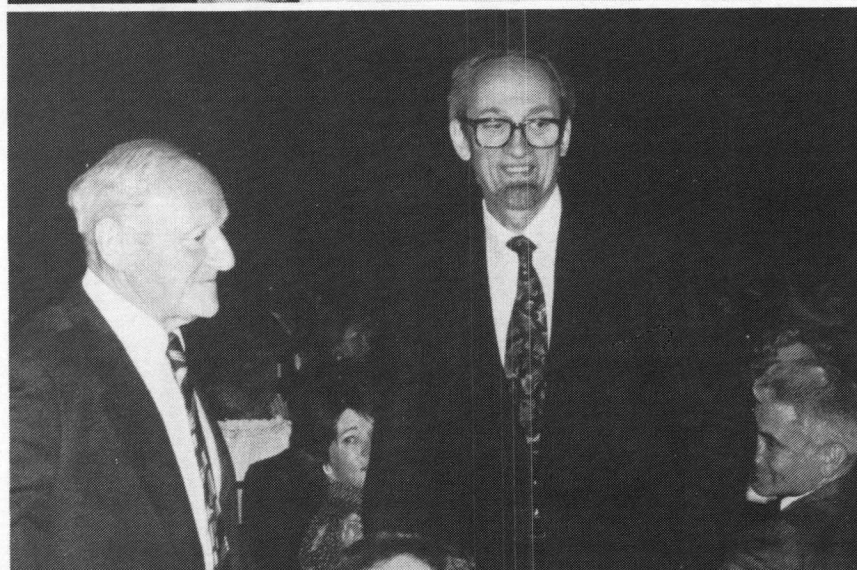


Messrs D Nozaic and C Warner (Geustyn, Forsyth and Joubert) and Prof G Shelef (Israel).

IAWPR — 11th Biennial Conference



(Above) National chairman of IAWPR, Dr GG Cillie, addressing delegates at the banquet.



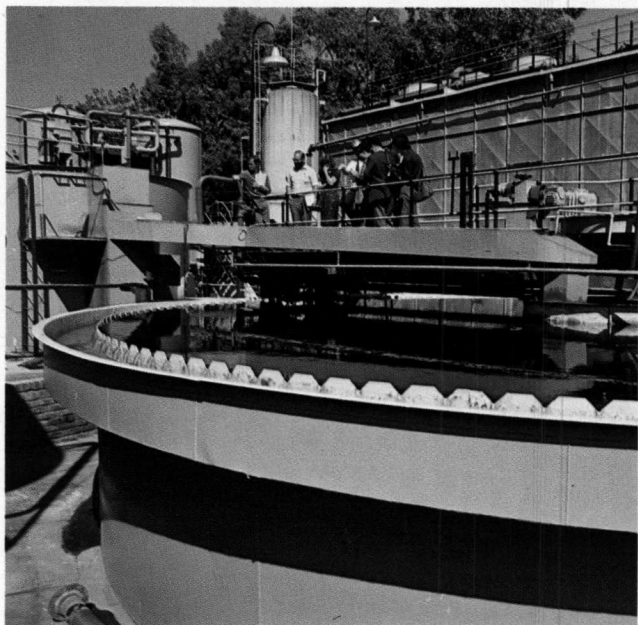
(Top left) Dr GJ Stander, conference president, receives special token of appreciation from Prof Engelbrecht.

(Left) Also honoured at the banquet Dr SH Jenkins (left) with son David who presented the honorary issue of **Water Research**.

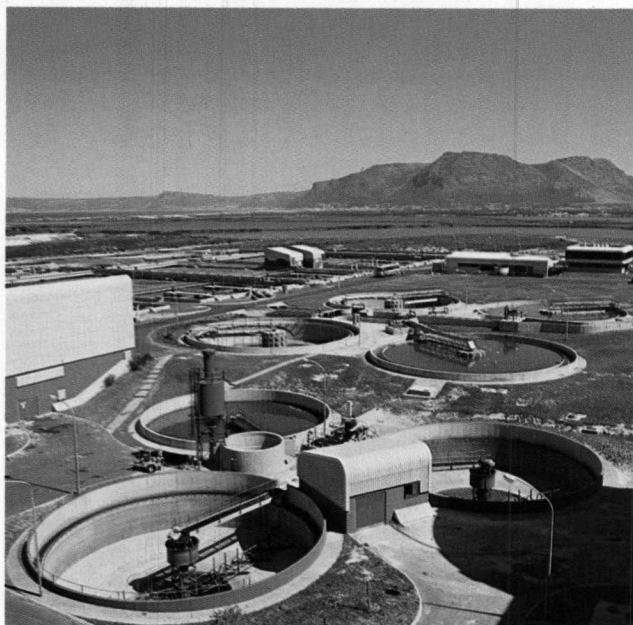


A table at the banquet: From left Mrs I Retief (Phalaborwa Water Board), Mr D Cousins, Dr P Roberts, Mr DS van der Merwe, Mr J McGlashan (obscured) — all WRC — and Mrs F Prinsloo.

IAWPR — 11th Biennial Conference



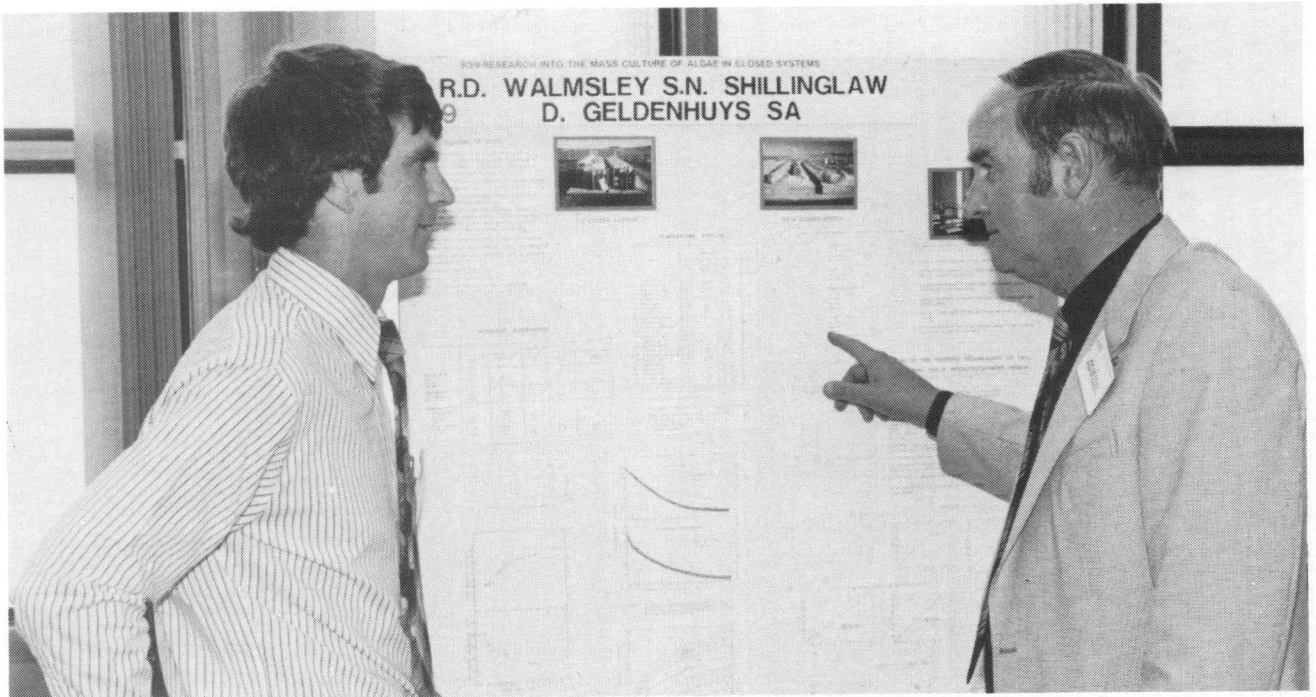
A scene at the Stander Water Reclamation Plant in Pretoria during the post conference tours.



A view of the Cape Flats sewage works from atop a digester, visited during conference technical tours.



At the closing ceremony: Prof and Mrs AH Molof (New York) chatting to Prof H Shuval of Israel.



At the IAWPR conference's poster presentations: Dr Danny Walmsley (left) discussing his poster with Prof P Lategan of the University of the Orange Free State (See also article on page 28).

VV-Waterdekade:

MILJOENE POMPE NODIG

Vooruitskattings van die totale aantal handpompe wat gedurende die VV-waterdekade en daarna tot aan die einde van die eeu benodig sal word, verskil baie van mekaar, afhangende van die dienste wat aanvaar word gelewer sal kan word en hoe lank die pompe wat gebruik word, sal hou.

Syfers wat ter voorbereiding van die Waterdekade opgestel is, toon dat teen 1990 ongeveer 1 833-miljoen mense in die Derde Wêreld, buiten Sjina, van nuwe skoon, vars water voorsien sal moet word. Amper 1 400-miljoen van hierdie mense woon in plattelandse gebiede waar handpompe die mees algemene vorm van waterverskaffing is.

Onlangse syfers uit Sjina toon dat ten minste 400-miljoen mense op die Sjiniese platteland in dieselfde tydperk van water uit handpompe afhanklik sal wees. Teen die einde van die eeu sal die bevolkingsaanwas nog ongeveer 800-miljoen mense regdeur die Derde Wêreld bygevoeg het.

Terselfdertyd sal die bestaande

pompe vervang moet word en teen die einde van die eeu sal selfs die wat gedurende die Dekade opgerig is, uitgedien wees. Indien die VV daarin kan slaag om 'n suksesvolle VLOM-handpomp te ontwikkel, sal die vervanging daarvan wel goedkoper wees as tans, maar dit sal meer dikwels moet geskied. Dit word bereken dat al die belangrikste onderdele van 'n VLOM-pomp miskien oor 'n tydperk van vyf jaar vervang sal moet word.

Die ander belangrike oorweging in die bepaling van die vraag na handpompe is die aantal mense wat elke handpomp kan bedien. Die Wêreldbank werk tans op 'n syfer van 200 mense per pomp, hoewel in een belangrike land soos Bangladesj die mikpunt vir die jaar tweeduisend 75 mense per pomp is, vir 'n geraamde plattelandse bevolking van 90-miljoen.

Die tydskrif *World Water* se skatting dat ongeveer 20-miljoen of meer handpompe teen die einde van die eeu benodig sal word, word so bereken:

- Nuwe handpompe om 75% van die plattelandse bevolking (buiten Sjina) teen 1990 te bedien (1 000-miljoen) plus 400-miljoen mense in Sjina teen 200 mense per pomp, beteken sewe miljoen nuwe pompe;
- In dieselfde tydperk sal dit nodig wees om pompe vir ten minste 500-miljoen mense te vervang: nog 2½-miljoen pompe;
- Om 75% van die bevolkingsaanwas teen die jaar 2 000 van water te voorsien (600-miljoen) sal nog drie miljoen handpompe nodig wees;
- Vir die vervanging van feitlik alle pompe teen die einde van die eeu wat voor 1990 in gebruik was, sal ten minste nog 10-miljoen pompe benodig word. Dit beteken 'n totaal van ten minste 22½-miljoen handpompe, selfs al is dit eers nodig om die pompe na tien jaar of langer te vervang.

TOERUSTING

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

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

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

Anton Prinsloo
REDAKTEUR



SA Waterbulletin
PO Box/Posbus 824
Pretoria 0001

EQUIPMENT

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

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

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

Anton Prinsloo
EDITOR

NEW QUICK LIQUID SAMPLERS

The new Spencer Retaw Liquid Samplers require no power supply, have no moving parts and can sample liquid for periods of from 3 hours to 8 days but in suitable circumstances the sampling time may be less than 15 minutes.

One of the main advantages of these liquid samplers is that the rate of sampling is constant. The sample chamber is immersed in the liquid and suspended solids

to be sampled and the hydrostatic pressure forces the sample in through a 6 mm diameter inlet. The rate of sampling is controlled by the regulator which controls the rate at which air is allowed to escape from the chamber and hence the rate at which it is replaced by liquid.

All parts of the sampler other than the regulator are polypropylene or A.B.S. and can therefore be easily cleaned in a wide

variety of detergents. Both ends of the sampler chamber are removable allowing every square millimetre to be cleaned.

Enquiries:
Spencer Retaw (Pty) Ltd
P.O. Box 8621
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EQUIPMENT

HIGH VOLUME PUMPS

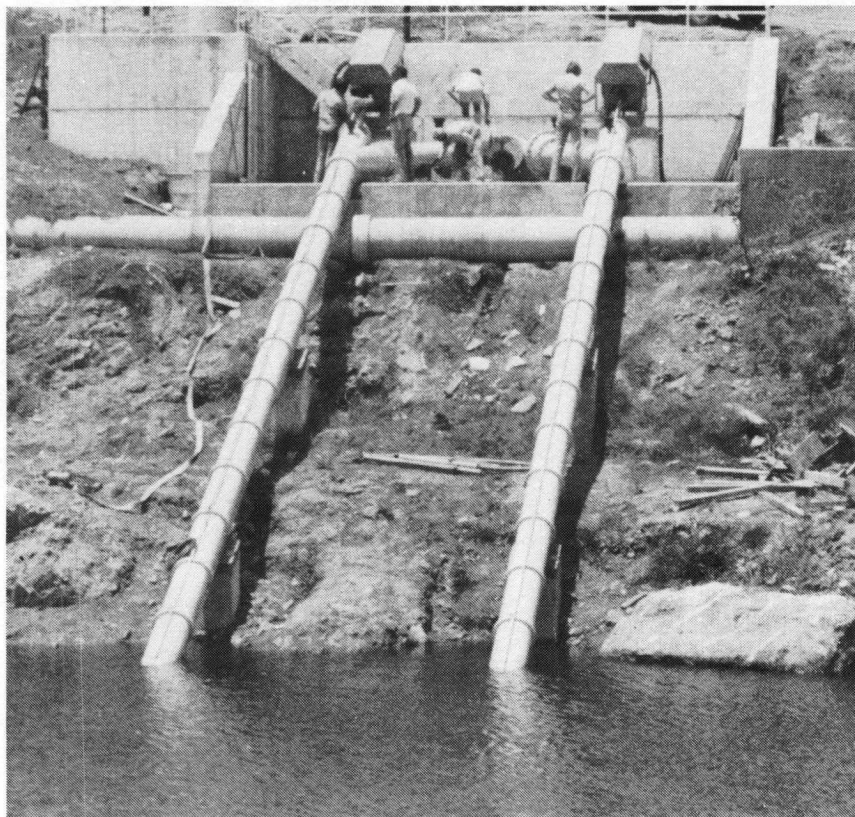
Two high volume pumps have been installed on the Little Brak River at Moordkuil as an integral part of the new Mossel Bay Municipality Water Scheme.

These Ornel pumps, manufactured by Mono Pumps, have been specified for the task of initially moving 4 000 000 cubic meters of water from the Little Brak River to the Klipheuwel Dam. Thereafter the pumps will supply to the dam on an ongoing basis.

Although high capacity pumps have been specified previously in the Western Cape this installation marks a new departure for the Mossel Bay Municipality. According to Mr Peter Harrison of William Spilhaus the pumps are ideal for the duty. "These high capacity pumps are particularly suitable as the varying water level of the river does not significantly effect the pump's efficiency or discharge rate. Also the simplicity of the civil work keeps costs to a minimum".

The two 400 mm diameter Ornel pumps are each powered by 185 kW time controlled motors and are capable of lifting 400 l/sec to a head of 32m and return of 84% rate of efficiency.

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BOOK ON
FILTERS

Filtration methods have changed considerably over the years. Some of them have recently regained importance. This applies in particular to floc filtration. Floc filtration means that the filterable matter (turbidity, colloids), which is either already present or formed by chemical treatment, is mechanically separated from liquids by percolation over layers of granular material. Floc filtration developed gradually from surface filtration to the modern technique of in-depth filtration. While with surface filtration, only the upper filter layer is utilized as filter medium, in-depth filtration makes use of the entire filter volume for separation of solids. The application and testing of additional specifically lighter filter materials then led to the development of multi-layer filtration, which in the last decade or so has been adopted everywhere in water treatment technology.

The principle of multi-layer filtration is that rough separation of solids occurs in the upper part of the filter by a relatively coarse and light medium, while residual solids are removed in the lower part of the filter by a fine medium of high specific gravity. The function of such filters is always that of in-depth or deep-bed filters, i.e. the volume between the grains throughout the filter bed (voids' volume) is used for the separation of solids. Consequently, more solids are retained than in a single-layer bed, and this

permits pre-treatment of the water with coagulants prior to filtration. The advantage of the multi-layer filter is the relatively slow increase in head loss, which in turn prolongs the length of filter run. Only when the upper bed in multi-layer filter is the relatively slow increase in head loss, which in turn prolongs the length of filter run. Only when the upper bed in multi-layer filters has been completely charged with contaminants will the lower bed come into full function, and for the coarse pollutants has the effect of a surface filter. This becomes apparent by a more rapid increase in the head loss (filtration resistance), indicating that the filter run is coming to an end.

A free booklet, dealing with the application of the granular filter media Filtrilur and Filtriplus for water treatment, is available. The application may either be for the treatment of surface water and bank filtrated river water for use as drinking water, or for the treatment of service and waste water. The booklet gives information on the possible applications and the mode of operation of these filter media, and deals in particular with floc filtration, which is employed in most cases to achieve a high degree of purification. It comments moreover on the importance of various hydraulic data for the design of filter plants.

Enquiries:
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Telephone: (011) 36-2811

TINY TV

Electronic devices seem to get smaller every day, and it certainly must be true of the television industry, because the CCTV Division of Rediffusion have signed up an agreement with Rees Instruments Ltd of the UK to market their full range of sub-miniature industrial inspection monitoring and control systems — including a television camera small enough to go down inside a 12 mm inside-diameter pipe, and if required, round the bends.

The Rees sub-miniature CCTV camera, developed in Britain, gained the British Design Council Award and they now have a whole series of inspection cameras varying in size to suit different applications such as sewer surveying, borehole inspection, internal weld inspection, and general underwater applications.

Some of the cameras can not only look ahead, viewing by means of their own built-in light source, but they can also swivel through 360° to look at pipe welds, etc.

The cameras incorporate a suspension system to provide shock protection to the vidicon and associated components under most severe site conditions.

Enquiries:
Rediffusion — CCTV Division
PO Box 39138
BRAMLEY 2018
Tel: 786-3535

SEWAGE PUMPS

TOERUSTING

Hugh Mellor, the pump people, have been awarded the contract to supply and install 21 submersible sewage pumps for the new harbour extensions at Richards Bay.

As the area there is very flat, the new pumps will be required to pump sewage from the new offices and works to the main sewer, and work is scheduled to be completed by the end of March. The complete contract, worth more than R62 000, includes all the necessary locally-produced pipework, valves, fittings, and motor control gear.

Flygt now have a large number of sewage-type installations in operation where reliable continuous operation is essential, with little or no servicing.

Enquiries:
Hugh Mellor & Co Ltd
PO Box 700
EDENVALE
1610



Part of the range of pipework valves, fittings etc at Mellor's

PUMPS FOR NEW STATION

Three Sulzer HPL 42-22^{1/2} six-stage pumps passed through Nelspruit in the Eastern Transvaal recently on their way to a pump station on the Crocodile River.

The pumps were made in 16 weeks by Sulzer for Dowson and Dobson Ltd, Nelspruit, and will be used in a R3,25 million Department of Community Development project to supply fresh water to the Kabokweni township in the KaNgwane homeland, 20 km from the Crocodile River.

The pumps have a capacity of 300 m³/h against a head of 335 m and are driven by 500 kW motors.

Three HPH 54 three-stage pumps, manufactured by Sulzer Bros (South Africa) Ltd of

Johannesburg, will be used at a new pump station in the Vaalkop Pumping Scheme near Brits to provide water for Bophuthatswana (Sun City), Northam and mines in the area.

Two of the pumps will be direct coupled to 750 kW motors, and the third will be coupled via a Voith variable speed turbo coupling which will make it adaptable to flow demand. One fixed speed and one variable speed pump set running in parallel will deliver a quantity of 350 litres per second at a head of 285 m. The third fixed speed pump set will be a stand-by unit.

The contract is expected to be completed early in 1983.

The Vaalkop Water Board already has two

HPL 42 five-stage units which were installed and commissioned during 1981. A further HPL 42 seven-stage, driven via a variable speed turbo coupling, is on order and will be commissioned during March.

The orders for all above pump sets were placed by Turbo Engineering (Pty) Ltd, Randburg, for the Vaalkop Water Board in Rustenburg.

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

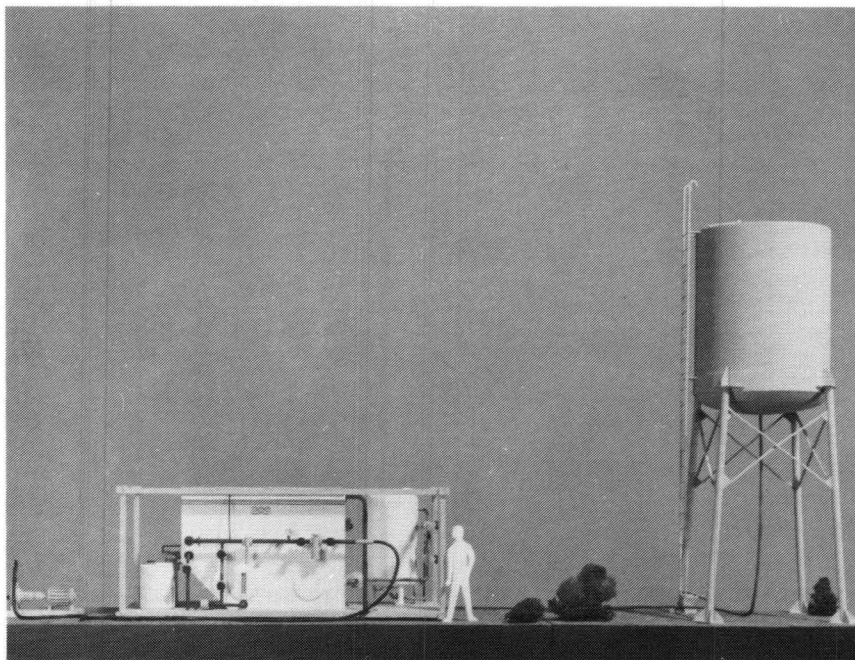
POTABLE WATER PRODUCER

The SEE-AQUAPAC is a compact containerised potable water production unit utilising all the conventional steps of a classical water plant such as prechlorination, coagulation, flocculation, sedimentation, filtration, postchlorination and neutralisation.

SEE-AQUAPAC units are specially intended for rural areas, isolated communities and expanding towns.

Advantages of the SEE-AQUAPAC unit: easy transportation, simple and rapid assembly, limited ground area, civil works limited to a simple concrete slab, no qualified personnel required.

Enquiries:
Mr. Arsène Bultinck
Vinstra Road 18
0185 Valhalla
Pretoria



W NK HOU INLIGTINGSESSIE

'Die Waternavorsingskommissie volg 'n beleid van nie-inmenging maar aanvulling,' het mnr PE Odendaal, hoofadviseur van die WNK, gesê toe hy die ontstaan, doelstellings en werkwyses van die Kommissie by 'n inligtingssessie in Januarie 1982 bespreek het. Dié sessie is by die konferensiesentrum van die WNNR gehou met die doel om navorsers, ingenieurs en tegnisi wat op die gebied van water werk en wat met die WNK skakel, in te lig oor die werksaamhede van die eerste tien jaar van sy bestaan.

Mnr Odendaal het gesê dat daar in die vroeë jare van die Kommissie 'n siening uitgespreek was dat alle uitgawes aan waternavorsing in Suid-Afrika deur die WNK gefinansier, beheer en gekoördineer moet word.

'Hierdie siening was egter nie vir die Kommissie aanvaarbaar nie,' het hy gesê. 'Die Kommissie was van mening dat waar dit wel sy taak is om alle waternavorsing in die land te koördineer, dit nie die bedoeling van die Waternavorsingswet was dat hy die finansiering van navorsing wat reeds deur staatsdepartemente en statutêre organisasies gedoen word, moet oorneem nie.

Sodanige oorname sou allerweë goeie wil vernietig en vertroue en samewerking ondermyn en daardeur effektiewe waternavorsing aftakel. Vir sover dit finansiering betref, het die Kommissie sy oogmerke gesien om leemtes in waternavorsing op te spoor en deur finansiering aan te vul.'

Mnr Odendaal het voorts beklemtoon dat in hierdie basiese beleid van nie inmenging maar aanvulling, die verdere beleid van raadpleging implisiet teenwoordig is. Daar word van die personeel van die Kommissie verwag om deur raadpleging na buite die kundigheid van persone en instansies te mobiliseer om die identifisering van navorsingsbehoefte en die uitvoering van die WNK se koördineringsstaak te bevorder.

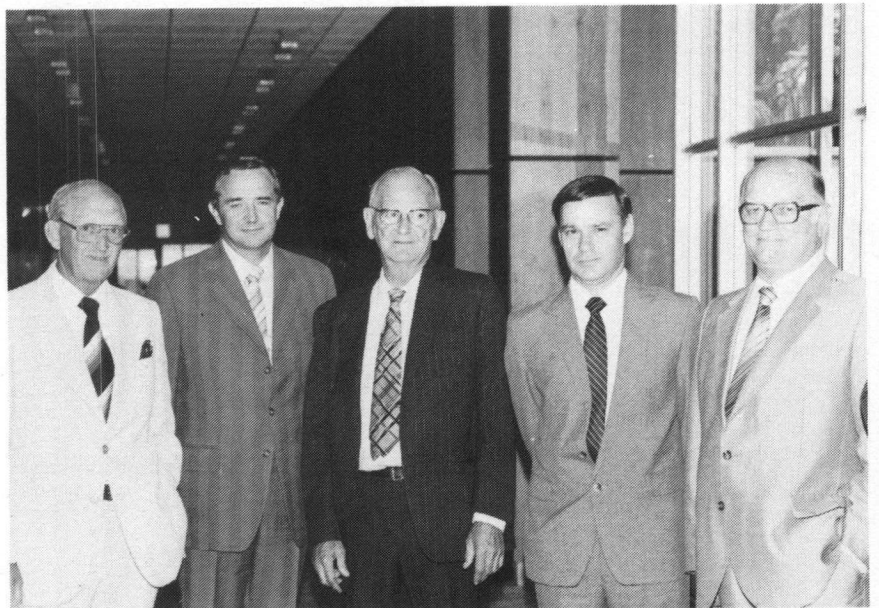
Om te verhoed dat ongesonde oorvleueling van navorsing plaasvind, raadpleeg die Kommissie gewoonlik belanghebbende staatsdepartemente en ander instansies voordat hy nuwe navorsingsprojekte inisieer, het hy gesê.

Een van die belangrikste take van die WNK is om tegnologie-oordrag (TO) te bevorder. Mnr Odendaal het gesê dat een van die belangrikste benaderings wat in hierdie verband ontwikkel is, was dié optrede om oorwegings ten opsigte van TO reeds by die beplanning en uitvoering van navorsingsprojekte in te bou. Om dit te vermag, het hy gesê, moet twee belangrike beginsels voor oë gehou word: Enersyds moet navorsing op welomskrewe behoeftes gerig wees en andersyds moet gebruikersinstansies so ver moontlik by die beplanning en uitvoering van die navorsing betrek word.

Wat die eerste beginsel betref, speel die verskillende Koördinerende Navorsings- en Ontwikkelingskomitees 'n sleutelrol om navorsingsbehoefte te identifiseer. Dié Komitees is deur die Kommissie vir bepaalde gebiede ontwikkel en verteenwoordigers van alle belanghebbende instansies dien daarin.

Wat die inskakeling van gebruikersinstansies by navorsing betref, het die Kommissie die beginsel van vennootskapnavorsing ontwikkel. Hierdeur, het mnr Odendaal gesê, word 'n gebruikerinstansie kontraktueel by die navorsing betrek en maak hy ook 'n inset by wyse van fasiliteite, mannekrag en fondse, wat terselfdertyd 'n aansienlike besparing op direkte navorsingsuitgawes deur die Kommissie verteenwoordig.

Hy het voorts gesê dat 'n navorsingsorganisasie gewoonlik ook by



Dié uitgelese groep waterpersoonlikhede het die inligtingssessie bygewoon: (Vlnr) mnr JF Otto (Direkteur-genl van die Dept van Omgewingsake); dr CF Garbers (President, WNNR); dr JP Kriel (voormalige sekretaris van Waterwese); mnr PE Odendaal (Hoofadviseur, WNK); dr CV van der Merwe, Minister van Omgewingsake.

Hierdie is die eerste van twee artikels in 'n bondige oorsig van die werksaamhede van die Waternavorsings kommissie. Die tweede artikel is in Engels en sal in die Augustus-uitgawe van SA Waterbulletin verskyn.



Mnr PE Odendaal, hoofadviseur van die WNK.

die navorsing betrek word om vir die wetenskaplike inset van die projek verantwoordelik te wees. Op hierdie manier word die kommunikasiegaping wat dikwels tussen navorser en toepasser bestaan, oorbrug. Deur vennootskapnavorsing word ook die risikofaktor, wat een van die grootste verserrings vir TO is, aansienlik verminder aangesien die toepasser eerstehandse kennis van die potensiaal van die nuwe tegnologie opbou, aldus mnr Odendaal.

Gebrek

In 'n voordrag oor *Navorsing oor besproeiing en vloedskade* het mnr DS van der Merwe, senior adviseur van die WNK, daarop gewys dat ongeveer 30 persent van die bruto-land bouprojek onder besproeiing op 10 persent van die bewerkbare oppervlakte ge produseer word. In 1970 het besproeiing 77 persent van die totale waterverbruik in die Republiek opgeneem, en dié syfer sal waarskynlik tot 56 persent in die jaar 2020 afneem. Mnr. Van der Merwe het gesê dat dit egter nie beteken dat die hoeveelheid water vir besproeiing sal afneem nie, want dié sal waarskynlik toeneem tot op 'n vlak van ongeveer $16\,000 \times 10^6 \text{ m}^3/\text{jr}$ in 2010

waarna dit na verwagting sal afplat. Dié afplating word toegeskryf aan die gebrek aan geskikte onontwikkelde gronde vir besproeiing na die jaar 2010.

'Daar word algemeen aanvaar dat die standaard van besproeiing in Suid-Afrika nie hoog is nie,' het hy gesê. 'Vanuit 'n waterbesparingsoogpunt moet hierdie standaard dus verbeter word, met ander woorde produksie per eenheid besproeiingswater toegedien moet geoptimeer word. Dit is dan ook die WNK se uitgangspunt by die toekenning van fondse vir besproeiingsnavorsing.'

'n Onlangse opname het getoon dat daar tans 73 navorsingsprojekte oor die verskillende fasette van besproeiing in die land onderneem word. Hiervan word 40 deur die Departement van Landbou en Visserie uitgevoer, hoofsaaklik deur sy Navorsingsinstituut vir Grond en Besproeiing en dié vir Vrugte en Vrughtegnologie. Verder word 31 deur verskillende universiteite en twee deur die SA Suikervereniging te Mt Edgecombe uitgevoer. Van die projekte wat deur die universiteite behartig word, geniet sewe die finansiële steun van die WNK.

Mnr Van der Merwe het gesê dat met dié verspreiding van die besproeiingsnavorsingsprojekte dit noodsaaklik was dat effektiewe koördinerende van die navorsing daargestel sou word. Dit is bewerkstellig deur 'n Koördinerende Komitee vir Besproeiingsnavorsing in die lewe te roep, in samewerking met die Departement van Landbou en Visserie. Die Komitee, wat onder die beheer van laasgenoemde Departement funksioneer, het verteenwoordigers van die Departement van Omgewingsake, van Samewerking en Ontwikkeling, en van die WNK, en het ten doel om onnodige oorvleueling van besproeiingsnavorsing uit te skakel, optimale aanwending van fondse en mannekrag vir sodanige navorsing te verseker, en om leemtes en prioriteite in besproeiingsnavorsing te identifiseer.

Ten einde die doel van hoër doeltreffendheid van waterverbruik in die landbou te bereik, moet onnodige waterverliese geïdentifiseer word. Dié kan in twee kategorieë

geplaas word, het mnr Van der Merwe gesê, naamlik

- verliese tydens die vervoer van water
- verliese as gevolg van onoordeelkundige besproeiing.

Wat eg. betref, is die nodige kennis beskikbaar om hierdie verlies te minimiseer, en word die toepassing daarvan deur ekonomiese oorwegings en plaaslike omstandighede bepaal.

Uitgeskakel

Laasgenoemde verliese kan grootliks uitgeskakel word indien die besproeiing wetenskaplik geskeduleer word. Dit is dan ook die rede waarom die WNK etlike navorsingsprojekte in hierdie verband ondersteun.

Hy het wetenskaplike skeduleering gedefinieer as die tyd- en hoeveelheidsreëling van 'n besproeiingstoediening met inagneming van al die gewaskundige, grondkundige en klimatologiese faktore wat 'n invloed op die tempo van waterverbruik van 'n plant uitoefen. Uit hierdie definisie is dit dus duidelik dat daar drie faktore is wat 'n rol speel en waarvan die nodige inligting beskikbaar moet

(Na bl. 26)



Mnr DS van der Merwe, senior adviseur van die WNK.

WNK- INLIGTING

(van bl. 25)

wees vir sinvolle besluitneming oor besproeiingstoedienings.

'Daar is vroeër aangedui dat Suid-Afrika se besproeiingsdoeltreffendheid laag is,' het mnr Van der Merwe gesê. 'Ongelukkig is daar nie betroubare syfers beskikbaar om 'n spesifieke waarde vir die doeltreffendheid te bereken nie. Dit is egter ongetwyfeld so dat 'n verbetering in die bestuur van besproeiing besproeiingsdoeltreffendheid plaaslik sal verhoog. Amerikaanse ervaring in hierdie verband is dat verbeterde besproeiingsbestuur deur die toepassing van wetenskaplike skedulering die gemiddelde besproeiingsdoeltreffendheid van 48 tot 60 persent verhoog het, met 'n gepaardgaande besparing in waterverbruik.

'Algemene plaaslike toepassing van die resultate van Suid-Afrikaanse navorsing behoort 'n nog groter effek te hê,' het hy gesê.

Met verwysing na vloedskade het mnr Van der Merwe gesê dat vloede wat grootskaalse verliese en ontwingting tot gevolg het, ge-

middeld een maal elke twee jaar in SA voorkom. Van die beste besproeiingsgrond is dikwels binne die vloedvlaktes van die riviere geleë en word dus tydens oorstromings aan skade blootgestel. Behalwe intensiewe landbou-ontwikkeling kom ook kommunikasie- en vervoerverbindings, stedelike gebiede en nywerhede dikwels langs riviere voor. Met die skerp styging die afgelope tyd in die waarde van woongebiede, nywerheidsaanlêe en besproeiingsgrond is die waarde van sodanige ontwikkeling in vloedvlaktes baie hoog.

Ten einde sinvolle besluite oor die daarstelling van vloedbeskermingswerke te kan neem, is dit dus nodig dat betroubare gegewens rakende vloede, vloedskades en werklike totale verliese bekend moet wees. As gevolg van die gebrek aan sodanige inligting het die WNK op versoek van die destydse Departement van Waterwese ooreenkomste met twee instansies gesluit om navorsing oor hierdie aspek uit te voer. Die twee instansies is die Buro vir Sosiale en Ekonomiese Navorsing van die Universiteit van die OVS en die Buro vir Ekonomiese Onderzoek van die Universiteit van Stellenbosch.

Die metodologie vir die evaluering van vloedskades is ontwikkel en deur die Instituut en die Buro toegepas op die 1974- en 1975-vloede in 'n aantal riviertrajekte. 'n Aantal vloedskadefunksies is ontwikkel maar aangesien dit op een vloedvoorkoms gebaseer is, sal dit deur verdere vloedskade-opnames verfyn moet word.

Prof PJC Vorster, hoofadviseur van die WNK, het 'n oorsig oor navorsing oor reënvalstimulering gelewer en het dit beskryf as "'n belangrike faset van die moderne wetenskap van weermodifikasie'.

Prof Vorster het gesê dat alhoewel die mens reeds vir baie jare primitiewe pogings aangewend het om die weersomstandighede in sy onmiddellike omgewing te beïnvloed, die meeste vooruitgang wat op wetenskaplike beginsels berus slegs in die afgelope 30 tot 40 jaar plaasgevind het.

'Weermodifikasie is nie 'n suiwer enkel wetenskap nie en behalwe die weerkunde speel fisika,

lugdinamika, termo-dinamika, chemie, toegepaste wiskunde en statistiek, ingenieurswese, elektronika, hidroulika, hidroulika en lugvaart 'n belangrike rol daarin. Dit is 'n opwindende toegepaste wetenskap waarvan ons nog net op die drumpel staan en waarin nog baie nuwe ontwikkelings moet plaasvind,' het hy gesê.

Aangegryp

Weermodifikasie het wêreldwyd die verbeelding aangegryp en word in die meeste ontwikkelde lande op die een of ander wyse beoefen. Volgens die verslag *The management of weather resources* van die Weather Modification Advisory Board aan die Sekretaris van Handel in die VSA in 1978 was daar die vorige jaar 88 operasionele en navorsingsprojekte oor reën- en sneeuvermeerdering en haelbestryding in die VSA aan die gang wat deur 23 state oor 'n oppervlakte van 673 000 km² gestrek het.

Prof Vorster het gesê dat die verslag inderdaad die volgende in die vooruitsig stel:

- Reën- en sneeuvermeerdering: 10-30% (1980 – 1990)
- Vermindering van orkaanwinde: 10-20% (na 1990)
- Haelvermindering: Tot 60% (na 1990).

Die verslag sê egter voorts dat suksesse nie onomstootlik bewys kon word nie, behalwe in die geval van 'n projek in Israel waar reënvermeerdering tussen 15 en 23% beoel het.

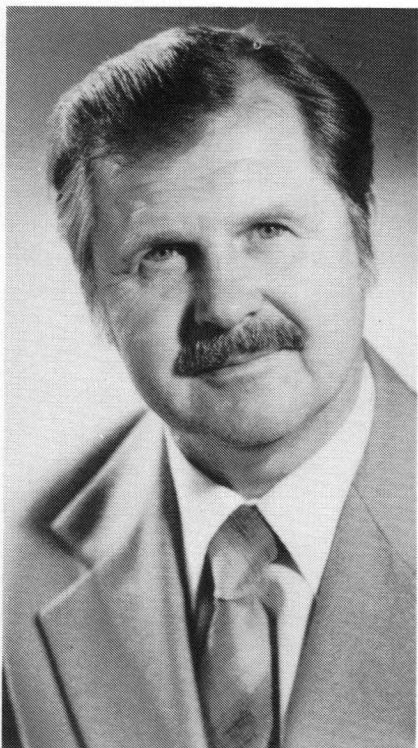
Die Kommissie se belangstelling in reënstimulering spruit voort uit die besorgdheid oor die Republiek se watervoorrade vir die toekoms. Opsommenderwys lyk dit as volg:

Die gemiddelde jaarlikse reënval bedra 475 mm teenoor 860 mm vir die res van die wêreld. Die gemiddelde jaarlikse afloop is ongeveer $54 \times 10^9 \text{ m}^3$, d.w.s. ongeveer tien keer die volume van die Verwoerd-dam. Die balans na verdampingsverliese uit 350 vernaamste damme beloop sowat $32 \times 10^9 \text{ m}^3$. As grondwater daarbykom, gee dit 'n totaal van $34 \times 10^9 \text{ m}^3$.

'Die ongelukkige gevolgtrekking hieruit,' het prof Vorster gesê, 'is



Prof PJC Vorster, hoofadviseur van die WNK.



Dr OO Hart, senior adviseur van die WNK.

dat, indien ons al die beskikbare afloopwater sou kon opgaar en die toename in waterverbruik normaal verloop, al ons watervoorrade uit konvensionele bronne van water teen die jaar 2020 toegesê sal wees. Na dié datum sal die land hom tot onkonvensionele bronne soos waterherwinning, reënstimulering, ontsouting, vloedwater, invoere, ens moet wend,' het hy gesê.

Belofte

Die Kommissie is van mening dat reënstimulering as 'n onkonvensionele waterbron groot belofte inhou en wil graag navorsing op hierdie gebied bevorder. Sedert laat in 1976 ondersteun die WNK dan ook 'n navorsingsprojek oor reënstimulering wat in die bolope van die Vaalrivier te Bethlehem deur die Weerburo uitgevoer word.

Intussen het die WNK ook begin belangstel in die reënaspekte van die operasionele haelbestrydingsprojek wat vanaf 1971 onder 'n handelsooreenkoms tussen die Laeveldse Koöperasie en Cansas International Corporation te Nelspruit uitgevoer is. Laasgenoemde projek is in 1981 beëindig.

Die finale verslag oor die Kommissieprojek aldaar het aan die lig gebring dat daar geen bewys was dat die haelbestrydingsprojek die plaaslike reënval nadelig geaffekteer het nie; dit wou trouens voorkom of die teendeel die geval kon wees.

'n Deeglike onafhanklike evaluasie van die werk word tans gemaak.

In 'n oorsig van die Kommissie se betrokkenheid by navorsing oor nywerheidsuitvloeiels, het 'n senior adviseur van die WNK, dr OO Hart, gesê dat sodanige navorsing in landsbelang moet wees en dat die tegnieke wat ontwikkel word deur alle lede van die besondere bedryf toegepas kan word.

Dr Hart het gesê dat die omvang en kompleksiteit van die uitvloeiselprobleem die wyse waarop navorsing aangepak sal word, bepaal. Vier fases kan dikwels hierby onderskei word, naamlik 'n ondersoek na die omvang van die probleem, laboratoriumskaalse eksperimente, loodsskaalstudies en volskaalse toepassing.

Nywerhede waarby die Kommissie reeds betrokke geraak het, is die tekstielbedryf, vleis-, huide en velle-, leer- en verwante bedrywe, die vrugte- en groenteprosessersbedryf, en die visbedryf.

'As gevolg van beperkte fondse en mannekrag kan al die nywerheidsuitvloeiselprobleme vanselfsprekend nie gelyktydig aangepak word nie,' het dr Hart gesê. 'Prioriteite moet dus deeglik in ag geneem word.'

Nuwe projekte wat aangepak sal word, is 'n ondersoek na die gebruik van fisies-chemiese tegnieke by die behandeling van nywerheidsuitvloeiels met 'n hoë organiese inhoud; 'n ondersoek na die waterbestuur en uitvloeiselbehandling by die prosessering van papier en papierpap, metaal, fermentasieprodukte en farmaseutiese produkte; 'n ondersoek na die tegniese werkverrigting van 'n volskaalse aanleg vir die behandeling van tekstiellymingsuitvloeisel.

Dr Hart het gesê dat baie goeie vordering reeds gemaak is met dié nywerheidsuitvloeiselprobleme wat die grootste hoofbrekens besorg. Daar word reeds vrg verky met die bou van volskaalse be-

handelings-eenhede by fabriek en ander sal binnekort volg.

In 'n oorsig oor waterherwinning, ontsouting en droë verkoeling het mnr CF Schutte, senior adviseur van die WNK, die klem laat val op die belangrikheid van laasgenoemde aspek as 'n wyse van waterbesparing.

Mnr Schutte het gesê dat droë verkoeling 'n onderwerp is waarvan waterwetenskaplikes en ingenieurs min weet aangesien dit totaal buite die gewone waterveld lê.

Verlore

'Die hoeveelheid water wat deur verdamping verlore gaan in 'n enkele kragstasie — water wat opgegaar, gepomp, gesuiwer is — saam met die relatief klein hoeveelhede wat vir ander doeleindes gebruik word, beloop sowat 160 Ml/dag of $60 \times 10^6 \text{ m}^3/\text{a}$ vir 'n kragstasie met 'n kapasiteit van 3 600 Mw en 'n lasfaktor van 75 tot 80%. Dit is meer as die konsumptiewe watergebruik van 'n stad soos Pretoria, of, anders gestel, dit is ongeveer 55% van die totale watervoorsiening aan 'n stad soos Pretoria,' het hy gesê.

(Na bl. 31)



Mnr CF Schutte, senior adviseur van die WNK.

MASS ALGAL CULTURE: SOME PROS AND CONS OF AN INTERESTING TECHNOLOGY



Mass algal culture is a technology which has received world-wide interest because of its high potential for the treatment of waste waters and the production of algal material for fuel (methane) and feed. With the current trend in world population growth, all technologies which can produce either food, fuel or treated water are of interest. However, there are many pros and cons to the successful application of any mass culture venture.

The pros:

The potential applications of mass culture are based on the growth characteristics and properties of the algal cell:

- Microalgae can be grown continuously throughout the year in shallow ponds and the cell density can be manipulated to make optimal use of available

By
RD Walmsley*
and
DF Toerien**

sunlight and nutrients. Mass algal cultures can thus provide a higher annual production of biomass per unit area than most terrestrial crops and may even lose less water per unit surface area by evaporation as

opposed to evapotranspiration.

- The protein content of dried algal material can be as high as 60% whilst its calorific value is approximately $5,4 \text{ kcal g}^{-1}$. The algal cell contains relatively little structural material (e.g. roots, leaves and fibre) and most of its biomass has a nutritional or fuel value.
- The growth rate of most terrestrial crops is limited by carbon dioxide supply from the atmosphere. In mass algal cultures concentrations of the soluble gas can be easily maintained above the level of

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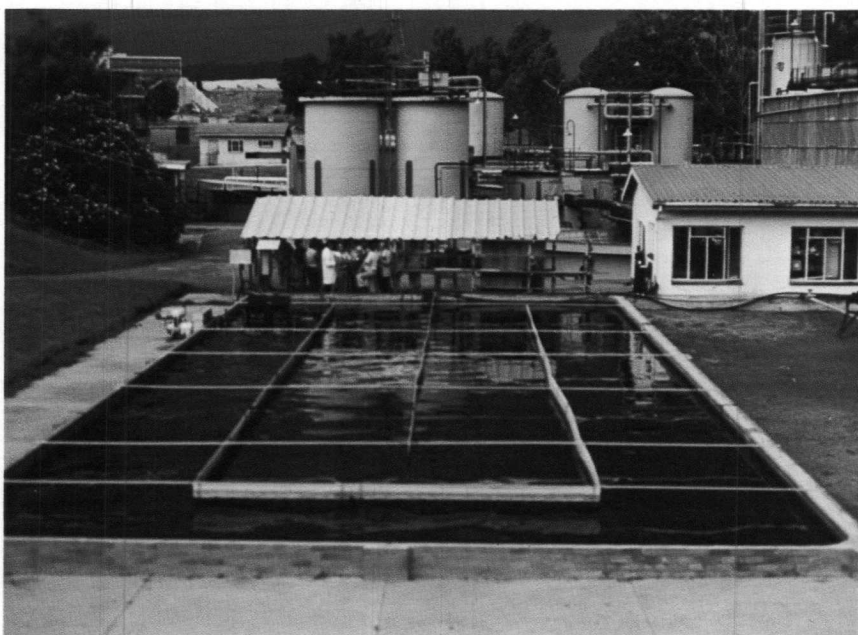
growth-limitation; being supplied either from stabilizing waste organic matter in the water, or from external CO_2 sources.

- Certain microalgae have the capability of growing in highly saline water and thus sources of water which are unsuitable for the production of most other plants can be utilized for biomass production.
- In the treatment of wastewater microalgae improve quality by removing inorganic compounds from the water (e.g. nitrates, ammonia, phosphate, heavy metals) whilst simultaneously providing oxygen for microbes which degrade the high organic load.
- High rate algal ponds are less costly to construct than conventional sewage treatment works (given sufficient land) and do not require skilled operators.
- Certain algae are potential sources of fine chemicals (such as carotenes and other pigments) or bulk chemicals such as glycerol.

The cons:

In the light of this great potential, the question can be asked, "Why is mass algal culture not practiced on a far wider scale?" Based on a current evaluation of the potential of mass culture as a source of protein, fuel (as methane), fertilizer (as sludge) and in the treatment of wastewater, the following technical, economic and political points have to be considered:

- Algal bioconversion cannot be productive enough to compete with other solar energy systems.
- Too much power input may be required for pond operation thus reducing net energy production by algal ponds.
- Algal harvesting (by chemical processes) and processing methods (e.g. drying) are as yet too expensive.
- Algal species control cannot easily be achieved in mass algal cultures.



Algal pond at Daspoort where the National Institute for Water Research is investigating physical and chemical methods for harvesting and processing algal material.

- There is not sufficient nutrient-rich wastewater available to grow enough algae to supply even 1% of any industrialized country's energy requirements.
- Fertilizer production from algal biomass is actually a sludge disposal problem.
- Methane digestion is a capital and energy intensive operation.
- Land costs for large-scale algal bioconversion systems rule out

(Opposite page and below) 100 m³ plastic-covered pilot pond on the University of the Orange Free State's experimental site.





their use in the majority of urban areas.

- Algal material in a concentrated form is not suitable as a single food source for livestock. Furthermore, it cannot yet compete economically with conventional sources of protein such as soybeans and fish meal.
- Algal mass culture is a new technology, and the economic, bureaucratic and political inertia towards new technologies result in long delays before implementation becomes reality.

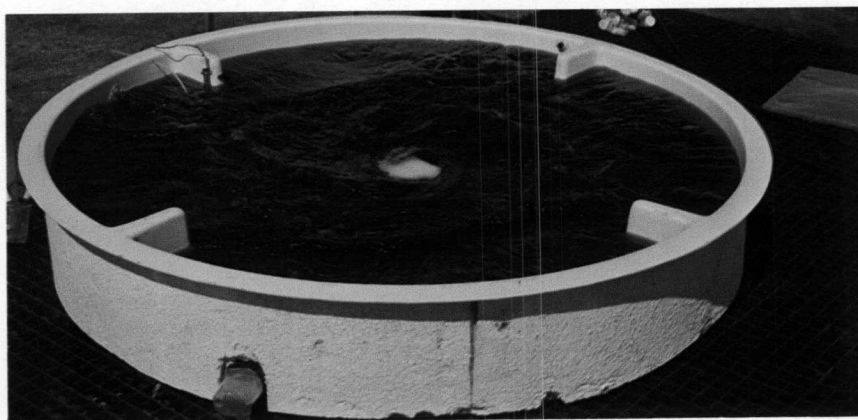
The future of mass algal culture

The most immediate application of large-scale algal mass cultures is in situations where production is coupled to the simultaneous treatment of effluents. The water treatment cost savings achieved will allow the algal product to be more competitive with other protein sources. Since the high costs of algal mass culture are especially associated with harvesting (e.g. chemical coagulation and flotation) and drying (energy intensive) processes, biological means to reduce these costs are urgently sought. A number of approaches to this pro-

blem should still be evaluated, particularly the use of fish which not only concentrate the algal material through faeces production, but also produce a more marketable source of protein.

As in most technologies the success of any venture can only be improved through research and development. Applied algology research is a long-term proposition, but unfortunately few funding bodies are as yet willing to recognize this. From experiences gained at the Institute for Environmental Sciences of the University of the Orange Free State which has conducted a wide diversity of industrial and scientifically sponsored mass culture projects, this appears to be one of the biggest stumbling blocks to the advancement of a potentially rewarding technology.

(Top) Circular miniponds which have been used at UOFS for investigating the feasibility of algal culture in plastic covered systems.



(Left) A circular minipond without plastic covering. Circulation in this type of pond is extremely good.

WNK- INLIGTING

Droë verkoeling verskil van nat-verkoeling daarin dat die water in verkoelingselemente vloei en deur lug verkoel word sonder dat enige water verdamp — dieselfde beginsel as dié waarop 'n motor se verkoeler werk. Die verkoelingelemente kan in 'n koeltoring geplaas word soortgelyk aan dié wat by natverkoeling gebruik word, of dit

kan in 'n stellasië geplaas word met waaiers wat die lug oor die elemente blaas.

'Die belangrikheid van droë verkoeling as water besparings-maatreël spreek dus vanself,' het mnr Schutte gesê.

Daar is egter ook nadele verbonde aan droë verkoeling waarvan die twee vernaamste is dat lugverkoeling minder doeltreffend as verkoeling deur verdamping is, en dat die kapitale uitleg vir 'n droë-verkoelingseenheid baie hoër as dié vir natverkoeling is.

Die Kommissie het saam met EVKOM besluit dat hierdie 'n priori-

teitnavorsingsgebied is en die WNNR is derhalwe gekontrakteer om die effek van wind en inversies op verkoelingsdoeltreffendheid te kwantifiseer sodat die belemmeringe verhoed of daarvoor gekompenseer kan word wanneer toekomstige eenhede ontwerp word.

Dié navorsing is uiters aktueel aangesien EVKOM se kragstasie Matimba naby Ellisras, waarvan die eerste eenheid in 1986 in bedryf moet kom, geheel en al droogverkoel sal wees. Dit sal 'n 6 × 600 Mw-stasie wees en verreweg die grootste droogverkoelde kragstasie in die wêreld.

Voorts het mnr Schutte ook kortliks na waterherwinning verwys en gemeld dat die WNK verskeie projekte hieroor finansier bv in Windhoek, Daspoort, Kaapse Vlakte en by Athlone. Laasgenoemde projek is nou beëindig.

Belangrik

Met verwysing na ontsouting het hy gesê dat die ontsouting van seawater of brakwater vanselfsprekend belangrik is omdat dit bykomende varswater lewer, terwyl die ontsouting van uitvloeiels die besoedelingslas op die ontvangende watermassas verlig. Die Kommissie ondersteun navorsing oor die proses van tru-osmose, maar het ook reeds werk oor die iononuitruilingsproses laat doen. Die ontwikkeling van membrane vorm 'n deel van die navorsing, en mnr Schutte het gesê dat goeie voorreeding reeds hier te lande met membrane vir tru-osmose gemaak is. Die kundigheid vir die vervaardiging van een soort membraan is aan 'n plaaslike firma oorgedra.

Mnr JF Otto, direkteur-generaal van Omgewingsake en vise-voorsitter van die WNK het die sessie namens die voorsitter, dr MR Henzen, met 'n verwelkoming geopen. Prof PJC Vorster, hoofadviseur van die Kommissie, het as seremoniemeester opgetree. Dié geleentheid is deur ongeveer 60 persone bygewoon.

BOTTOM'S UP!



'No, Charlie, I didn't say nose down and landing gear up — I distinctly said nose up and landing gear down . . .' Two Transvaal ducks caught in an undignified posture.

CONFERENCES

GROUNDWATER

Groundwater '82, the biennial symposium of the Groundwater Division of the Geological Society of South Africa will be held at the University of the Witwatersrand, Johannesburg, South Africa, from July 5 to 7, 1981.

Enquiries: Groundwater '82, c/o WRG Orpen, Private Bag X313, Pretoria 0001, SOUTH AFRICA.

ENVIRONMENT

An international conference on coal-fired power plants and the aquatic environment will be held from August 16 to 18, 1982, in Copenhagen, Denmark.

Enquiries: DIS Congress Service, Linde Alle 48, DK-2720, Copenhagen, DENMARK.

IAHR

The 3rd Congress of the Asian and Pacific Regional Division of the International Association for Hydraulic Research will be held in Bandung, Indonesia, from August 24 to 26, 1982.

finally . . .

MORE AND MORE GROGGY. . .

Seasoned reader Wollie Eloff of Windhoek has taken umbrage at the drink-more-water attitude of the world — and fired off a Whiskey Drinker's Ditty to this

Enquiries: Ms Soelastri Djennoedin, IAHR, Jalan Ir H Juanda, No 193, PO Box 51, Bandung, INDONESIA.

IWRA

The fourth World Congress of the International Water Resources Association will be held in Santa Fe/Parana, Argentina, from September 3 to 11, 1982.

Enquiries: IWRA, PO Box 34434, Washington DC 20034. USA.

IWSA

The 14th Congress of the International Water Supply Association will be held in Zurich, Switzerland, from September 6 to 9, 1982.

Enquiries: IWSA Swiss Committee, Hardhof 9, CH-8023, Zurich, SWITZERLAND.

column; it is 'to be sung, shouted or plain cried to any old tune — it doesn't really matter, anyway' . . .

Yes, Joe, I know —

I oughter
be drinking water;
I fear
it's very dear,
no doubt
'cos of drought.
Let's swog
a grog;
Let's sip
a nip;
Let's ram
a dram

But I know,
Joe,
I oughter
be drinking water!

But half a mo',
Joe!
If I oughter
be taking water,
instead of which
I pitch
for a mug
of Highland jug,
and sated —
inebriated —
I take to H₂O:
Won't I blow,
Joe?

Explode?
Erode?
I'd much rather
stink
of drink
Joe,
old crow —
than rust a crust
on my bust . . .

PROCEEDINGS READY

The AWWA Research Foundation has announced in Denver that the Proceedings of the second Water Reuse Symposium are available as a three-volume set.

This Symposium, held in Washington DC in August 1981, addressed the major issues confronting the water supply industry in the implementation of water reuse and recycling. Renovation of municipal, industrial and agricultural wastewater for reuse was covered from the engineering, scientific, economic and legal viewpoints.

These Proceedings are an invaluable addition, the publishers claim, to the library of all individuals and institutions dealing with water supply, waste disposal, or utility planning, and may be ordered at \$30.00 per set from the AWWA Research Foundation, 6666 West Quincy Ave, Denver, Colorado 80235 USA.

SA WATERBULLETIN

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

Subscription is free. Material in this publication does not necessarily reflect the considered opinions of the members of the WRC, and may be copied with acknowledgement of source.

Editorial offices: WRC, PO Box 824, Pretoria 0001, Republic of South Africa. Tel (012) 28-5461.

Editor: Anton Prinsloo
Asst editor: Jan du Plessis.

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

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