

Water in die nywerheid:

WNK LOODS NUWE PROJEK

Die Waternavorsingskommissie het in samewerking met die Departement van Omgewingsake 'n projek van stapel laat loop wat daarop gemik is om optimale waterverbruik in die Suid-Afrikaanse nywerheid te bewerkstellig. Die nuwe projek sal uiteindelik elke fabriek in Suid-Afrika raak wat water gebruik.

Volgens dr Oliver Hart, senior adviseur van die WNK, het die Waternavorsingskommissie tot dusver sy navorsing hoofsaaklik toegespits op 'n paar van die nywerhede wat groot waterverbruikers is soos die tekstielbedryf, die vrugte- en groenteprosessering- en vleisbedryf en die velblotings- en looinywerhede. Hierdie navorsing het 'n aansienlike wisseling getoon in die spesifieke waterverbruik (d.i. die hoeveelheid water verbruik per eenheid produk) van fabriek wat dieselfde produkte lewer.

"Dit beteken dat baie fabriek hulleself onbewustelik groot waterrekeninge op die hals haal — rekeninge wat heel waarskynlik in die nabye toekoms nog verder gaan styg vanweë 'n verwagte verhog-

ing in die verkoopprys van water," aldus dr Hart.

Die eerste fase van die projek sal 'n opname behels met die volgende oogmerke:

- Om 'n databasis tot stand te bring (met inligting oor waterverbruik, rou materiaal wat gebruik word, uitvloeielsgehalte, ens.) wat gebruik kan word om doelwitte te bepaal vir spesifieke watergebruik en besoedelingslaste wat gereedlik binne die bereik van die nywerheid is;
- Om gebiede te bepaal waar navorsing benodig word wat fabriek sal help om hulle water- en uitvloeielsbestuur teen 'n minimum koste te kan verbeter;

- Om die Departement van Omgewingsake te help in hulle moniteringstaak kragtens die Waterwet, 1956.

Die Waternavorsingskommissie het die firma Binnie en Vennote wat jarelange ondervinding van water-afvalwaterbestuur het, aangestel om die eerste fase van die projek te onderneem. In hierdie fase sal die aandag hoofsaaklik op nywerhede in die Pretoria-Vereniging-Sasolburg-gebied toegespits wees waar 'n hele aantal spanne, elkeen onder leiding van 'n chemiese ingenieur, fabriek in die gebied sal besoek om die inligting in te samel wat benodig word. Vraelyste sal ook vooraf aan fabriek gestuur word om tyd te bespaar en die data-insameling te vergemaklik.

☐ in bulletin

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Grondwaternavorsing:

SUKSES MET UOVVS-MODEL

'n Tussentydse verslag getiteld *Grondwatermodellering en parameteridentifikasie van die Sishen-akwifer* is pas op versoek van die Waternavorsingskommissie vir algemene sirkulasie vrygestel. Die verslag is opgestel deur SD Lynch en FDI Hodgson van die Instituut vir Grondwaterstudies aan die Universiteit van die Oranje-Vrystaat en maak deel uit van 'n driejarige navorsingskontrak wat die Waternavorsingskommissie met dié Universiteit aangegaan het ten einde die toepaslikheid van grondwatermodelle as 'n hulpmiddel in die bestudering en evaluering van Suid-Afrikaanse akwifere te ondersoek.

Die vernaamste doelstellings van die ondersoek was onder andere die volgende:

- Die konstruering van 'n gepaste numeriese model wat die fisiese toestande van die Sishen-waterdraer volgens bestaande inligting beskryf.
- Die ontleding van die sisteem ten einde die relatiewe bydrae van elk van die hidrouliese komponente te bepaal, en
- Die identifisering van onsekerhede in die model en 'n aan-

duiding van gebiede waar verdere inligting verkry moet word voordat 'n model wat vir bestuursdoeleindes geskik is, opgestel kan word.

As 'n eerste poging om die Sishen-waterdraer te modelleer, was die projek uiters suksesvol gewees. Die hoeveelheid en die kwaliteit van die data wat benodig sal word (uit opnames in die gebied) om die huidige model in 'n volwaardige bestuursmodel te omskep, is bepaal. Die huidige model kan egter as voldoende gekalibreerd beskou word om mynowerhede in die Sishen-gebied in toekomstige besluitnemingprosesse te help, maar die outeurs het aangedui dat daar versigtig te werk gegaan sal moet word aangesien die eerste fase van modelkalibrering nie vir die doel uitgevoer word nie.

Ander gevolgtrekkings in die verslag is dat daar voldoende grondwater in die Sishen-gebied voorkom om ten minste in die af sienbare toekoms in die plaaslike behoeftes te voorsien; dat die hoeveelheid water wat vanuit die sisteem onttrek kan word, nou met die mynboudiepte sal saamhang en dat die pompkapasiteit in die

Noordmyn onvoldoende gaan wees. Bykomende pompe sal op strategiese posisies geïnstalleer moet word ten einde verlangde watervlakdalings in hierdie gebied te kan bewerkstellig.

Navrae oor die verslag kan gerig word aan die Voorsitter, WNK, Posbus 824, Pretoria 0001.

OZONE: VIEWS AIRED SOON

The International Ozone Conference to be held in Pretoria from 26 to 28 March 1984 is in the final count-down stage. The theme of the conference is technology transfer in the use of ozone or alternative oxidants/disinfectants and activated carbon in water and wastewater treatment.

Should you wish to attend this important conference, kindly contact Mrs M Meyer at the CSIR Symposium Secretariat S.327, PO Box 395, Pretoria 0001. Telephone (012) 86-9211.

Weather modification

Reports on rainfall stimulation released

The Water Research Commission has released for general circulation the first two final reports of the Nelspruit weather modification project.

The first report covers the period 1978 to 1981 and was prepared by Professor Michael Garstang, Dr David Emmitt and Bruce Kelbe of Simpson Weather Associates in Virginia, USA. The second report on the one year project in 1982 was also written by Simpson Weather Associates but in collaboration with Graeme Mather and Michael Dixon of the Cansas International Corporation of Nelspruit.

1978 — 1981: LKB CALLS IT A DAY

The first research project on the stimulation of rainfall at Nelspruit had a duration of three years ending in 1981 at about the same

time that the Laeveld Koöperasie Beperk (LKB) decided to terminate their operational hail suppression programme and asked the Government to help with the financing of weather modification research in the area. The objectives of the Water Research Commission project were as follows:

- To analyse the available rainfall data for the Nelspruit area to determine whether or not there are any indications of a change of rainfall during the period in which LKB was conducting operational cloud seeding for hail suppression. (Some

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TEGNOLOGIEOORDRAG

farmers claimed the cloud seeding was reducing the rainfall).

An analysis of annual rainfall had shown a small increase which was not statistically significant and it was necessary to carry out a detailed analysis of the daily rainfall in order to extend the search for possible indications of change.

- (b) To carry out cloud physics studies in order to assess the potential for rainfall stimulation in the area.

When the final report was received early in 1982 it was sent for comment to numerous consultants overseas who were nominated by the Commission and the Department of Transport. During June 1982, all of the consultants were brought to South Africa to discuss the report with the authors, Simpson Weather Associates.

Major finding

The major finding as far as the analysis of rainfall is concerned is that no evidence has been found to indicate that the operational hail suppression seeding reduced the rainfall in the area. In fact, strong indications of an increase were found but because of the method of data collection associated with an operations project, the cause of the change cannot be postulated with any confidence. The major findings concerning the cloud physics study were that the microphysical processes within the eastern Transvaal clouds are strongly influenced by the deep warm region (2,4 km between cloud base and freezing level), a modified maritime droplet spectrum, strong updrafts, shear, and low natural ice nuclei concentrations. Also, dry ice seeding brings about rapid growth rates of ice crystals.

1982: THE WRC TAKES OVER

The year 1982 was a transition period for the Nelspruit research programme. The three year contract with the Laeveldse Koöperasie Beperk (LKB) had just ended and the final report by Simpson

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TEGNOLOGIEOORDRAG

Weather Associates was under review. At the same time the State was considering a request by LKB that the State should take over the funding of weather modification research at Nelspruit. While the question of future use of the valuable equipment and manpower at Nelspruit was under review at ministerial level, the Minister of Environment Affairs and Fisheries requested the Commission to continue research for a further year to ensure that the facilities were not lost to South Africa in the interim.

As a result of this request, the Commission contracted Cansas International Corporation to operate the field equipment and Simpson Weather Associates as the principal investigators for one year with the objectives of obtaining further information to support

various aspects of the final report for the 1978 to 1981 period and to continue the assessment of the feasibility of rainfall stimulation in the area.

One of the important aspects that was studied was the difference in rain days between wet years and dry years.

It was found that wet years have approximately the same number of rain days and rain at approximately the same rate on the most frequent significant rain days as in dry years. The primary difference between wet years and dry years is the frequency of occurrence of significant rain days (days with average station rainfall ≥ 7.5 mm). In wet years significant rain days contribute 75% of the total seasonal rainfall with rain falling at about 50% more stations than in dry years. Days which receive a station average ≥ 15.0 mm account for 50% of the rainfall in wet years and rain at 74% more stations in December, January and February than in dry years. Storms which yield ≥ 30 mm/day are confined to wet years and occur most

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WNK se weerprofeet voorspel vir Laeveld

Boere in die Laeveld-omgewing wat belangstel om te weet hoe warm dit in hulle kontrei gaan word of wat die kans is dat dit op hul plaas gaan kom reën of hael, kan nou per telefoon gebruik maak van die Watervorsingskommissie se nuwe streekweervoorspellingdiens in Nelspruit. Die diens is spesiaal ontwikkel om in die behoeftes van die Laeveldse boeregemeenskap te voorsien en is uniek in die sin dat dit die werklike weersomstandighede op daardie spesifieke oomblik in die gebied weerspieël. As 'n boer dus moet besluit of hy moet besproei of nie kan hy net eers die weerkantoor op Nelspruit skakel om vas te stel wat die kans is dat 'n reënbus na sy plaas toe op pad is.

Die weervoorspellings word daagliks saamgestel uit meteorologiese inligting wat die personeel van die Cansas International Corporation (CIC) in Nelspruit versamel.

Volgens mnr Graeme Mather van CIC word 'n radiosonde elke oggend om agtuur by Nelspruit opgestuur om die temperatuur en die voggehalte van die lug te bepaal asook die snelheid van die wind te meet.

Hierdie gegewens word dan tesame met weerkaarte wat elke dag vanaf die Weerburo in Pretoria ontvang word, verwerk en 'n voorspelling word vir die streek vir die volgende 24 uur gemaak. Hierna word die ontwikkeling van wolke oor die gebied met gevorderde radar-toerusting dopgehou en die weervoorspelling van tyd tot tyd aangepas.

Die weervoorspelling word elke oggend om 09h30 op datum gebring en boere en ander Laevelders wat belangstel om daarna te luister, kan dit doen deur Nelspruit, telefoon (01311) 2-8465 te skakel.

RAINFALL

(From page 3)

frequently in late (January-March) summer. Dry years have more frequent days with low average rainfall per station (< 2 mm) compared to wet years. However, in both wet and dry years 12% of the days with rain yield 50% of the rain, alternatively 50% of the days with the lowest rainfall yield only 7.3% of the rain in both wet and dry years.

The high frequency of rain days,

apparent adequate moisture supplies on the most frequent significant rain days and the deficiency of storms yielding large rainfalls in dry years suggests that there may be more opportunities to change rainfall in a positive sense by seeding in dry years than has been previously supposed. Further analysis of that data may provide an estimate of the potential change that could be affected in dry years.

Finally, the work presented in this report suggests that cloud microphysical characteristics may

vary substantially over the period of the summer. Clouds during very early and very late summer (October and March) may be more characteristic of continental/high latitude conditions while the mid-season months (December, January, February) may have clouds mostly characteristic of maritime/low latitude conditions.

For further information on both these final reports contact the Chairman, Water Research Commission, PO Box 824, Pretoria 0001.

LEAK DETECTION: DEMO'S EXTENDED

The detection of underground leaks and the implementation of water loss control programmes are matters which have been enjoying the attention of water supply and distribution authorities for more than a century. As new developments in one field have occurred, adjustments in the other field were made. The latest significant advancement has been the development of an electronic device called a leak noise correlator (LNC), which can pinpoint the position of a leak in a pipeline by cross correlation techniques which measure the time delay of the signal in reaching the transducers placed either side of the leak.

With a view to making water authorities and other interested parties aware of these new devices, the Commission invited two overseas manufacturers, one from the U.K. and the other from Germany, to participate in a demonstration exercise in South Africa, initially comprising two "open days," on September 30 and October 6, 1983.

Although the attendance on these occasions was extremely gratifying, cities and towns further afield were virtually unrepresented. However, from correspondence received in response to the general invitation to attend the open days, it was obvious that there is great interest in the new equipment in other areas and consequently demonstrations were also arranged in Pietermaritzburg and Cape Town.

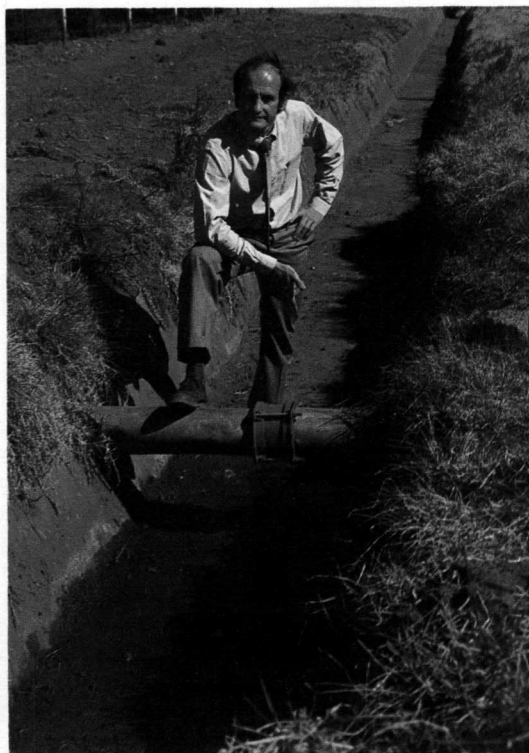
Extend tour

Because of the encouraging response, one of the manufacturers involved decided to extend their stay in South Africa and to make their equipment and operator available for an extended tour of the country. This tour took place from October 23 to November 2, 1983 and comprised demonstra-

tions in Bloemfontein (18), Koeberg (13), George (16), Port Elizabeth (13), Cradock (11) and Potchefstroom (12). The numbers in brackets represent the number of people attending the demonstration at each venue.

All of the demonstrations followed the same pattern:

- An introductory 15 minute talk by Mr Charles Chapman, senior adviser of WRC, supported with slides, describing the need for water loss control programmes, the cost implications and benefits, and advocating a methodology for carrying out such programmes.



Mr Charles Chapman, senior adviser at the Water Research Commission, photographed in his leak detection habitat.

- A short 5 minute film describing the operation of a leak noise correlator (LNC).
- A 15 minute description by Geoff Pook, an operator of the correlator, on how to operate the latest type of equipment, current and future developments.
- A field visit to a leak position where the LNC was demonstrated to the attendees.

The first three demonstrations, viz, at Bloemfontein, Koeberg and George were all done "cold". That is, no prior visit was made to the leak site until the actual demonstration took place.

This proved to be totally unsatisfactory as spectators became restless while the team went through the routine for accurate leak detection.

The remaining three demonstrations were all preceded by a well worthwhile, two hour homework session.

As indicated in the table, leaks simulated by opening a ferrule are not successful. Apparently the rubber washers tend to relax after opening can seal the leak after an hour or two.

An additional problem lies with the design of the correlator itself. In order to avoid all house consumptions appearing as leaks, the correlator is designed to filter out

normal consumption noises. This means that, to the correlator, noises from simulated leaks are usually no different from house consumption and are therefore filtered out without registering on the screen.

CONCLUSIONS

1. Generally speaking the demonstration tour was a great success. Even at Koeberg, where no leak was found, the correlator functioned admirably as no leak was found where no leak existed.

It is unfortunate that this demonstration is classified as a failure (disaster) simply because those attending the demonstrations wanted to see, and were expecting to see, a leak exposed.

2. "Dry runs" are an essential part of any future similar exercises and can save up to two hours of "messaging about" during the demonstration.
3. Many local authority personnel still believe that the only leaks which exist or occur, appear on the surface immediately above the leak position. Leaks which they do not know about, do not exist.
4. Only the largest 6 or 8 authorities could justify the purchase or correlation equipment for their own use. Current price approx. R25 000.
5. Another 10 or so could also justify purchasing a correlator for use on a regional sharing basis. For example George, Mossel Bay, Knysna, Sedgefield and Oudtshoorn could all share.
6. Put in perspective, R25 000 over 5 years would cost, say, R6 000 per annum (capital and redemption). At 20 c/m³ this means that leaks totalling 30 000 m³ per year must be found.
One 6 mm ϕ hole will leak 15 600 m³ per year at 5 bar pressure. (See SA Water bulletin, August 1983, p.3.) Therefore only two reasonably sized unknown leaks need to be found each year to justify a correlator.

PLACE	DEMONSTRATION	COMMENTS
Bloemfontein	Real leak under tarred road. Visible wet patch. Good correlation.	A second visible leak in a.c. pipe in new township. Leak discovered ± 60 m from suspected position.
Koeberg	Residential township. Simulated leak. Open ferrule. NLF*.	Upon excavation of the leak position only dry sand was found due to the relaxation of the rubber washer causing the leak to seal itself.
George	New extension. Simulated leak. Copper pipe from meter to waste. Weak correlation.	Extremely low noise intensity on valves due to 163 m distance on a.c. pipe. Only two contact points available. Normally minimum required.
P.E.	Real leak under tarred road. No surface sign. Excellent correlation.	A suspected second leak at Pilkington glass. Steel fire main in swamp area 225 mm ϕ . NLF.
Cradock	Simulated leak using open ferrule. Strong OOB* correlation came up blank.	Extremely small leak ± 211 /hr. During "dry run" leak showed up well, but during demo hardly at all, due to relaxation of the rubber washer reducing the leak to a slow drip.
Potchefstroom	Simulated leak. Slackened house connection at meter.	Good correlation, but not very impressive because of artificial nature of leak — no impact.
*OOB — Out Of Bracket NLF — No Leak Found		



Harvesting of water hyacinths, Shongweni Dam, Natal.

New project

CAN WATER HYACINTH REDUCE ALGAL BLOOMS?

The Water Research Commission has awarded a research contract to the University of Natal to investigate the potential use of water hyacinth for the improvement of water quality. The main objective of the study will be to establish the mechanism and processes associated with water hyacinth inhibition of algal growth (as experienced in the Shongweni Dam near Durban) and the project will be under the leadership of Professor Charles Breen of the Department of Botany in Pietermaritzburg.

During recent years it has been noted at both Shongweni and Hartebeespoort Dams that the occurrence of high concentrations of algae, normally associated with excessive eutrophication, was dramatically reduced when water hyacinth (*Eichhornia crassipes*) became dominant in these dams. Consequently, at Shongweni Dam, the Durban City Council initiated an experimental programme for managing water quality through the controlled growth of hyacinth on about 10 to 20 percent of the dam's surface by restricting the hyacinth to one arm of the dam

with a floating boom. Hyacinth is harvested at the rate at which it grows and is composted on site. This experiment has proved so successful that water quality management by this means is now a standard practice at Shongweni Dam. Figures obtained from the City Engineer's Department in Durban showed that a reduction of 61% in chemical treatment costs was achieved initially through the introduction of hyacinth control.

LIGHT DEPENDENT

One reason why the water

hyacinth may have an effect on the algae laden water is that algal production is light dependent and development of a surface covering of floating plants could reduce algal growth. This is certainly not the only and probably not the major factor, which accounts for the reduced algal standing crops in Shongweni Dam. The area covered by water hyacinth is generally too small to account for the reported reduction in algal standing crop by either light limitation or nutrient reduction.

An alternative explanation is that hyacinth produces a substance

which is inhibitory to algal growth. The inhibition of germination, growth or metabolism of one plant because of the release of chemicals by a different plant is termed 'allelopathy'. The phenomenon is well documented, particularly amongst higher plants of terrestrial environments. It has also been reported in algae and other aquatic plants where its principal function appears to be to provide advantage by suppression of competitors. The dilution effect in aquatic environments tends to reduce the activity of algal toxins so that they are effective only at or near the site of production. For this reason the best documented examples of allelopathy among aquatic plants are the inhibition of algal epiphyton growth on leaves, stems and roots of aquatic plants. This may also apply to hyacinths since observations have shown that when growing well, hyacinths are largely devoid of epiphyton. There is less certainty about the effectiveness of the 'inhibitors' acting at sites removed from the plant, but it is not unlikely, as evidence suggests, that the inhibitors in terrestrial environments are often waste products which can be active at low concentrations.

The research programme will comprise three main tasks, namely,

● **An assessment of the evidence that water hyacinth has reduced algal blooms in Shongweni and Hartbeespoort Dams.**

With this task the research team will attempt to answer the following questions:

- Is there any evidence that the algal standing crop in Shongweni Dam has declined since the introduction of hyacinths?
- If a reduction is evident, to what extent can it be attributed to altered nutrient loading, inflow of toxic material and reduction by harvesting hyacinths?
- What are the prospects for improving water quality further in Shongweni Dam?
- Is there any evidence that algal problems have increased at Hartbeespoort Dam



Floating boom confining water hyacinth to one arm of Shongweni Dam.

subsequent to removal of hyacinths?

- **A review of allelopathy with particular reference to aquatic Macrophytes.**
- **An investigation of the allelopathic potential of hyacinths.**

This task will involve laboratory experiments in which water is assayed for its allelopathic potential by both conventional and new or recently developed algal bio-assay techniques.

PHONE PHIL FOR AMSTERDAM . . .

Are you planning to attend the Amsterdam IAWPRC Conference? Kindly contact Mr Phil Coombs, secretary to the SA National Committee for IAWPRC, and inform him of your intention. His address is c/o National Institute for Water Research, PO Box 395, Pretoria 0001. The telephone number is (012) 86-9211.

Sewage treatment:

RESEARCH ON EXCESS PHOSPHATE REMOVAL INTENSIFIED

The Water Research Commission research on phosphate removal has now reached a stage where the research results and findings of 10 years' work are currently being published in the form of an extensive information document, *Theory, Design and Operation of Nutrient Removal Activated Sludge Processes*. This document is aimed at local authorities and consulting engineers active in this field and sets out the currently available and proven technology for biological nutrient removal.

However, our knowledge on biological phosphate removal has progressed only to a state where conservative guidelines based on the results from empirical investigations can be given for design and operation of biological phosphate removal plants.

Biological phosphate removal is the cheapest technology available for the removal of phosphates from effluents. It does not increase the salt load in effluent as is the case with chemical phosphate removal. With the present state of the art, biological phosphate removal does not yet consistently remove phosphate to the 1 mg/l level prescribed by the standard which will be enforced as from August, 1985. This means that at times supplementary chemical phosphate removal will be necessary. It is, therefore, important to continue research on biological phosphate removal in order to upgrade the technology with a view to the elimination of supplemental chemical treatment.

Looking to the future, it is also essential to establish the levels of phosphate concentration in sewage effluents (below 1 mg/l) which can consistently be achieved with biological phosphate removal, as it is envisaged that the 1 mg/l standard may eventually have to be tightened to levels as low as 0,1 mg/l, in sensitive catchments. In order to achieve this standard the mechanism governing phosphate removal will have to be intensively researched, and the Water Research Commission has therefore negotiated with the University of Cape Town to further extend its

research on excess biological phosphate removal from sewage. This research programme will stretch over a period of three years and will consist of many tasks, some of which will comprise the following:

THE BIOLOGICAL

EXCESS

PHOSPHATE REMOVAL

Studies to date of the process have been mainly of an empiric and parametric nature. This approach has been taken to its useful limit and a more fundamental approach is now required. Although the fundamental approach is already being followed by a number of researchers in the RSA and abroad, certain crucial issues need to be

urgently addressed to assist in the further development of the existing design and operating criteria for biological excess phosphate removal which were developed under contract for the Water Research Commission, in order to make more cost-effective biological phosphate removal possible.

Pure feed culture studies

The following crucial questions can possibly be best addressed by pure feed culture studies of phosphate accumulating bacteria:

- What physical reaction conditions are required to induce the formation of highly enriched cultures of phosphate accumulating bacteria. For example, are anaerobic-anoxic-aerobic, or just anoxic-aerobic or

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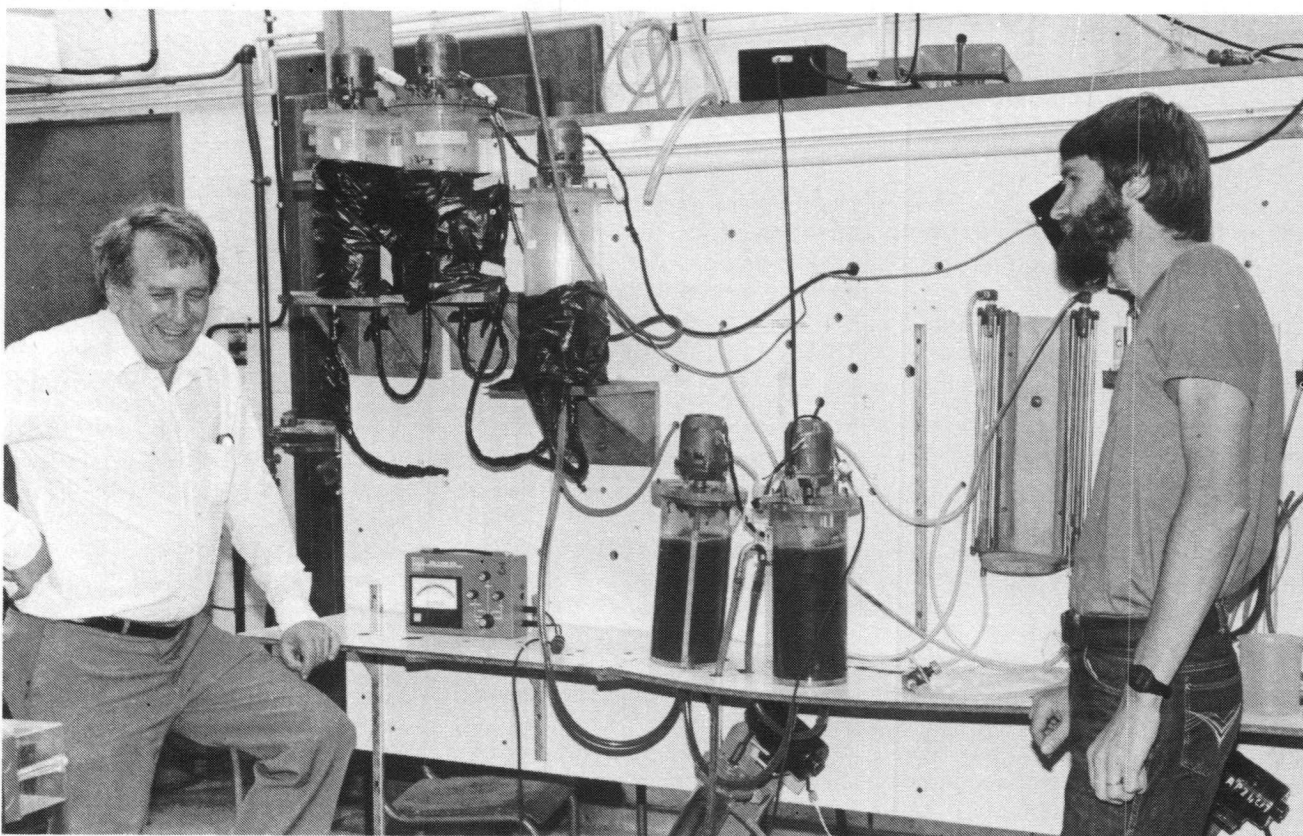
Abstracts are being awaited for a post-conference seminar on *Biological phosphorus removal from wastewater* to be held in Paris, France, on 24 and 25 September 1984.

The seminar will follow upon the 12th Biennial IAWPRC Conference to be held in Amsterdam from 17 to 20 September 1984 and is also an event related to the activities of the research group on biological phosphorus removal which was founded after the highly successful post-conference seminar held in Pretoria in April 1982.

Discussions at the Paris seminar will focus on:

- * microbiology
- * chemistry and biochemistry
- * pilot scale studies
- * full scale studies
- * treatment, handling and disposal of phosphate-rich sludges
- * research and development needs.

Enquiries may be sent to Dr Michel Florentz, Phosphorus Seminar, Anjou-Recherche, 52 rue d'Anjou, 75384 Paris Cedex 08, France.



Two UCT researchers, Prof G van R Marais and Dr George Ekama, in their laboratory.

only aerobic conditions essential prerequisites?

- What are the growth rates of phosphate accumulating bacteria under a variety of process conditions; what are their phosphate uptake and release rates; and at what rate do these organisms sequester substrates?
- By what means and at what rates do bacteria in anaerobic zones transform complex substrates to suitable forms for the inducement of phosphate release in this zone?

Anaerobic sludge age

The concepts of anaerobic sludge mass fraction and anaerobic retention time as basic parameters for the design of excess phosphate removal processes have not been found completely satisfactory for the purposes of design and operation. A new parameter, i.e. anaerobic sludge age, has been proposed as a better fundamental parameter. This parameter and its incorporation into the generalized activated sludge process model needs to be critically evaluated.

Kinetic model for phosphate release and uptake

Using the data collected from the pure feed culture studies and the data from the evaluation of the anaerobic sludge age a kinetic model for phosphate release and uptake will be developed. This model will be tested against existing laboratory, pilot and full-scale data on biological excess phosphate removal and form the basis for design and operating criteria.

GENERATION AND EFFECT OF READILY BIODEGRADABLE COD

The City Council of Johannesburg is currently investigating at full scale various ways and means of generating readily biodegradable COD, considered essential for successful excess phosphate removal, by anaerobic digestion of raw sludge to the acid stage. The Council requires information on the fundamentals of this process, i.e. best reactor design, suitable process conditions for short chain fatty acid production, as well as guidance on the best operational and process

control procedures. This information will be generated by laboratory studies on raw sludge acid digestion. An important secondary phase of the investigation will be the evaluation of the use of fatty acids produced in this manner, how they effect the nutrient removal process, particularly the phosphate accumulators and filamentous (sludge bulking) organisms.

MEASUREMENT OF READILY BIODEGRADABLE COD

Previous research by the University of Cape Town's group indicated the importance of the parameter of readily biodegradable COD (S_{bs}), because it could be directly linked to phosphate removal. However, the present analytical technique for measuring this parameter is rather complex and not well suited for general use. The following simplified analytic techniques for the determination of S_{bs} will be investigated:

- (a) measurement by membrane filtration,

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Phosphate removal

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- (b) measurement by oxygen utilization rate in aerobic batch tests, and
- (c) measurement via nitrate reduction in anoxic batch tests.

PHOSTRIP PROCESS

Critical evaluation of the literature on this process, visits to plants employing this process in the USA and local preliminary experiments have convinced South African scientists and engineers that the Phostrip process, or modification of the process, have considerable potential for the RSA. However, direct transfer of the USA technology to the RSA is not advocated since various fundamental problems need to be addressed before the process can be applied with confidence locally. The main question centres around the design and operation of the phosphate stripping reactor in a wastewater treatment process which must produce an effluent low in organic, nitrogenous and phosphorous matter. The process and certain modifica-

tions will first be studied at laboratory scale to provide answers to the aforementioned question. If found viable and promising, the process behaviour will be modelled and incorporated in the generalized activated sludge model.

COOPERATIVE RESEARCH

The University will closely liaise with other research groups working on Water Research Commission projects related to nutrient removal in the activated sludge process. The study on the generation of short chain organics by high rate anaerobic (acid) digestion will be undertaken in collaboration with the City Council of Johannesburg. A study on the optimisation of the Cape Flats Works will be undertaken in collaboration with the City Council of Cape Town.

At the end of the study, a final report will be compiled comprising a detailed record and analysis of the findings and results of the study. In addition, a manual will be compiled based on the report, delineating design and operational criteria for optimal nutrient removal.

Wastewater:

PROF MARAIS ON INTERNATIONAL TASK GROUP

Well-known water researcher Prof G van R Marais of UCT was one of five international pollution control researchers who met late last year at Clemson University in the USA to form a new task group of the International Association on Water Pollution Research and Control (IAWPRC).

The task group will prepare a manual outlining the use of mathematical modelling in the design of wastewater treatment systems. They will continue their work in Tokyo this autumn, and in Denmark in September. The final report will be presented to the IAWPRC governing board early in 1985.

Other members of the group are Tomonori Matsuo from the University of Tokyo; Mogens Henze, chairman of the group, from the Technical University of Denmark; Les Grady from Clemson University, and Willy Gujer from the Swiss Federal Institute for Water Research and Water Pollution Control.



Clockwise, from left to right: Tomonori Matsuo, Willy Gujer, Mogens Henze (chairman), Les Grady and G van R Marais.

Hydrology

REGISTRATION OF ALL SOUTH AFRICAN HYDROLOGISTS

A register of all hydrologists in Southern Africa is at present being drawn up by Dr PJT Roberts, chairman of the newly founded South African National Committee for the International Association of Hydrological Sciences (SANCIAHS).

According to Dr Roberts the International Association of Hydrological Sciences (IAHS) is composed essentially of six international commissions and one international committee and the activities of IAHS are promoted and co-ordinated by a network of national committees. The national committee for each country is usually composed of the National Correspondent for the IAHS and one correspondent for each international commission (referred to as commission correspondent).

The first meeting of the South African National Committee for the IAHS (SANCIAHS) was held on 28 September 1983. With the formation of this committee, South African hydrologists at last have an official body to represent their interests and to promote a sense of fellowship amongst all those working in the field of hydrology. The establishment of SANCIAHS was a prerequisite to meaningful participation by South African hydrologists in international activities and the committee has already put out feelers for hosting an international event on behalf of the IAHS.

According to IAHS guidelines for national committees, one of the first tasks facing SANCIAHS is to draw up a register of all hydrologists in the country and this register will reflect the interest of each hydrologist in the activities of the international commissions of the IAHS. The reasons for drawing up a register are as follows:

- The register would facilitate efficient distribution of information to the hydrological community and would assist in the organisation of national seminars.
- Convenors of international workshops and seminars and leaders of international projects would know which individuals from each country to invite for participation.
- The register would form the basis for the election of members of SANCIAHS in the future. It was decided at the first meeting that members would be elected every four years (to conform with the four year cycle of the parent body i.e. the SA National Committee for the International Union of Geodesy and Geophysics) and those hydrologists who register their names under each interna-

tional commission will elect the Commission Correspondent for that commission.

Dr Roberts said that in registering South African Hydrologists with SANCIAHS, it was necessary to face the question of who or what is a hydrologist? For the sake of the register a hydrologist will be any person (regardless of sex, race or religion) who is active in or interested in the activities represented by the international commissions or committees of the IAHS. The stress is therefore on active interest or participation at all levels of hydrology rather than on academic qualifications.

Should you wish to register as a hydrologist with SANCIAHS please complete the registration form which is inserted as a supplement to this issue of SA Waterbulletin, and return it to Dr PJT Roberts, Water Research Commission, PO Box 824, Pretoria 0001.

French visit WRC



Representatives of the French Société Lyonnaise des Eaux et de l'Eclairage visited South Africa recently and had talks with Ministers of State and other dignitaries. Shown here at the Water Research Commission are (fltr) Messieurs Michel Dupont, adviser to Jérôme Monod (chairman of the Société, next to Dupont), Dr MR Henzen, chairman, WRC; Christian d'Aumale (adviser to M. Monod), and Henry Castelneau, foreign trade adviser to the French government.

Working towards the water decade's goal

The current status of water supply and sanitation in the Republic of Venda*



The new Vondo Dam, Venda.

In the Republic of Venda considerable progress has been made towards providing the entire population with clean water. The professed goal of the Water Decade — to secure safe drinking water for all by 1990 — can easily be achieved in this rapidly developing country.

Running purified water is being delivered to the houses of an ever growing percentage of the population and water supply schemes utilizing underground as well as surface water resources are being developed. These vary in size from single boreholes equipped with hand pumps to regional water projects. The largest project, the Vondo Regional Water Scheme, is designed to supply purified water to the central part of the country in which approximately 40% of the population is concentrated.

More than 95% of the Venda population of roughly 400 000 people live in rural villages. Most of these villages are well planned residential units for the farming communities of the various agricultural areas. Some villages close to each other are often grouped together in large units and

are referred to as "agricultural settlements". Population densities in these villages are low, with plot

by
MS Musetsho

**Assistant Secretary Venda
Department of Agriculture
and Forestry**

and
JN Nepfumbada

**Technical Director — Venda
Department of Transport
and Works**

sizes ranging between $\frac{1}{4}$ and $\frac{1}{2}$ hectares.

Less than 5% of the population live in proclaimed rural and urban townships. In Thohoyandou which includes Sibasa, Makwarela and Shayandima approximately 2 350 families live in houses on properly serviced stands. In the rural towns of Vuwani and Makhado at total of approximately 140 houses have so far been erected on serviced stands.

Rural village stands are not individually provided with public services such as water, sanitation, electricity or roads and stormwater drainage, but all villages have access to either natural surface water or installed water outlets or standpipes.

The mean annual precipitation (MAP) varies in Venda from below 400 mm on the northern plains to as much as 2 000 mm high up in the mountains. The MAP in the

* Extracts from two papers delivered at the *Seminar on appropriate technology transfer in water supply and sanitation* recently held in Venda, and organized by the National Institute for Water Research of the CSIR.

Klein Letaba and Levubu catchments increases slightly from 800 mm in the south to 1 000 mm on the southern foot hills of the Soutpansberg. In this mountainous central part of Venda the rainfall generally increases with the height above sea level to a maximum of 2 000 mm. On the western slopes of the mountain and further down the Nzhelele valley the rainfall drops sharply from 1 600 mm to 500 mm over a distance of approximately 15 km.

The major rivers in Venda are the Levubu (main tributaries Dzindi and Mutshindudi) the Mutale (tributaries Tshirovha and Mbodi) and the Nzhelele (tributaries Mutshedzi and Mufongodi). Other important rivers are the Ngwedi which is a tributary of the Mutshindudi and the Nwanedzi river which crosses the northern boundary of Venda shortly after its confluence with the Luphephe river.

The Mutale, Nzhelele and Mutshindudi rivers have their sources within a few kilometres of each other in the high rainfall Thathe Vondo region of the Soutpansberg mountains where 5% of the area of Venda contributes an estimated 33% of the total run-off of approximately 450 million kl/a.

The mean annual run-off (MAR) of the Mutale is 97 million kl from a 165 km² catchment area. The catchment area of the Mutshindudi at the Vondo Dam is 51 km² and the MAR 29 million kl.

Although many Venda communities depend on groundwater resources for many years, no extensive survey has yet been undertaken to determine the potential yield. Some boreholes yielding 45 kl/h and more are being exploited in the southern and central parts of Venda. Unfortunately groundwater of the dry regions of Venda often has a very high mineral content and is also extremely corrosive.

Water supply schemes

Since time immemorial the calabash and clay pot have been used to transport water in Venda. Today the container may be modernised and water is brought close to man in a variety of ways but in many instances the woman carrying water home on her head is still the final link between the source and the consumer.

The smallest water supply schemes operating in Venda today are boreholes equipped with hand-pumps. There are at present hun-

dreds of these installations in the country and many families are totally dependent on such boreholes for their daily water supply.

More sophisticated borehole schemes consist of one or more boreholes equipped with diesel or electric pumps which deliver water directly into reservoirs from where it is distributed to standpipes or other outlets in rural villages. The oldest of these schemes are those at Masakona and Vyeboomsdrift. Other important borehole schemes are to be found at Khubvi and Tshituni. At Khakhu a scheme has recently been developed where a single borehole (capacity 50 kl/h) supplies the average daily demand of 180 kl. The wellpoint system is another variation of ground water exploitation. A number of well-points are installed in sandy deposits and connected to a single pump. Examples of these systems are those in operation at Mashamba, Mashau and Nthabalala.

Perhaps the easiest way to develop a water scheme in the mountainous water-rich part of the country is simply to divert water from a fountain or stream into a gravity pipeline which can either feed outlets directly or discharge
(To page 14)



The plastic drum has replaced the clay pot, the stand pipe the polluted stream, but women still have to carry the water home.

Water supply and sanitation in Venda

(From page 13)

into a reservoir. Many rural villages and schools are provided with water in this way. Water obtained from springs or streams high up in the mountain usually is of a comparatively high quality, but in some cases chlorination has to be applied in the reservoir feeder mains.

Water from the larger rivers is often badly polluted especially during low flow conditions. A number of pumping schemes along such rivers do exist. Water is merely disinfected which in itself is not ideal. Because of the high unit cost of small water treatment plants this type of scheme for individual communities is not desirable.

It is sometimes advisable to combine different water sources in a single scheme. The Tshifhire-Murunwa scheme which is at present being considered will draw water from two streams and a number of boreholes for a present population of 3 500.

Under certain circumstances even regional water schemes can be combined with or supplemented by local schemes. In Tshakuma the supply from the Vondo Scheme will be augmented by existing boreholes. Where regional water projects are developed they usually replace local schemes which have become inadequate due to population increase. In most cases it is impractical to incorporate these small schemes in the new system because of maintenance and operating costs but in future some may be reconsidered when growing demands justify their reinstatement.

Phiphidi water scheme

The Phiphidi scheme which was constructed in 1963/64 was the first of its kind in Venda. The source is a 15 m high concrete dam (capacity 300 000 kl) in the Mutshindudi river 10 km to the west of Thohoyandou. The scheme initially consisted of a 560 kVa hydro electric power plant, which is still the only one in Venda, a 1 750 kl/d purification plant, a pumping sta-



The new Phiphidi Water Purification Plant.

tion, two reservoirs with a combined capacity of 2 200 kl and 11 km of pipelines. Water was supplied to all villages between Phiphidi and Sibasa, the towns of Sibasa, Makwarela and Shayandima and Tshilidzini hospital.

By 1973 the total water demands exceeded the capacity of the scheme and the supply had to be augmented by a temporary system of well-points in the sandbanks along Phiphidi dam.

during the period 1973 to 1982 the Phiphidi Scheme was systematically replaced by the Vondo Regional Water Scheme which was approved and initiated in 1972.

When the founding of the new Venda capital Thohoyandou was announced in 1974 the original plan of the Vondo Project has to be adjusted to provide for the future water demand of the city. Other modifications and extensions to the plan have been investigated and applied where practical and economically justified. Eventually the region will be bordered by the southern watershed of the Mutale river in the north and the Klein Letaba river in the south and will extend from Tshakuma on the

western border of Venda to Tshilwili 25 km north east of Thohoyandou — an area of 750 km² which is at present inhabited by approximately 160 000 people of 40% of the Venda population. Construction of the Vondo Scheme began in 1973. The initial phases were in fact improvements of the Phiphidi Scheme. Until the completion of Vondo Dam in 1982 the Phiphidi dam was the only source of water for the Vondo scheme. Two reservoirs and several pipe lines of the original scheme are permanently incorporated into the Vondo Scheme.

The main feature of the scheme is the Vondo dam in the Mutshindudi river 14 km west of Thohoyandou. The 30 m high earth fill dam has a "morning glory" type spillway with a discharge capacity of 320 kl/s. The dam was so designed that the storage level can later be raised by 18 m whereby the storage capacity will be increased from the present 5 million kl to 30 million kl. The potential yield of the first phase is 11,5 million kl/a and that of the second 20,5 million kl/a. The Vondo dam was constructed during the period

Water supply and sanitation in Venda

from 1979 to 1982 at a total cost of R5,9 m.

A 4,5 km long 500 dia pipe line gravitates raw water from the dam to the water purification plant at Phiphidi. The first phase of the Phiphidi plant was constructed from 1975 to 1977 and had a capacity of 10 000 kl/day. During 1982/83 the plant was enlarged to a capacity of 40 000 kl/day which is approximately twice the present sustained summer peak demand of the whole region.

The catchment area of Vondo dam is virtually uninhabited and the runoff is normally of good quality. At the Phiphidi plant the purification process consists only of chemical dosing and rapid sand filtering.

From the purification works clean water is fed into three main distribution systems — the Tho-

hoyandou system, the Donald Fraser system and the Vuwani system.

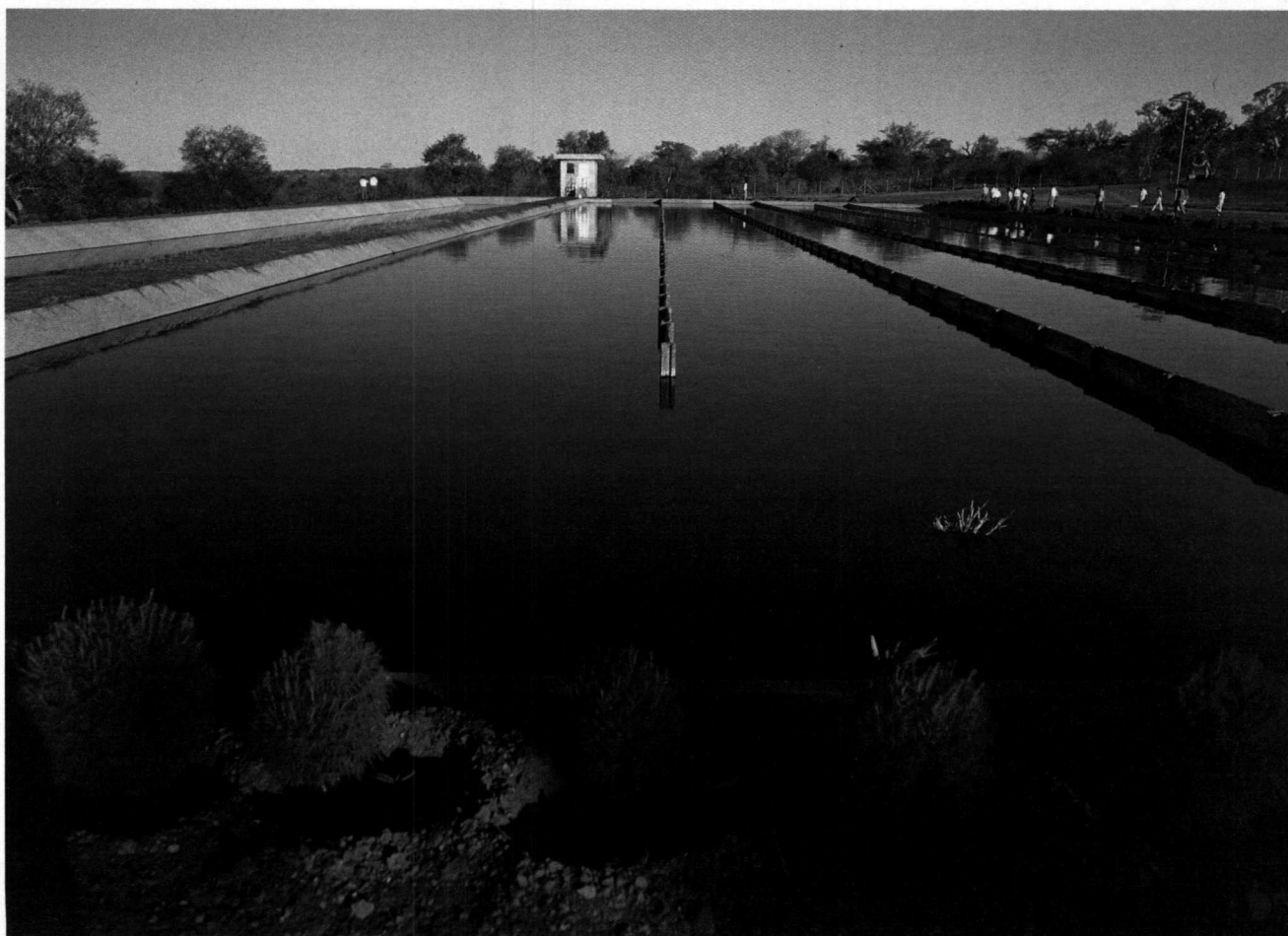
The Thohoyandou system is subdivided into three sub-systems. For the first water is pumped 50 m high over a distance of 6,5 km to a 13 000 kl reservoir from where it is distributed to Sibasa, Makwarela and other high-lying residential areas of Thohoyandou. The second sub-system gravitates water from the purification works to a 9 000 kl reservoir from where it serves the central part of the city. Eventually 4 such reservoirs will be built to meet the increasing demands of this part of the capital. The third subsystem delivers water from Phiphidi via a 7 000 kl reservoir to Shayandima, Tshildizini hospital and the industrial area of the city. Eventually the two systems will be linked to supplement each other

automatically when necessary. About 8 rural villages around Thohoyandou also receive water from the Thohoyandou system.

The Donald Fraser system will eventually supply water to seventeen rural villages, the proposed town of Tshitereke and two hospitals. Donald Fraser and William Eadie. From Phiphidi water is pumped 60 m high to a 1 800 kl reservoir (a larger one will be required soon) from where a 28 km long gravity pipe line delivers water to the reservoirs of the various consumers along the way. Several pumping stations were required to supply high-lying villages.

The Vuwani system extends southwards over a distance of 30 km. Water is gravitated all the way but has to be pumped to Tsakuma and part of Lwamondo. About 20

(To page 29)



Maturation ponds at the new Thohoyandou Sewage Works.



Bykans 'n dekade gelede, in 1975, het die toenmalige Eerste Minister, mnr BJ Vorster, die Oranje-Vistonnel amptelik in werking gestel en het water vir die eerste keer in die kenbare geskiedenis vanuit die Oranjerivier na die Oos-Kaapse valleie gevloei om die karige voorrade van dié gebied aan te vul. In hierdie oorsig kyk *SA Waterbulletin* kortliks na die skema en hoe besproeiing in die Vallei tans daar uitsien.

ORANJE-VIS: 'N DEKADE NA DIE TONNEL

Die Oranje-Vistonnel is 'n verbindingskanaal waardeur water vanaf die Oranjerivier na die Groot-Visrivier, die Klein-Visrivier, Schoenmakersrivier, die Mentzmeer en Benede-Sondagsriviervallei vloei.

Die water word uit die Verwoerd-dam by Oviston naby Venterstad in die tunnel ingelaat en stort 82 kilometer verder in die Teebus-spruit. Daarvandaan voer dit na die Grasrugdam, en stroomaf word dit

uitgekeer aan besproeiingsrade soos Brakrivier, Knutsford, Baroda, Marlow, Scanlen en Mortimer, asook aan enkele privaatbesproei-ers. Die Munisipaliteit van Cradock deel ook in hierdie vloei.

Die water wat verbyvloei, vergaar in die Elandsdriftmeer bo die stuwal, met 'n kapasiteit van $135 \times 10^6 \text{ m}^3$. Dié meer vorm die noordelike punt van die Sondags-Visrivierkanale. Hier word die

**SOUTH AFRICAN NATIONAL COMMITTEE FOR THE INTERNATIONAL
ASSOCIATION OF HYDROLOGICAL SCIENCES.**

Registration form for South African Hydrologists

1. Title and
full names: :
2. Business
address :
.....
.....
3. Telephone No.
(Office) :
4. Basic discipline (*e.g. civil engineering, geography, limnology, agriculture etc*):
.....
5. Highest academic qualification
6. Please indicate with ticks those International Commissions that reflect your interests in hydrology.

International Commission on Surface Water
International Commission on Ground Water
International Commission on Snow and Ice
International Commission on Water Quality
International Commission on Water Resources Systems
International Commission on Continental Erosion
International Committee on Remote Sensing and Data Transmission
7. Please indicate with ticks your present involvement in hydrology.

☐ *Student*
☐ *Teacher/lecturer*
☐ *Full time research officer*
☐ *Practising hydrologist*
☐ *Hydrological technician*
☐ *Manager*
☐ *Retired but interested*
☐ *Hydrology a minor component of your job*

**Please return to Dr PJT Roberts, Water Research Commission, PO Box 824, PRETORIA
0001.**

(Supplement to *SA Waterbulletin*: February 1984)



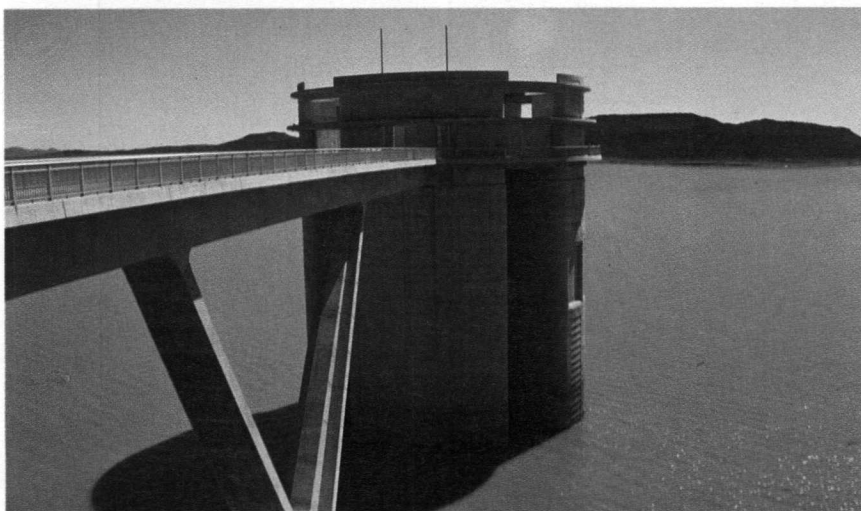
'n Nagtelike blik op die imposante wal van die Verwoerddam, die noordelikste watermassa van die Oranje-Visrivierskema.

(Onder): Die inlaat tot die Oranje-Vistonnél by Oviston in die Noord-oos-Kaapprovinsie.

water uit die Groot-Visrivier gekeer en voer dit langs die linkeroewer oor 'n afstand van 18,2 km tot by die ingang van die Kookhuistonnel.

Uit hierdie gedeelte van die kanaal verkry die Klipfontein-besproeiingsraad met 'n inlysting van ongeveer 1 120 ha sy water, asook vyf individuele besproeiers met ongeveer 290 ha.

Die Kookhuistonnel is 13,2 km lank en voer die water deur die Bosberg in 'n kanaal en met 'n duikpyp van 577 m tot by die Klein-Visriviergeut. Uit hierdie deel van



(Na bladsy 18)

Oranje-Vis: 'n dekade verby

(Van bladsy 17)

die skema verkry die dorpie Kookhuis en die Somerset-Oosbesproeiingsraad hulle water.

Verder op die pad na die suidooste vloei die Oranje se water in die natuurlike loop van die Klein-Visrivier oor 'n afstand van 35 km tot by die plaas Wellington Grove. Langs hierdie trajek is daar 29 besproeiërs met 'n inlysting van net oor die 900 ha.

By Wellington Grove is daar 'n pompstasie gebou wat water vanuit die Klein-Visrivier in 'n kanaalstelsel van 24 km lank pomp. Die kanaal eindig in die Schoenmakersrivier. Hiervandaan vloei dit ongeveer 40 km in die natuurlike loop tot in die Mentzmeer vir besproeiing in die laer Sondagsriviervallei.

Die eerste groot ontwikkeling in die Visriviervallei het in die jare 20 plaasgevind toe twee van die drie damme gebou is, naamlik Kommandodrif en Lake Arthur, asook meeste van die uitkeerwalle waarmee water in die ou kanale uitgekeer is.

In daardie jare was daar ongeveer 22 000 ha ingelyste grond onder besproeiing, wat deur die jare afgeneem het tot by ongeveer 16 000 ha in die laat sewentigerjare en weer sedertdien toegeneem het. Die besproeiingsaktiwiteite was egter nie besonder intensief tot in die sestigerjare nie. Die damme was soms vir 'n jaar lank dolleeg, soms kon hulle in die orde van 75 mm per jaar voorsien.

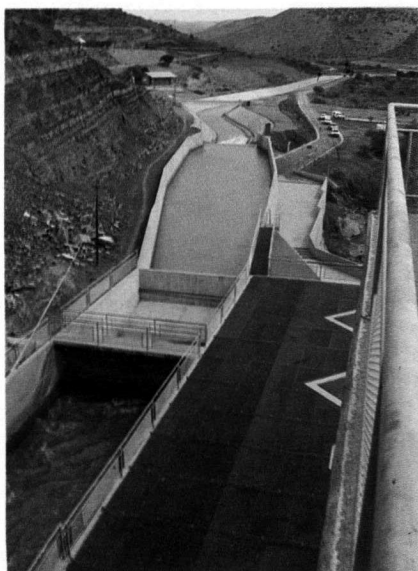
As daar water was, is daar koring en ook 'n redelike persentasie lusern verbou. Die meeste besproeiingsgrondeienaars was egter veeboere omdat hulle dié boerdery as 'n stabiliserende faktor gesien het.

Volgens mnr Pieter van Heerden, voorligtingsbeampte op Cradock, het die koms van die groot water deur die tunnel nie 'n groot verandering in die gewasverbouingspatroon teweeggebring nie en is die veefaktor steeds belangrik.

Lusern word tans op 68,9% van die bewerkte oppervlakte verbou (en dié bewerkte oppervlakte is 87% van die ingelyste oppervlakte



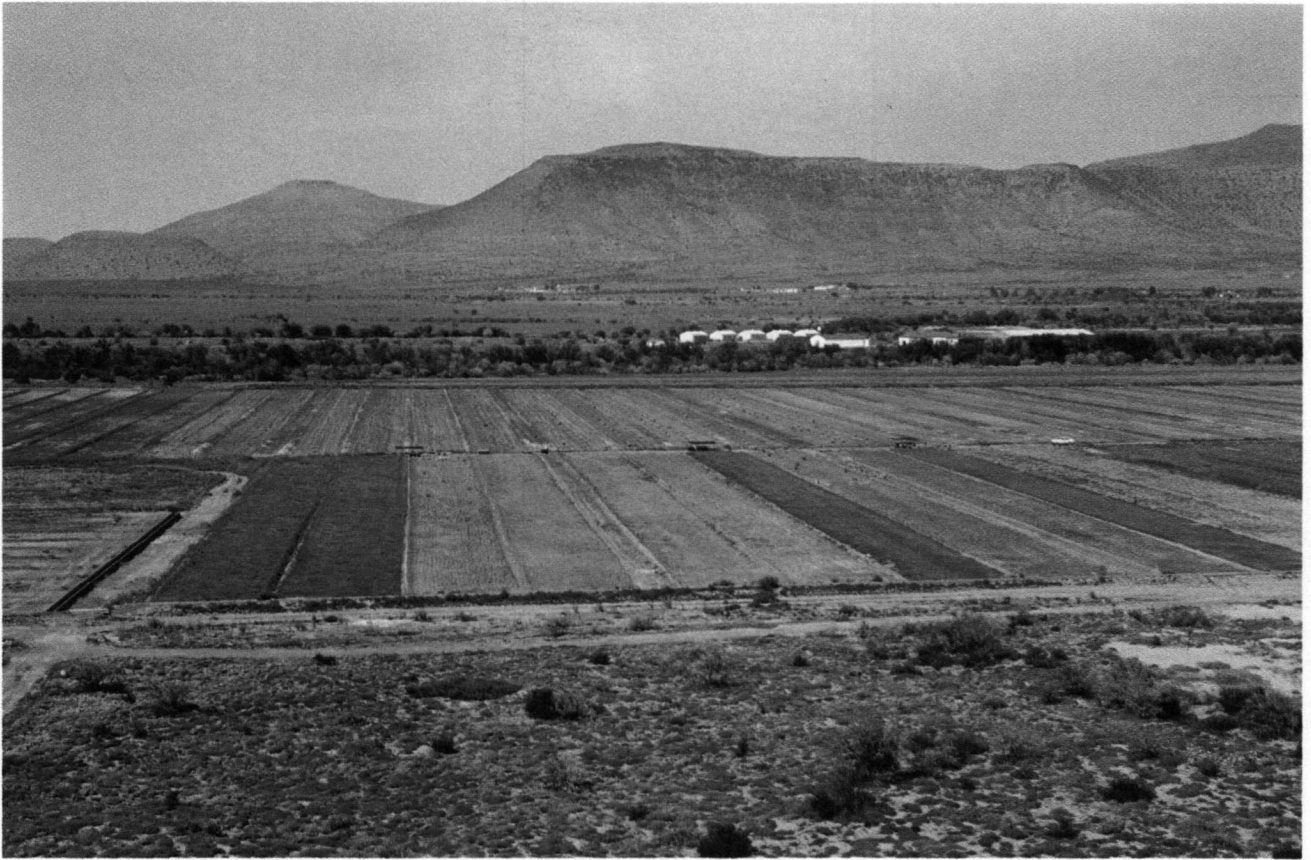
'n Ondergrondse beheerkamer by Teebus waar die water van die tunnel na 82 km weer aan die daglig blootgelê word.



Die uitkeerkanaal by die Elandsdrift-stuwal.



Die inlaat tot die Kookhuis-tunnel.



'n Toonbeeld van die krag van die water wat die Karooveld in landerye omskep. Hierdie algemene toneel in die Visriviervallei dui die kontras aan.

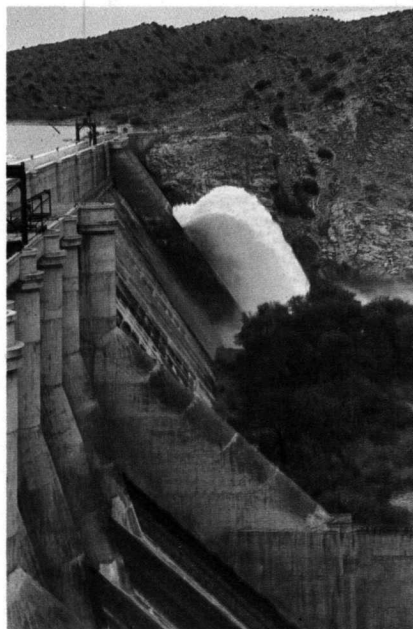
wat tans ongeveer 23 000 ha beslaan). Van hierdie lusern word 41,8% vir kontantproduksie verbou en 27,1% vir veevoer. Somergraanmielies neem 7,5% van die bewerkte oppervlakte in beslag, en suikermielies 1,4%. Kleingrane in totaal beslaan 18,1%, aartappels 0,7%, aangeplante weiding 10,6%, boord 0,3% en groente 0,7%.

Dié opname wat mnr Van Heerden teen die einde van 1982 gemaak het, het ook nie grootliks verskil van 'n soortgelyke opname wat teen die einde van 1980 gemaak is nie.

Die aanvanklike beplanning het voorsien dat daar veral by die Laer Visrivier 'n redelike oppervlakte appelkoosboord ontwikkel sou word en groot groenteproduksie. 'Die grond se pH en hoërige soutinhoud het egter voorkom dat hierdie ontwikkeling plaasgevind het,' sê mnr Van Heerden. 'Die grond het egter mettertyd verbeter, die pH-vlakke het gedaal en daar word nou weer met nuwe oë na die droëboonproduksie gekyk.'

Die aanvanklike watertoekenning

vir die hele vallei was 900 mm/ha/jaar. Die gewasbehoefte is egter intussen hersien en die Bo- en Middel-Visriviergebiede se toekenning is na 1 350 mm verhoog, en die Laer Visriviergebied na 1 250 mm.



Water word uit die Mentzmeer vrygelaat.

Mnr Van Heerden monitor van tyd tot tyd die onttrekkingsdoeltreffendheid in die gebied. Dié doeltreffendheid word gemeet deur die aanvraag van die boere vir water in 'n betrokke maand teenoor die nettogewasbehoefte van daardie betrokke maand in berekening te bring.

'Tans is die onttrekkingsdoeltreffendheid in die Bo-Visriviergebied ongeveer 35 persent, die Middel-Vis 40 persent en die Laer 49 persent,' vertel mnr Van Heerden.

Die boere het aanvanklik elke twee weke water in die kanaal gehad — nou is dit verander na een keer elke drie weke in die koeler maande en elke week in die warm somermaande.

'Ons wil skedulering hier tot die uiterste nut voer,' sê hy. 'Ons beveel in hierdie gebied die gebruik van die Scheeperspan aan, en nie soseer tensiometers nie. Maar om die korrekte hoeveelheid water per besproeiing te kan toedien, moet die boer die regte fisiese uitleg hê.'

Dit is op hierdie gebied wat die herbepanning van besproei-
(Na bladsy 20)

Oranje-Vis: 'n dekode verby

(Van bladsy 19)

ingsgrond ter sprake kom. Volgens mnr Van Heerden beloop die gemiddelde koste van herbeplanning ongeveer R1 500 per ha. Hy wys egter daarop dat die boer dan, mits sy stroombeheer en afsnytye korrek werk, 'n besproeiingsdoeltreffendheid van meer as 90% kan handhaaf.

'In die nie te verre toekoms nie sal ons egter 'n sterk voorligtingsaksie moet uitvoer om die skedule-ring in die praktyk ingevoer te kry,' sê hy.

Gemeganiseerde besproeiingstelsels het nog nie posgevat in die Vallei nie. 'Die probleem is dat die gronde oor die algemeen 'n hoë klei-inhoud, 'n hoë slikinhoud en in baie gevalle 'n hoë fynsandfraksie vertoon. Die infiltrasietempo is baie laag — tot minder as 12 mm/h onder vloedtoestande is al gemeet,' sê mnr Van Heerden.

Alhoewel die oppervlakte onder besproeiing nie juis sedert 1921 in die Visriviervallei grootliks vermeerder het nie, het die Oranje-Vistonnal tog groot voordele

meegebring, waaronder die versekering aan die boere van konstante water.

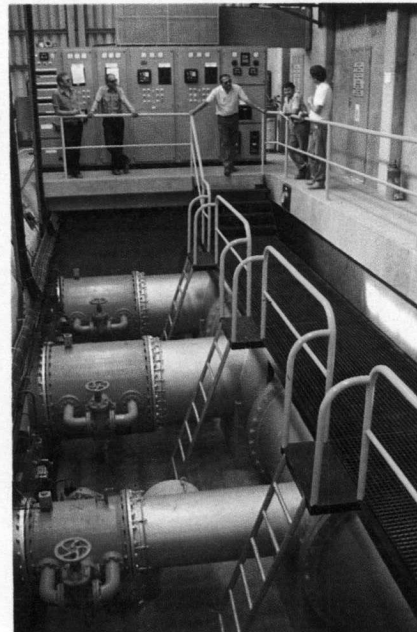
Wat wel in die sestig jaar sedert 1920 verander het, is die omgewing en die dorp Cradock. Die 'great Fish River Irrigation Board' se pamflet van 1922 meld die volgende:

'The most important town in the Board's area is Cradock, distant 181 miles by rail from Algoa Bay. This town is 2 700 feet above sea level, and the district is extremely healthy for man and beast, the generally prevailing condition being sunshine.

'Here are churches of practically every denomination . . . two large modern High Schools in new buildings . . . also a large College for training teachers. These buildings and the town generally are lit by electricity . . .'

Ook insiggewend is dat 'small houses' beskikbaar is teen £250 tot £500, 'n windmeule en boorgat teen ongeveer £150.

Te oordeel aan die bou-aktiwiteit en die skepping van persele in Cradock, die algemene gees van

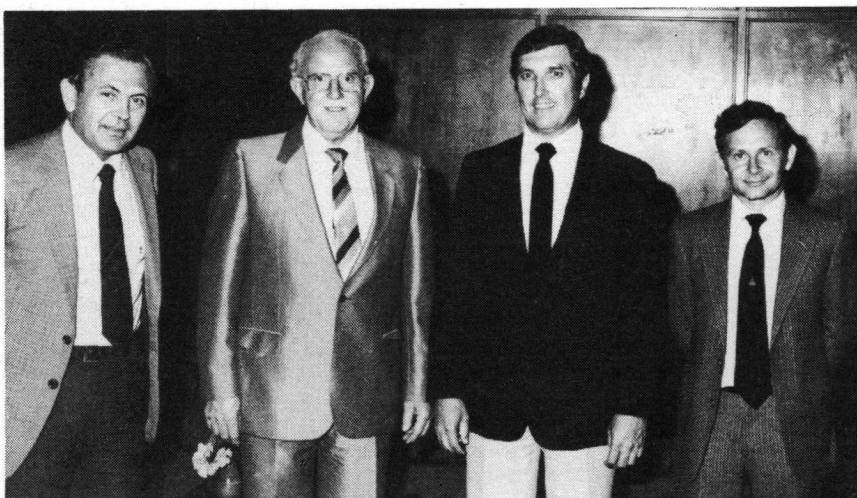


Die pompkamer by Wellington Grove, waar water in die kanaal na die Schoemakersrivier gepomp word.

entoesiasme onder die boere in die kontrei, het die water van die Oranje reeds 'n golf van voorspoed gebring.

USA SOIL EXPERT IN REPUBLIC

The Water Research Commission was privileged to be visited by Dr Joe Ritchie of the United States Department of Agriculture in November 1983. Dr Ritchie, who is stationed at Temple in Texas, was here in an official capacity to take note of soilplant-water research being done in South Africa. A soil scientist by training, he has gained international recognition for his work on soil-plant water relationships, including the development of user-orientated mathematical models of the field water balance and more recently, of crop growth and production. During his stay in the Republic, Dr



During his visit to South Africa, Dr Ritchie visited the WRC. Shown in the usual order, are Mr DS van der Merwe, chief adviser WRC, Dr MR Henzen, chairman of the WRC, Dr Ritchie and Mr GC Green, senior adviser WRC.

Ritchie visited the majority of the irrigation research projects funded by the Commission and freely exchanged ideas with project leaders

and researchers. The main topic of discussion was research into strategies for increasing water use efficiency in irrigated agriculture.

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University of Pretoria
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ANALYTICA '90

March 18-23 1990

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Enquiries: Prof J F van Staden (012) 420-2515 (Voorsitter/Chairman)

Dr P L Kempster (012) 808-0374 (Sekretariaat/Secretariat)

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deur T Zohary, A C Jarvis, F M Chutter, P J Ashton en R D Robarts

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Manure handling:

Funke: Common sense is the key

In a paper on the *Potential impact of intensive livestock feeding systems on the environment*, Mr JW Funke, specialist consultant of the Water Research Commission, said that there were a number of common sense measures, some of them even of economic benefit, that could be taken to avoid negative effects from intensive livestock operations on the environment.

Mr Funke who was speaking at a manure handling seminar organised by the South African Poultry Association on the Barlet poultry farm in Randburg, said that it was a large cattle feedlot near Middelburg, Transvaal, which in the mid-seventies showed the authorities the necessity to exercise some control. At this feedlot during a period of heavy rains, a large amount of manure was spilt into the lower Olifants River threatening the quality of the water supply to the town of Middelburg.

"Fortunately, this had been a single incident which could be brought under control by the construction of a series of ponds and the contouring of the landscape."

Mr Funke said that other complaints which had been received in the past and which were still coming to the attention of the authorities were associated with fly and odour nuisance, originating mainly from laying hen establishments and piggeries located near residential areas.

Some of the guidelines that Mr Funke suggested to farmers who have to deal with the problem of manure handling were the following:

- Apply wet manure on to land only at agronomic rates.
- To avoid pollution of ground water by leaching, or of surface water by run-off, split application into smaller volumes.
- Provide a safety strip of grassed land of at least 100 m in width between manure application area and the next water course.



- Locate intensive livestock operations on a ridge, away from water, and not in a valley where stormwater may drain the concentrated pollution load into a river.
- For fly and odour control, keep manure as dry as possible by providing good drainage or by absorbing excess moisture with sawdust or woodshavings.
- Avoid manure from becoming wet by preventing moistening by leaking watering nipples or spilled water troughs or rainwater.

Mr JW Funke (left) of WRC and Mr IW Bartlet, chairman of the SA Poultry Association, looking at a method of composting manure by forced aeration on the latter's farm where a seminar was recently held.

- Alternatively, for fly control, make full use of the natural enemy complex.
- Prevent anaerobic decomposition of large volumes of manure by applying natural or forced aeration during composting or drying.

Off the press:

Improve sanitation and public health

Sanitation and disease — health aspects of excreta and wastewater management; *Richard G Feachem, David J Bradley, Hemda Garelick and D Duncan Mara;* Published for the World Bank by John Wiley and Sons, New York, 1983.

Public health is most important to all planners and better health is the main benefit such planners hope to gain through the implementation of waste disposal systems. Most developing countries do not have adequate disposal systems for human wastes. A survey by the World Bank has shown that as much as 25 percent of such urban dwellers do not have access to any disposal system. In rural areas it may be as high as 85 percent.

Therefore this book sets out to provide such information for a broad readership and is intended for a wide spectrum of professionals concerned with sanitation and public health.

The book is organised in two parts — part one discusses the theory and control of the health hazards of excreta and is mainly derived from literature studies. Part two discusses the environmental biology and epidemiology of specific excreted pathogens. The pathogens covered include the viruses, bacteria, protozoa and helminths. The occurrence, identification, reservoirs, transmission, incubation and epidemiology of each pathogen is discussed and is followed by the literature cited.

This is a large book, just on 500 pages and packed with information. The authors have certainly succeeded in their aim to present their material free from jargon and in a very readable manner. It is a must for all people concerned with the provision of waste disposal systems in the developing countries.

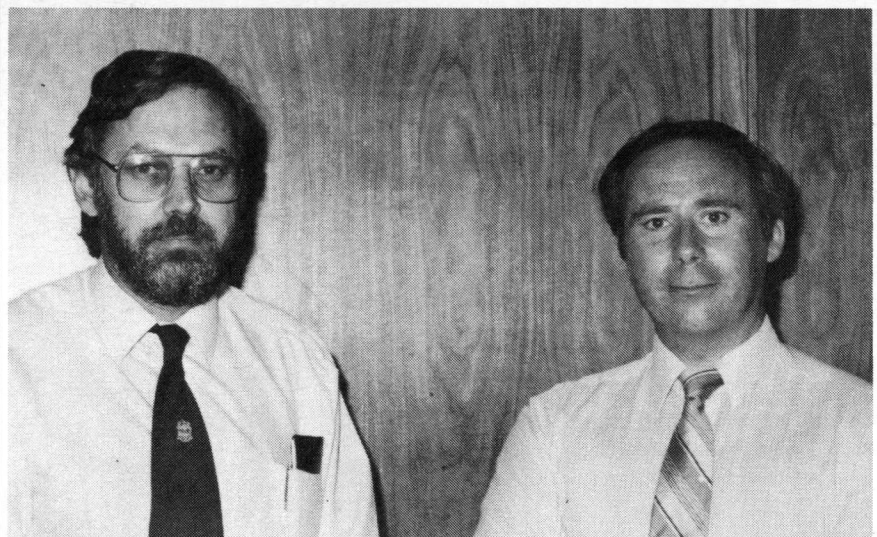
The book also provides guidance on the provision of simple but adequate disposal systems which is so vital in the quick provision of

sanitation to people in rural areas where many of the diseases discussed, are prevalent amongst the local inhabitants.

It can be freely recommended to all people concerned with public health, and especially those in the developing countries. I am certain

that it fulfils adequately the aims set out by the authors and should lead to a sound understanding of the problem and how to combat this problem with the funds available to the authorities. In short: A highly commendable book. **WHJH.**

Sludge expert visits S.A.



Mr John McGlashan (left) senior adviser of the WRC, and Mr Terry Calcutt, manager of the Sludge Group at the Water Research Centre in the UK.

Mr Terry Calcutt, Manager of the Sludge Group at the Water Research Centre in the United Kingdom recently made a private visit to South Africa. During his visit two days were spent in discussions with staff of the Water Research Commission and of the City Engineer's and City Health Departments of the Municipality of Johannesburg.

The discussions centred on research in the field of sewage sludge treatment and disposal and focused mainly on similar research on autothermal aerobic digestion being conducted in the United Kingdom by the Water Research Centre and in Johannesburg by the City Council in terms of an agreement with the Water Research Commission.

Mr Calcutt's visit enabled an ex-

change of ideas at a stage in the research programmes where important decisions regarding future phases of the work would soon have to be taken. Different aspects of the research work enjoy different priorities in the two countries because of the differing conditions and circumstances that exist in the United Kingdom and in South Africa for sewage sludge disposal. Notwithstanding these differences, the outcome of the discussions can lead to future collaborative effort between the Commission and the Water Research Centre. Information exchange in the early formative stages of research projects will avoid unnecessary duplication of effort and will enable project objectives to be widened or modified to suit the conditions in both countries.

TOERUSTING

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

SPLIT CASE PUMPS ON VAAL

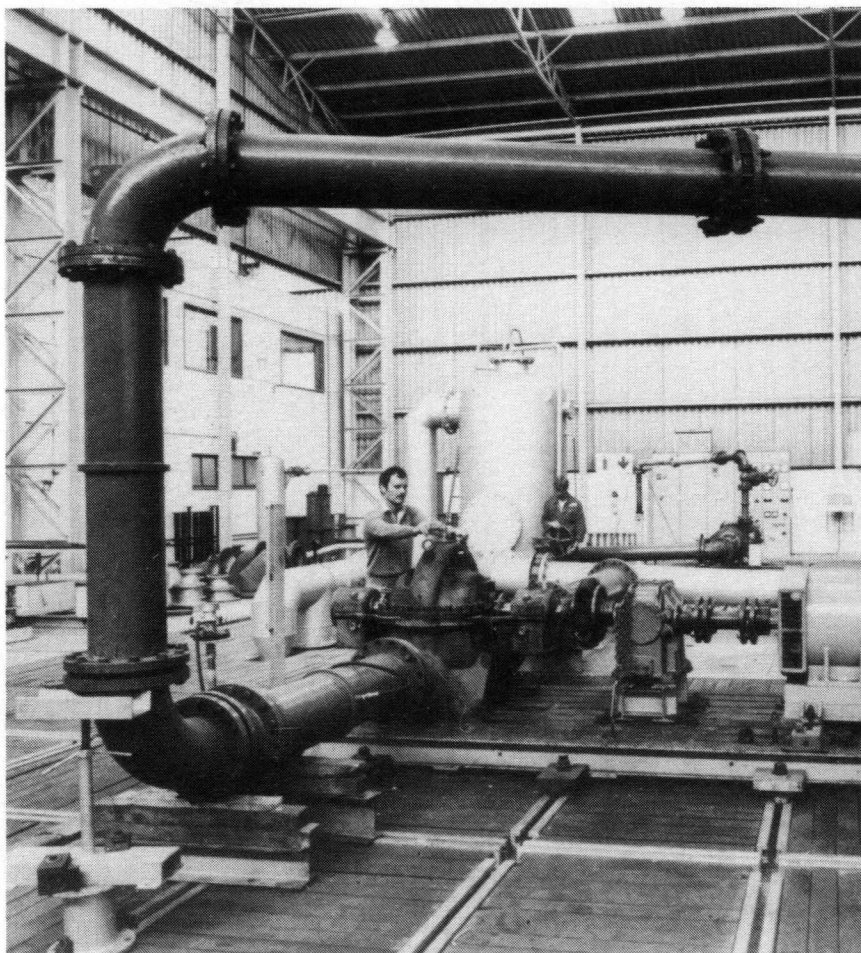
Eight Sulzer type SM split case pumps are being installed at the Balkfontein pump station on the Vaal River as part of the scheme to increase the water supply to the Free State gold mines from 240 m³/d to 360 m³/d. The pumps, made by Sulzer Bros (South Africa) Ltd, of Johannesburg, at their Elandsfontein works, and erected by Turbo Engineering (Pty) Ltd, will supplement the existing Sulzer NP horizontal end suction pumps at the station.

Four of the pumps, the SMV 401-400 vertical units, will each lift 1 670 m³/h of water through 27 m from the inlets in the intake building on the Vaal which is the height of a seven-storey building. The other four pumps, the SM 302-640 horizontal pumps, in the high lift pump station, operating at a head of 105 m, will feed the main pipeline.

At the De Erf pump station 50 km along the pipeline a further four SM 302-640 will provide the final boost to pump water into the Welkom-Virginia distribution system 20 km away.

The OFS scheme is due to be completed this year. It is being undertaken by the OFS Goldfields Water Board which was formed in 1979, taking over the control and assets of the former OFS Goldfields Government Water Scheme. At the request of the Water Board, consulting engineers Geustyn, Forsyth and Joubert carried out an investigation which indicated that a 50% increase in the water supply would be required to meet the demand until 1991.

Enquiries:
Sulzer Bros (S.A.) Ltd
P.O. Box 930
Johannesburg
2000
Tel: 618-4125



A Sulzer pump being tested at the Elandsfontein factory.

WATER SAVER

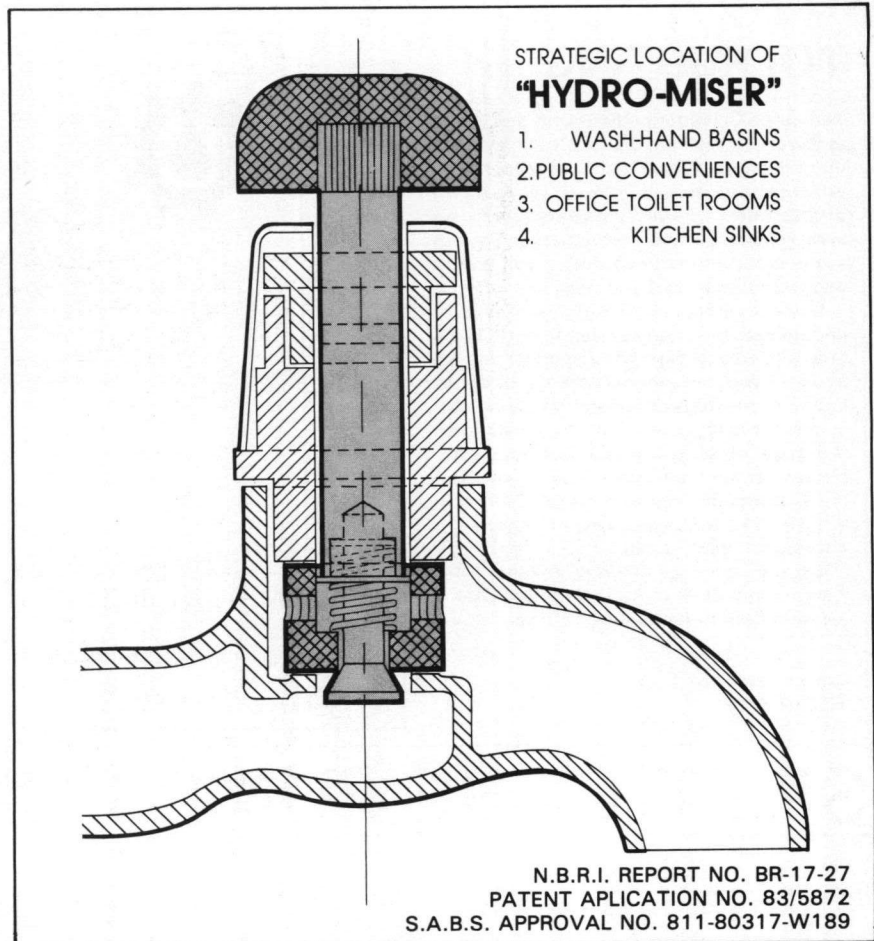
We have come up with the answer to a pressing need — the Hydro-miser, a positive water saving retrofit device for use on standard 15 m/m — 11 m/m dia. spindle taps. It is a press button fail safe, flow restrictor and easy to instal. Our main claim being that it is not necessary to replace your existing tap; only the screwed spindle is removed as when replacing an ordinary washer and a "Hydro-miser" is introduced. Furthermore as circumstances dictate, the tap may be returned to its original state.

As we have acquired the sole manufacturing rights and are simultaneously filling a dire need in a crisis situation, we are marketing the "Hydro-miser" at as near cost as possible. Prices for quantities are obtainable on request ex factory.

Hotels, office-blocks and schools will realize immediate savings in water consumption and certain strategic locations in the home such as kitchen sinks, wash-hand basins will benefit.

Enquiries:

**PROGRESS INSTRUMENT
DEVELOPMENT (PTY) LTD**
233 Element Road
Chloorkop Extension 1,
Transvaal S.A.
Private Bag 233 Chloorkop 1624
Telephone 976-1020/1/2
Telex 8-8815



VERTICAL PUMPS ON VAAL

The seven Mather & Platt vertical pumps, with 410 kW motors mounted on top of them, which are now pumping water from the Vaal River into the Grootdraai Dam in the emergency water scheme recently opened by Nr Sarel Hayward, Minister of Environment Affairs & Fisheries.

The pumps, motors, valves and delivery pipework were installed in less than four weeks by mechanical engineering contractors Turbo Engineering (Pty) Ltd of Sandton. The 6 m long pumps (six running in parallel, the seventh on standby) each have a capacity of 1 450 l/s against a head of 21 m. Each pump has a delivery diameter of 900 mm.

Enquiries:

Turbo Engineering (Pty) Ltd
PO Box 782005
Sandton
2146
Tel: 786-5244

MOBILE WATER PURIFIER

The PORTPAC Purifier is a compact water purification system to meet the pertinent requirements at places where safe drinking water not available.

All the functions and efficiencies of a full-fledged purification plant are properly packaged into a compact system of the PORTPAC Purifier.

Orderly skid-mounted are those tanks for chemical mixing, co-agulation, sedimentation (inclined parallel plates), rapid filtration, backwash water and others. This simple arrangement makes the PORTPAC Purifier quite easy for transportation and installation and, at the same time, it enables unpractised people to operate and maintain the whole system.

The PORTPAC Purifier, equipped with power generator, can display the timely performance in case of emergencies like earthquake, fire, typhoon and others.

Enquiries:

M. Fukumura
Ebara-Infilco Co Ltd
Kasuga Bldg 34-2
Shiba 5-chome
Minato-ku
Tokyo
Japan



FIBRE SOLUTION TANKS

Liquid Metronics (Pty) Ltd announces the local manufacture of fibreglass solution tanks which have provision for direct mounting of a dosing pump, an agitator and liquid level switches.

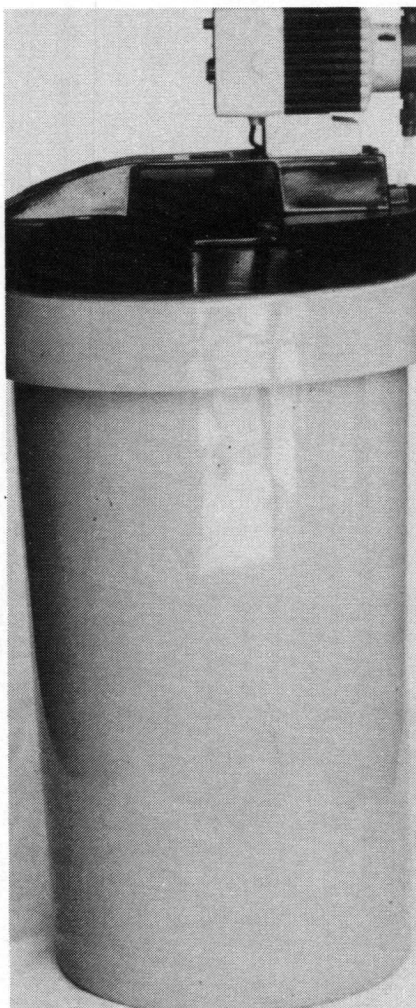
Besides containing either corrosive or non-corrosive liquids, it completes a dosing package which although compact, is able to perform a series of complex functions like mixing, blending and level control. As such it is functionally unique.

The self supporting tanks have tapered sides and are graduated in litres, with a capacity of 200 litres. The aesthetically attractive yellow fibreglass construction is ideally suited for outdoor use in South Africa as it offers high resistance to ultra-violet light.

A unique feature is the heavy duty moulded fibreglass cover.

Enquiries:

Liquid Metronics (Pty) Ltd
(Derek Stansfield)
Tel: (011) 609-2154



CIVIL CONTRACTS

Pinetown-based civil engineers SM Goldstein Natal have been awarded contracts worth nearly R6,5 million for major contracts in Transkei and Natal, including one for what will be one of the largest prestressed concrete reservoirs in the country.

Managing director Gerald Heseding said the Transkei contract called for extensions to Umtata's sewage treatment works, situated a kilometre from the town on the Umtata River.

The R1,3 million project is scheduled for completion by the end of March, next year.

Other contracts awarded the company early this month are a dam for the Department of Environmental Affairs in the Tala Valley to regulate and store the flow on the Umlaas River and a 27 000 cubic metre reinforced concrete reservoir for the city Engineer's Department in Pietermaritzburg.

The Thornlea dam will have a crest length of 260 m and a height of 16 m above river bed level.

SM Goldstein has also been given the contract for Richard Bay's 47 000 cubic metre concrete reservoir which will be one of the biggest of its kind in South Africa.

The R2-million Mandlazini reservoir will take 12 months to complete and is situated 10 kms up country of Richards Bay.

Enquiries:

SM Goldstein Natal
PO Box 1135
Pinetown
3600

FLOW METERS

Quadrina design and manufacture complete ranges of turbine flowmeters for the measurement of liquids or gases. The ranges include in-line flowmeters for uni-directional or bi-directional flow, and catering for liquid flowrates over the range 50 cc/minute to 1 000 m³/h, and gas flowrate over the range 200 cc/minute to 5 000 m³/h.

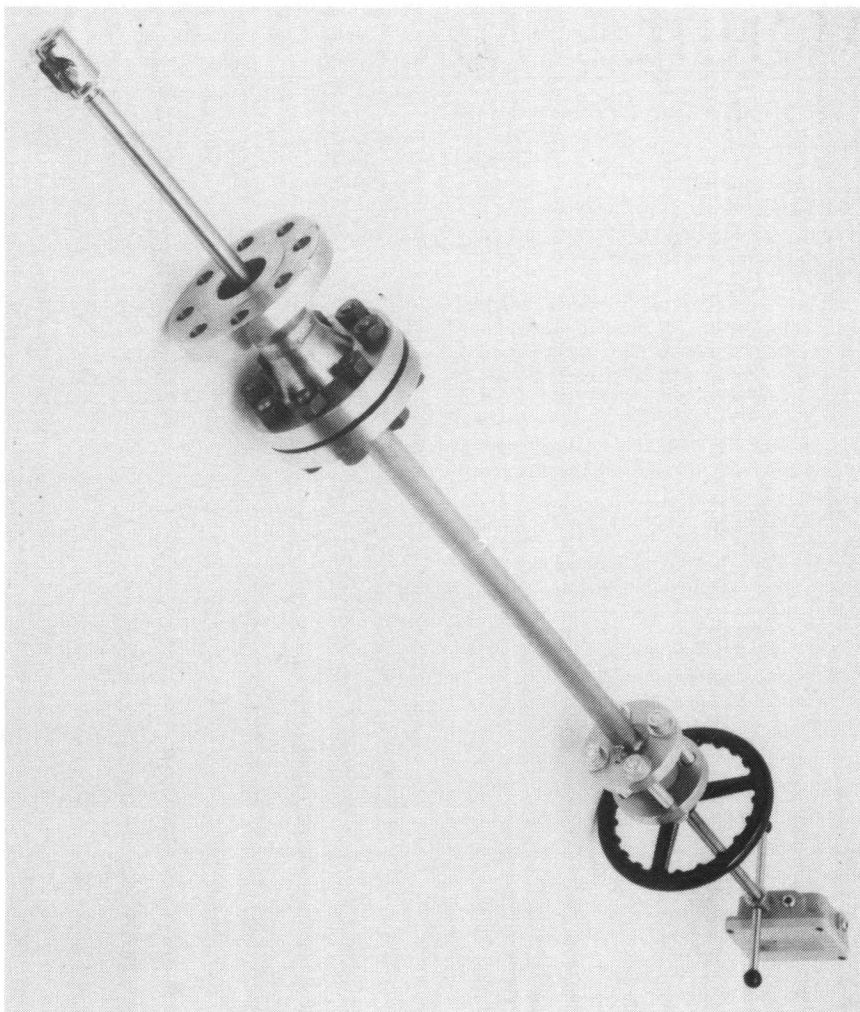
The Probeflo insertion turbine flowmeter is a speciality of Quadrina. This device offers a means of reliable and inexpensive flowmetering in any size pipeline from 2 inches upwards. It may be used either as a portable device or for fixed flowmetering applications, can be used for closed conduit or open channel measurements, and is suitable for use in liquids or gases.

Flowmeters are individually tested and calibrated at the Quadrina factory, and each flowmeter is issued with a calibration certificate when despatched.

Also Quadrina can offer complete pipe-work sections for flowmetering installations, together with flow straighteners and filters where required. Similarly, control valves, flow switches and other related equipment may be provided to order.

Enquiries:

P.G. Davidson
Anavac (Pty) Ltd
PO Box 5293
Weltevreden Park
1715
Tel: (011) 674-1190/1



CEMENT IN WATER WELLS

Virtus/Endiem manufacture a complete range of specialist equipment for supporting, packing off, and cementing operations in water well construction. Liner hangers, packers, and stage cementing collars.

We also manufacture equipment for gravel packing and installing wellscreens.

Our products are very competitively priced and our design and manufacturing abilities are extremely flexible.

Virtus/Endiem can design and manufacture equipment in various materials to solve any of your more complex well construction problems.

Enquiries:

Virtus Ltd
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London Street
Lancashire
FY7 6JQ
England



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Conductivity measuring amplifiers are used for monitoring and measuring of aqueous solutions. The conductivity relates to concentration of dissolved solids, acids or alkalis.

The conductivity principle, therefore, lends itself ideally to water conservation in wet processing operations such as: Electroplating plants; Pickling plants; Paint pre-treatment plants and other metal surface treatment where a large number of rinse water tanks are employed.

Whether fitted to a single-stage rinse tank or to the final stage of a counterflow rinse system, the Conductivity Amplifier EC80 maintains a pre-selected rinse water standard which may be applicable to a particular process and that can easily be selected by the operator. When connected to a solenoid valve fitted on the fresh water inlet, the conductivity amplifier will shut off the water supply when either:

- a) the rinse water is at the required quality, or
- b) no work is being processed through the plant.

Enquiries;
P. Golisch
Effluent Control (Pty) Ltd
PO Box 586
Isando
1600
Tel: (011) 974-1131



SUBMERSIBLE PUMPS

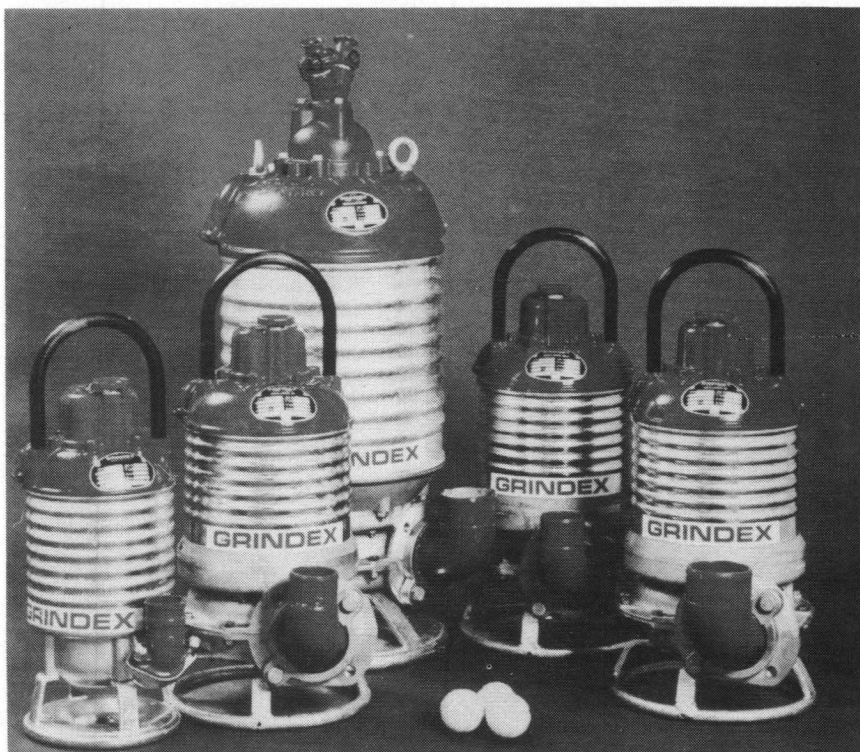
Grindex submersible pumps have three fail-safe devices.

Key feature is a unique spring loaded valve, which opens when the pump is empty, and allows cooling air to be circulated by the pump impeller. There is also an overload cut-out switch, as well as a bi-metal thermal cut-out switch.

Stratford Engineering are placing most of their units into mining applications, which generally require large capacity reliable and very rugged pumps. As an added strengthener, the pump casing is corrugated. This means that, whether installed semi-permanently or being moved from site to site, the unit is more than strong enough to withstand the rough handling.

Grindex pumps are available in capacities ranging up to 10 000 l/m with discharge heads up to 100 m. Suitable units can be supplied ex-stock for almost any application, including use in series to lift to almost any head.

Enquiries;
Stratford Engineering (Pty) Ltd
PO Box 785759
Sandton
2146



IWPC seminar:

EXPERTS TO SPEAK

A short IWPC seminar on *Organochlorine compounds in water: Analysis, implications, treatment, realistic standards* will be held on 22 March 1984 at 14h00 in Hall S.19, Engineering Block, University of Pretoria.

The Chairman will be Dr WHJ Hattingh, Water Research Commission and the speakers Prof William J Cooper of Florida International University, USA ("Problems in analysing for organo-chlorine

compounds in water"); Dr RF Packham of the Water Research Centre, UK ("Standards, limits and guidelines") and Dr T Zabel of the Water Research Centre ("Treatment practice and THM control").

Each presentation will last about 20 minutes and ample time will be allowed for discussion.

This seminar will take the place of the monthly IWPC meeting which would have been held on 15 March 1984.



Dr Willie Hattingh, senior adviser at the WRC, who will chair the IWPC seminar.

COURSE ON HYDRO REPORT

The Six-Volume report series "Surface Water Resources of South Africa" published by the Hydrological Research Unit has been well received and widely used. A course and workshop on the report series has been arranged. The aim will be to show what is contained in the reports and how best to use them to solve water problems. Participants will have the opportunity to work through a complete water resources example.

Duration of Course/Workshop: 2 days. Venues and timing: Johannesburg 19/20 March 1984; Cape Town 26/27 March 1984; Grahamstown 29/30 March 1984; and Pietermaritzburg 2/3 April 1984.

Course Leaders: DC Midgley, WV Pitman, BJ Middleton and the cost: R150 per participant. This includes a copy of the Guide and Addendum to the Report series, teas and lunches.

For further information, please contact BJ Middleton, PO Box 8856, Johannesburg 2000. Tel: 832-1201.

BESOEDILING VAN MEUSE

'n Deegliker ondersoek na die toenemende besoedeling van die Meuserivier sal in die korttermyn gedoen moet word deur die Franse, Belgiese en Nederlandse owerhede wat die rivier se water en uitvloei-sels beheer, het die Vereniging van Waterverspeidingsmaatskappye van die Ryn en Meuse (RIWA) op 'n perskonferensie in Den Haag (Holland) aangevoer.

In die verslag wat in samewerking met die Intercommunale Bruxelloise des Eaux (CIBE) opgestel is oor die kwaliteit van die Meuse se water, voer RIWA aan dat die water van die Meuse 'n oormatige getal eutrofiserende stowwe soos ammoniak, fosfate en nitrate bevat.

Meer as vyf miljoen mense van België en Holland is afhanklik van die Meuse vir drinkwater.

MORE INFO ON IFAT

IFAT 84 will be held in Munich from 22 to 26 May 1984 and this International Trade Fair for Waste Disposal will cover sewage, refuse, city cleaning, street maintenance and winter road service.

Range of products that can be viewed includes those relating to sewer systems, ground water drainage, pumps, sewage treat-

ment equipment, sludge conditioning, refuse engineering, city cleaning and several other.

More information may be had from Münchener Messe-und Ausstellungsgesellschaft mbH, Messegelände, Postfach 12 10 09, D-8000 München 12. Tel: (089) 510-7209/216.

Water supply and sanitation in Venda



The four-channel activated sludge Orbal system at the Tshlidzini Hospital.

(From page 15)

settlements as well as the towns of Vuwani and Tshifulanani will be served by the system. The population of some of these settlements such as Lwamondo and Tshakuma already exceeds 10 000. Eleven reservoirs with storage capacities ranging from 300 kl to 1 200 kl have been constructed and at least another 10 will be required.

Both the Donald Fraser and Vuwani systems will be about 75% completed by 1984 after termination of all current contracts. The Thohoyandou system is extended from time to time as the need arises and in accordance with the approved plan for the city water supply system.

The total cost of the Vondo Regional Water Scheme until completion of the current contracts will be approximately R19 m.

Nzhelele water scheme

The Nzhelele valley is inhabited by a rural population of approximately 20 000 which is concentrated in various agricultural settlements. The Siloam hospital is situated

halfway down the valley and further to the west the town of Makhado (present population 8 000) is being developed.

Construction of the Nzhelele Scheme started in the mid seventies when water was diverted from the upper reaches of the river and piped to Siloam and the surrounding villages. During the past 8 years the scheme has been extended as far west as Makhado, 32 km from the diversion. The main pipe line gravitates water through three pressure zones down the valley. Water for Makhado then has to be pumped 130 m high over a distance of 0,9 km. Distribution of water from the main pipe line to villages either through gravitation or pumping is still under way.

Due to the unreliability of flow in the Nzhelele River a storage dam is required for proper functioning of the scheme. This dam is being planned in the Nzhelele River on a site near the diversion weir. At present only the water supply of Siloam is being purified but in the near future a purification plant for the treatment of the total domestic water supply will be constructed.

Mutale river project

The feasibility of a development project in the Mutale valley was first studied in 1970. The main object of this proposed scheme was the irrigation of more than 10 000 ha in the Tshiombo valley and on the Malonga Plains. At least 2 dams and an extensive canal system were foreseen. The Mutuale River Project would then also provide for a more reliable supply of potable water to the agricultural settlements in the Mutale valley and to the proposed town at Tengwe.

The sewerage schemes of Venda

In Venda's agricultural villages the village populations usually vary from less than 100 inhabitants to a maximum of 1 500 people.

In these villages the individual households provide their own sanitation, usually by way of pit latrines and washwater is invariably drawn from one of the numerous streams of Venda. This rudimentary system

(To page 30)

Water supply and sanitation in Venda

(From page 29)

has provided adequate sanitation for the people of Venda through the ages.

With the development of the country and an increase in the population it was however inevitable that points of concentration would occur. The first points of concentration were around the town of Sibasa where an urban population started to settle and at the three major hospitals of Venda. Providing adequate sanitation at these points became the responsibility of the Department of Transport and Works.

Thohoyandou sewerage works

By far the biggest outfall system in Venda is the unit that serves the capital, Thohoyandou, with its three suburbs Makwarela, Sibasa and Shayandima. With a total length of 55 km of collector sewers and 18 km of sewer main this system can serve approximately 60% of the area of Thohoyandou now being developed and its suburbs. The average dry weather flow through the system ranges from 1 200 to 1 500 kl/day.

Until recently purification of the sewage has been effected through a system of maturation ponds. These ponds were replaced by a conventional purification works complete with primary sedimentation, biological filters, secondary sedimentation, a maturation river, digestors and dry beds. The new works was completed and commissioned in the beginning of 1983 and has a first stage rated capacity of 3 000 kl each. The design was based on an estimated flow of 100 litres of sewage/person/day and a B.O.D. (biochemical oxygen demand) of 45 g/person/day.

This system is functioning highly satisfactorily and is being monitored by the National Institute for Water Research of the CSIR.

At the request of the Department of Agriculture and Forestry the pipe layout at the purification works

was changed to allow conveyance of the purified effluent to the old maturation ponds. The intention is to use it for irrigation or fish culture.

Tshilidzini hospital outfall works

Tshilidzini hospital was founded in 1956 and has a total of 355 beds. This hospital serves the southern regions of Venda with a population of approximately 150 000 people.

The hospital's sewage is treated through a 4 channel activated sludge orbital system with a rated capacity of 150 kl/day. Polishing of the effluent is through a maturation river. Although this plant is running at at least 1½ times design capacity the effluent from the maturation river is still acceptable. After chlorination the effluent is used to irrigate the vegetable gardens of the hospital.

A major extension to this hospital is proposed in the near future. To cater for this higher demand, all the sewage will be gravitated via Shayandima to the Thohoyandou works.

Donald Fraser Hospital outfall works

The Donald Fraser Hospital with its 412 beds serves a community of approximately 170 000 people in the central and north eastern parts of Venda.

The effluent from this hospital is also treated in an activated sludge orbital system. The system has only three channels and a rated capacity of 136 kl/day. The hospital generates approximately 235 kl of effluent per day. Most of the flow is generated in the hospital's laundry. Although this plant is completely overloaded (especially hydraulically) it is still functioning surprisingly well. To alleviate the pressure on this plant, future planning is to separate the laundry effluent and treat that in maturation ponds. Treated effluent is again used for irrigation after chlorination.

Siloam Hospital maturation ponds

With its 496 beds, Siloam Hospital is the largest in Venda. It serves mainly the Dzanani district in the north western part of Venda. The population served is approximately 150 000 people.

The outflow from the hospital is treated through a system of maturation ponds consisting of 2 primary ponds with a total area of 10 000 m² and 5 secondary ponds with an area of 13 000 m².

The quality of the effluent is excellent and it is used for irrigation of crops used in the hospital.

Makhado Township maturation ponds

Makhado is a township of 80 houses being developed as a service centre for the Dzanani district. The town is water and sewer reticulated. The sewage is treated in a system of 4 maturation ponds with a total area of 1 500 m². Provision has been made to double the pond area to meet expected future demand.

Problem points in the present system

The previous short account shows that sanitation throughout Venda is at present functioning reasonably well. There are however points of stress in the present system that will have to be attended to in the near future. Three of the main points are:

The larger agricultural settlements

It has been mentioned that some of the agricultural villages have 10 000 and more inhabitants. That so many people can be grouped together without providing some aid in their sanitation is quite unrealistic. Some of the inhabitants are in fact providing only the most rudimentary latrines, a state of affairs that leads to unsavoury conditions in certain areas.

This problem can be alleviated by helping the inhabitants to construct proper latrines, preferably with some system of sludge draw-off. These can be designed in such a way that they can later be converted to aqua privies when these settlements become water-reticulated.

Pollution of Streams

The sparkling streams of Venda are of its finest assets and must be guarded jealously. Most of the population are at present, and will be for many years to come, dependent on these streams for their potable water.

Unfortunately these people are also obliged to use these streams for their washing. The recent drought has accentuated the fact that these streams can no longer fulfill this dual function during the dry seasons. Serious cases of pollution have occurred, especially in the streams running through the more densely populated areas, e.g. the Dzindi, Dzondo, Mvudi, Mutshindudi and the lower regions of the Levubu rivers.

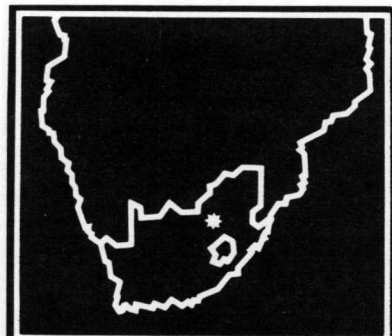
To relieve the burden on these streams, serious consideration must be given to the provision of washin facilities in conjunction with the reticulation systems at present being constructed in several of the agricultural settlements.

Schools as points of concentration

Venda has an estimated 160 000 school children in 350 schools. This is an average of more than 400 pupils per school. Several of these schools are without any form of sanitation or have at best the most rudimentary systems.

Reticulated water at each of these schools is a goal that is being strived at. Once this is achieved, aqua privies or even complete water-borne sewerage systems with septic tanks could be a permanent solution.

South Africa will host the first international conference and exposition on groundwater ever held outside the United States. It will be staged in Johannesburg from 12 to 17 November, 1984, as the first public event scheduled for the Witwatersrand Agricultural Society's new National Exhibition Centre at Crown Mines, Johannesburg, now under construction.



WATER • FOR • SOUTH • AFRICA

Titled WATER FOR SOUTH AFRICA, it has been described by the organizers as the world's most ambitious waterwell convention/exposition to date by the National Water Well Association of America, in collaboration with the Borehole Water Association of Southern Africa.

The National Water Well Association is the most respected organisation of its kind in the world. Not only does it act as official adviser on groundwater matters to the American President, but also to the World Bank, while carrying out assignments for the United Nations in countries all over the world.

The Borehole Water Association is the first overseas affiliate of the

American body, which is staging the Johannesburg convention/exposition in response to a request from the local organisation.

This convention comes at a dramatic point in the economic and social history of South Africa. The Republic has seen its worst drought in 50 years. South Africans at every level, from government leaders to farmers and urban householders have had to recognise the indispensable role today of water in our national life. In future every water source will have to be husbanded. "We can no longer afford to dismiss groundwater as an afterthought, as a secondary reserve of little significance," the organizers say.

CONFERENCES AND SYMPOSIA

(From page 32)

from 22 to 26 May 1984 in Fort Collins, Colorado, USA.

Enquiries: International Commission on Irrigation & Drainage, 48 Nyaya Marg, Chanakyapuri, New Delhi 110021, India.

URBAN DRAINAGE

The 3rd international conference on urban storm drainage will be held from 4 to 8 June 1984 in Göteborg, Sweden.

Enquiries: Prof Anders Sjöberg, Dept of Hydraulics, Chalmers University of Technology, S-41296 Göteborg, Sweden.

AUST WWA

The 1985 International Convention of the Australian Water & Wastewater Association (AWWA) will be held from 28 April to 3 May 1985 in Melbourne, Australia.

Enquiries: Convenor, Australian Water & Wastewater Association, 1985 International Convention, G.P.O. Box 358F, Melbourne, Victoria, 3001, Australia.

finally . . . (From p 32)

centi and millipedes, dead birds and butterflies). That was exactly when this scourer nipped her.

'Unfortunately, as you also know, women have no sense of humour (nor of direction, but that is only comical, not serious). The doctor is still trying to cure her of the hiccoughs, although he managed to get most of the water out of her lungs. Pity that she cannot laugh at herself when he calls it a tuneless malady. But then, women are funny that way.'

CONFERENCES AND SYMPOSIA

WATER SUPPLY AND QUANTITY

A symposium on water supply for the Vaal river catchment area and the economic implications of water quality will be held on 16 March 1984 at the CSIR conference centre in Pretoria.

Enquiries: The Secretariat Vaalco PO box 26192, Arcadia 0007. Telephone (012) 323-7556/7.

SOIL SALINITY, IRRIGATION

An international conference on soil salinity under irrigation processes and management will be held from 25 to 29 March 1984 in Bet Dagan, Israel. Also included will be an irrigation equipment exhibition.

Enquiries: Conference Secretariat, PO Box 3054, 61 030 Tel Aviv, Israel.

OZONE

An international conference on ozone will be held from 26 to 28 March 1984 in Pretoria.

Enquiries: Symposium Secretariat S.327, CSIR, PO Box 395, Pretoria 0001, South Africa.

AFRICAN WATER TECHNOLOGY

The second African Water Technology Exhibition and conference will be held from 9 to 13 April 1984 in Nairobi, Kenya.

Enquiries: International Conferences (Exhibitions) Ltd., 6 Porter Street, London W1M 1HZ, England.

FLOW MEASUREMENT

An international conference on Flow Measurement in the Water industry will be held from 10 to 12 April 1984 in East Kilbride, Scotland.

Enquiries: P. Collier, National Engineering Laboratory, East Kilbride, Glasgow G75 0QU, UK.

OZONE AND BIOLOGY

A symposium on Ozone and biology will be held from 17 to 19 April 1984 in Rennes, France.

Enquiries: Ozone and Biology, Ecole Nationale Supérieure de Chimie, Av du Gen Leclerc, 35000 Rennes, France.

GROUNDWATER

An international groundwater symposium will be held from 21 to 23 May 1984 in Montreal, Canada.

Enquiries: A Kohut, Groundwater Symposium, Montreal '84. Ministry of Environment, 765 Broughton Street, Victoria BC, Canada V8V 1X5.

IFAT 84

A sewage engineering & refuse disposal conference & exhibition will be held from 22 to 25 May 1984 in München, West Germany. Enquiries: ECL (Exhibition Services) Ltd, 11 Manchester Square, London W1M 5AB, England.

IRRIGATION & DRAINAGE

A large triennial irrigation conference and exhibition will be held

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finally . . .

Tuneless melody

'I often think — let that not surprise you,' Oom Louw Schalken said whilst wetting the *riempies* of his *velschoen* with his tongue and delivering some wax from his left ear with it, 'that women have become house-bound and know very little about the exciting outdoor life waiting in the back garden. Take my wife, for instance (or for keeps, whatever suits you best). What does she know of the exciting song of the lawn mower, the snip-snip of garden shears, the gentle brush of the rake as it gathers the fallen leaves?

'I mean, in days gone by women were out of the caves all the time, fighting off the unwanted attentions of the savages, or of their own husbands, whichever were the most threatening, or promised the most fun.

'Now, I am reminded of the time when I took my old *beste* off the kitchen run and let her clean the swimming pool. (By that time it had gone a sour green, not unlike the face of the *koster* when he cleaned the organ and found his fingers on the *voëlent* which some kid had put on the keys).

'Well, the water improved, the pH went down (although my HP went up) and the chlorine ate up all the two-legged *waterhondjies*, not to mention the unspeakables left by the kids in the water, such as chewing gum and elastic bands, sherbit tubes, two unmatching earrings, a toe nail of something, a used disco ticket and some stuff that looked like it once belonged to ET.

'You know how I firmly believe that women are human beings, not to be parked in the house and to be allowed to have some fun. So I bought one of these pool scourers that work while you sit in the shade of your karee watching your wife in the water, snorkling out some leaves that had drowned in the deep end (with an assortment of

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SA WATERBULLETIN

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

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