SA WATERBULLETIN

Nuusbrief van die Waternavorsingskommissie
Newsletter of the Water Research Commission

FEBRUARIE 1985

ESCOM to use tubular RO:

S.A. DESALINATION TECHNOLOGY SCORES

The manufacture of a tubular RO system for an industrial wastewater concentration plant represents a breakthrough for local desalination technology. In this regard a contract was recently awarded to Foster Wheeler by ESCOM for the construction of a plant for the desalination of cooling tower blowdown and other waste streams at ESCOM's Lethabo power station.

Bintech technology (Bakke) will be used for the RO membranes and modules which will produce 6,5 Mℓ per day of product water for reuse purposes.

In the mid-seventies the Water Research Commission (WRC), in conjunction with the National Institute for Water Research and the Institute for Polymer Science (IPS) of the University of Stellenbosch, decided on tubular reverse osmosis as an answer to some of South Africa's desalination problems. The WRC sponsored the IPS in its efforts to develop suitable membranes.

An organisation was also required to develop a commercially viable support system for the membranes and to this end Bakke Industries was approached,. This company not only possesses the necessary R & D facilities, but is also located fairly colse to the IPS.

A contract between Bakke Industries and the WRC provided for technology transfer in respect of characterised membranes and their subsequent commercialisation by Bakke.

Membratek, a division of Bintech (Pty) Ltd, worked on the project for a period of four years, doing pilot studies before going commercial during 1983. During the course of 1984 two plants were installed and commissioned, both of which desalinate brackish water.

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A typical TRO plant for pilot testing of the recovery of effluents.

in bulletin

Tubular RO

(From page 1)

The mechanics of the tubular RO membrane in concentrating effluent is as follows:

Osmosis is the phenomenon by which a semi-permeable membrane allows the passage of the solvent (usually water) while it restricts the passage of solute particles which are also termed dissolved solids. The solvent travels through the membrane in both directions setting up a dynamic equilibrium in relation to the osmotic pressure of the solution. The process of reverse osmosis involves the overcoming of the osmotic pressure of the solution which has the effect that the solvent is forced through the membrane in one direction only. The solution becomes more concentrated as the solvent flows out through the membrane.

Water is pumped inside the cellulose acetate tubular membrane with the effect that the pressure used not only overcomes the osmotic pressure of the solution, but forces enough permeate (pure water) through the membrane to attain the desired recovery.

Between 70% and 90% of the feedwaters can be recovered, depending on what system configuration is used. Depending on the characteristics of the water, inorganic salts are rejected at the 90 — 95% level while all bacteria, viruses, pyrogens and most organics are also rejected by the membrane.

Membranes are housed in modules made up of aluminium casings packed with polymer discs that allow for the membrane configuration which reduces the cost of the tubular system to a level competitive with conventional spiral membrane systems. Each module contains 19 tubular membranes which are factory assembled and tested.

The RO modules have a 100% local content and were developed specifically for water with high fouling characteristics. Fouling agents such as organics, silica, iron and manganese can, to a large extent, be removed from the membrane surface by intermittent flow reversal incorporating spongeball flushing. The more exposed membrane surface facilities cleaning, thereby minimizing the troublesome pretreatment stage needed in conventional RO plants.

Quick, easy

Complete reverse osmosis plants are manufactured at Bintech (Paarl) where refurbishment of the modules also takes place. At present the smallest units that are produced deliver 6 m^3/day of purified water, and are skid mounted with all outgoing and incoming connections fitted for easy and quick installation. Larger plants are assembled at the Paarl factory in modular form and installed with a minimal amount of site work.

All units are supplied with complete instrumentation, *i.e.*:

- Inlet and outlet pressure meters.
- Temperature, pH and conductivity meters.
- Flow meters for product and concentrate.
- Salt rejection meter with percentage reject rate.
- High pressure pump meters (hours and amps).
- Sponge-ball timer and various alarms.
- Optional computerized data logging.

After all that has been said about Tubular Reverse Osmosis (TRO), the benefits and applications of this system warrant a mention. The TRO process can concentrate most of the industrial effluents that cause treatment headaches without the usual chemical addition pretreatment and precipitation of metal hydroxides as is common with standard effluent handling and treatment systems. The TRO system recovers between 70% — 90% of the waste waters for reuse. Ultimately savings are effected on water consumption costs, discharge costs, effluent surcharges and chemical addition costs. The applications are vast and range from acid mine waters, power generation cooling waters, ion-exchange feed waters, electroplating effluent and food and textile effluents to desalination of secondary sewage effluents as witnessed by the very good results that the Port Elizabeth Municipality are experiencing on their TRO Pilot Plant.

A closer view of a module showing the arrangement of the membranes.

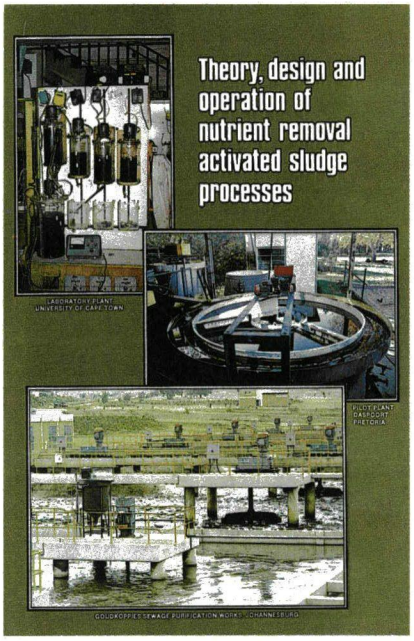
Debate:

Nutrient removal: critics answered

During February 1984 the Water Research Commission (WRC) published a monograph jointly compiled by the University of Cape Town, the City Council of Johannesburg and the NIWR (CSIR) entitled "Theory, Design and Operation of Nutrient Removal Activated Sludge Processes". This pulication was the culmination of approximately ten years of research and development jointly financed by the WRC and the aforementioned organizations. The document was widely distributed in the RSA, i.e. about 500 copies to local authorities, consulting engineers, government departments and research scientists, as well as to overseas research scientists and organizations. The response was overwhelming, another 650 copies have been requested to date, necessitating a second printing of the monograph.

Comments on the content of the monograph, in general, were very favourable. It appears to have met a very basic need, i.e. a consolidation of information generated under Water Research Commission (WRC) backed research and development on biological nutrient removal from wastewater. The need for such a publication was particularly urgent since by August 1985 sewage works in so-called sensitive river catchments will have to comply with the 1 mg/ℓ dissolved ortho-phosphate standard.

Criticism has also been levelled at the monograph and some of the major points raised are dealt with below:



I. Is the monograph the final word on biological nutrient removal?

Because of its exhaustive text, prepared by world renowned authors, and, it being distributed as a WRC publication, the monograph may have left the impression with some that it is the final word on biological nutrient removal. This is an unfortunate impression since biological nutrient removal is still a very dynamic field, particulary biological phosphate removal. The scope and intention with the monograph was summed up in the Introduction as follows: "This publication therefore does not pretend to be the last word on biological nutrient removal; it is an information document with interim guidelines for the design and operation of biological nutrient removal plants".

This publication was written during the period 1982/83 and finalized and printed during 1983/84. It therefore reflects knowledge generated under WRC funded research up to and including 1983. Since then the WRC has funded two new projects on biological phosphate removal, one with the City Council of Johannesburg and one with the University of Cape Town. As recently as September 1984 progress with research, development and application of biological nutrient removal was discussed in-depth at an IAWPRC Seminar in Paris, France where many new findings came to the fore and a number of aspects still requiring research were identified. In the light of the aforegoing and as stated in the Introduction to the monograph: "This publication therefore does not pretend to be the final word on biological nutrient removal; it is an information document with interim guidelines for the design and operation of biological nutrient removal plants".

II. Does the monograph give the whole picture?

The monograph deals almost exclusively with research and development carried out under WRC projects. It excludes certain processes, for example the chemical/biological PHOSTRIP process, and biological systems such as the two-stage PHOREDOX (or AO) and PHOFIX (Kerdachi and Roberts) process. The monograph deals predominantly with the three- and five-stage BARDENPHO processes, as well as the UCT process and modified variation thereof treating municipal waste waters, settled and unsettled. The full scale experience reported in the monograph relates mainly to results obtained at the Johannesburg Goudkoppies Works. Many other biological nutrient removal works exist in the RSA, but their operation was not critically examined and reported upon since this was outside the terms of reference of the Commission projects. It is obviously desirable that the present data base should be expanded in order to give guidelines based on as wide an experience as possible.

In the RSA there are currently about 30 full-scale plants that were either designed or modified to operate as biological nutrient removal plants. Evaluation of the operation and performance of some of these

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Debate: Nutrient removal

(From page 3)

plants in so far as phosphate removal is concerned, was carried out by the National Institute for Water Research during 1980/81 and gave a somewhat dismal picture. Only one of the fifteen plants evaluated conformed to the phosphate standard for 95% (or more) of the time, with the remaining plants showing erratic performance, sometimes complying with the standard, but most times showing poor phosphate removal. Some of the possible reasons for this state of affairs have been identified —

(i) Based on present day knowledge some of the earlier designs were not optimal particularly in regard to the design and operation of the anaerobic zone.

(ii) Operational skills to deal with a somewhat more complex plant than the ordinary had not yet been developed.

(iii) At that time local authorities did not have statutory obligation to comply with the effluent phosphate standard and hence there was no urgent need to spend money on the optimization of their plants or to provide training for their operators.

(iv) More recently it has been demonstrated that sewage characteristics play a very important role in a plant's propensity to remove phosphate. In certain instances these characteristics may have been unfavourable and the cause for the poor phosphate removal observed.

III. TKN:COD ratio as a parameter for process selection

(i) Concentration ratio of influent TKN to total influent COD (TKN:COD ratio)

(ii) Concentration ratio of influent readily biodegradable COD to total influent COD (S_{bsi}/S_{ti})

(iii) Nitrification growth rate constant (μ_{nm20}).

Some of these parameters in particular S_{bsi} and μ_{nm20} cannot be found by simple testing procedures but require relatively sophisticated experimental techniques. The monograph stresses, however, that if at all possible these parameters should be determined for each sewage.

In the absence of such measurements, the monograph suggests default values for S_{bsi}/S_{ti} and μ_{nm20}; necessarily these had to be chosen conservatively. The default values are used to illustrate the design procedures and the default values eventually define respective upper limits to the TKN:COD ratio above which the phosphate removal propensity of the 5-stage Bardenpho and UCT system is expected to decline.

Some consulting engineers and other practitioners feel that these upper limits for the TKN:COD ratios are too conservative and that there are instances of plants that remove phosphates adequately at TKN:COD ratios higher than the limiting ratios. In these instances it has not been possible, as yet, to assess if the design process as recommended in the monograph measurements of the actual S_{bsi}/S_{ti} and μ_{nm20}; and other information necessary to make the predictions are not available. Certainly if the actual S_{bsi}/S_{ti} ratio is higher then the default ratio, a higher TKN:COD would be indicated by the design procedure, and, *vice versa.* This aspect and others pertaining to the design are currently subject to research; data on full scale plants are being collected by a number of organizations whereupon it will be possible to assess what adjustments to the design procedure are needed.

IV. Empirical Model for Biological Phosphate Removal

In the monograph an empirical model is set out for biological phosphate removal. It is founded on a large laboratory data base collected on a variety of treatment process types and different sewages from the Western Cape. The prediction of the model has been verified on data from the Goudkoppies and Northern Works of the City Council of Cape Town.

In Chapter 7 of the monograph a nomogram for phosphate removal estimation is presented. The application of this nomogram by practitioners has cast doubt on its usefulness. Instances have been quoted where the model predicts relatively little or no excess biological phosphate removal, whereas excellent removal was achieved. In another instance the application of the nomogram apparently predicted good phosphate removal while in fact poor removal was achieved. This has given rise to concern and an investigation is underway to assess the validity of the model, its accuracy of prediction and in particular its correct application. The findings of this investigation will be published as soon as these are available. However, since this is the only quantitative predictive tool currently available to practitioners at this point in time, probably it will still be used for some time to come. Therefore users are cautioned as to the limitations and conservativeness built into the model.

With regard to biological phosphate removal an important development which has been under investigation for a few years now, is that of altering the composition of the raw sewage by generating readily biodegradable COD (mainly volatile fatty acids) via acid fermentation of primary sludge. Two techniques have been developed. The first is to digest the underflow from primary settling tanks in a separate digester and return the super-

natant to the process influent line. The second is to retain the raw sludge in the primary settling tanks to encourage acid fermentation. Application of these techniques at a number of works, for example Johannesburg's Northern Works, the Windhoek Works and the Kelowna Works in Canada, has given very promising results, substantially improving the magnitude of the phosphorus removal and to allow influent with higher TKN:COD ratios to be amenable to P removal. The advantage of the second technique is that it can be applied in an existing works without major structural modifications and it offers the possibility of smaller anaerobic zones in new designs. Also, primary sedimentation may be preferable in new plants since it would lend itself to the manipulation of the nature of the incoming sewage, while removing 35 to 40% of the organic load which can lead to a 50% reduction in secondary sludge production and a 40% reduction in energy demand. However it is still a new technology and its limitations and the possible side effects that the altered composition may have, such as poorer settleability of the sludge, still needs to be thoroughly investigated. This technique is currently being investigated at full scale on a number of plants in the RSA by process consultants research into identifying and quantifying of parameters of significance is being undertaken by the City Council of Johannesburg, the University of Cape Town and the National Institution for Water Research.

V. Process Nomenculture

Process nomenclature used in the monograph although possibly in common use, is not consistent with the original definitions of some of the processes, particularly as regards to the BARDENPHO and PHOREDOX processes. This matter has been discussed by the SA Branch of IWPC Working Committee for Nutrient Removal and the committee has recommended the use of a consistent nomenclature, *inter alia,* that the names 3-stage BARDENPHO (anaerobic/anoxic/aerobic) process, 5-stage BARDENPHO (anaerobic/anoxic aerobic/anoxic/aerobic) process and the 2-stage PHOREDOX (anaerobic/aerobic nonnitrifying) be used by its members. This consistent nomenclature will hopefully overcome the confusion currently reigning in the misnaming of these processes.

It is clear from the above that there are a number of unresolved issues relating to biological nutrient removal. Nevertheless, practice and RSA legislation require decisions on the design, modification and operation of sewage works to be made today. Consequently, the WRC offers as its contribution to this important field, its monograph on the "Theory, Design and Operation of Biological Nutrient Removal

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Master plan for surface hydrology

A core working group, whose task will be the systematic identification of research needs in South Africa for surface hydrology, has recently been initiated by the Water Research Commission.

Surface hydrology is a field which to date has not had an adequate overall master plan. The subject matter is wide and requires a multi-disciplinary approach to cover it adequately. Where necessary the core working group will call upon the expertise of other knowledgeable scientists and engineers on an *ad hoc* basis.

The Water Research Commission has identified certain people in terms of their proven expertise, experience and knowledge of hydrological research and South African water resources, and invited them to serve on this group in a personal capacity. Initially the members of the core group are to be Dr PJT Roberts, Mr DWH Cousens, Prof RE Schulze, Mr E Braune and Mr F Kruger. Dr LP Fatti will be serving in an advisory capacity on methodology.

Surface hydrology is highly interdependant with other aspects of water research e.g. hydrometeorology and geohydrology. The master plan will be developed to allow efficient co-ordination of effort between these three fields and other aspects of water research.

Whereas hydrometeorological research will include, amongst others, energy, precipitation, meteorological droughts and climatological studies, surface hydrology will be concerned with catchments and their processes such as interception, infiltration, overland flow, evapotranspiration and flood studies as well as streamflow and soil moisture. Research on groundwater, for which there is already a developed master plan, deals mainly with the development of techniques for the determination of national and regional groundwater resources, groundwater process studies, conjunctive use of ground and surface water resources and geohydrological techniques.

Any of this research may necessitate studies on physical, conceptual, statistical, analogue or empirical techniques as well as on computer numerical methods. It normally requires the collection, processing, quality control, storage and extraction of data. This may require work to be undertaken on instrumentation.

The function of the working group will be to develop and maintain the master research plan for surface hydrology. This master plan will outline future research needs and priorities and will be closely linked to a register of research projects. The register documents projects which have been completed or are currently being undertaken and is maintained by the WRC.

The August issue of *SA Waterbulletin* introduced an important new project to its readers, viz., the National Industrial Water and Wastewater Survey (NATSURV). In collaboration with the Department of Water Affairs, the WRC has sponsored this survey of industrial water-related practices. Survey data will be stored on a computer database to eventually report for legislative and planning purposes.

NATSURV: PROGRESS REPORT

The first phase of the NATSURV project has now run its course. The year 1984 saw the drawing together of personnel and equipment to serve teams whose interests centred on particular aspects of the overall project. Teams were formulated to undertake the surveying, analytical chemistry and computing functions. Since each team was established as a semi-autonomous unit and staffed by professionals in the various disciplines, the development of each team's capabilities was simultaneous and highly specific. Experience gained in the field generated ideas and formed the basis for new approaches and techniques. Indeed, problems brought to light by early field work necessitated radical rethinking of NATSURV policy on more than one occasion.

Project mobilisation and the early sorties into largely unfamiliar industries provided much hard-won experience and NATSURV'S expeditionary and laboratory efforts are now beginning to bear fruit in the somewhat indigestible form of computer printout.

LOCALITY

It was logistically desirable to concentrate early surveying in the proximity of project headquarters in Wynberg, Transvaal. Accordingly, the surveying teams have so far been active in Wynberg, Isando, Spartan and Chloorkop industrial estates. However, pre-arranged survey visits to specific industrial premises in other areas for the purpose of broadening experience or testing new equipment were also undertaken.

The initial proposal that the surveying teams should 'walk-the-streets', visiting each premises in turn was followed faithfully. However, it soon became apparent that industrial water usage was significant in only a portion of those premises visited. Hence it became necessary at an early stage to distinguish between those premises whose survey resulted in a questionnaire return and those which did not (see Table 1). The small number of the former which was produced from such intensive area coverage was attributed to the non-manufacturing nature of industries located in these estates. The teams discovered few water-related problems and this is probably due to the fact that these estates were all established comparatively recently with modern plant and infrastructural services.

RESULTS

To date, some 75 industry types have been identified as being significantly different in the NATSURV context. If scale is accounted for by a large, medium and small classification, questionnaire returns from 225 selected premises would be required to form a database comprising just one unit of each. The non-selective princi-

TABLE 1: NATSURV PROGRESS

Industrial estate	Surveys	Surveys resulting in a questionnaire return	
		in progress	completed
Wynberg	451	9	35
Isando	208	18	44
Spartan	247	13	32
Chloorkop	15	1	1
Other areas*	13	4	8
Total	**934**	**45**	**120**

*... Germiston, Krugersdorp, Balfour, Rosslyn, Alberton, Nigel, Four Ways. Springs, Benoni.

ple embodied in the concept of 'walking-in-streets' and the character of industrial estates initially surveyed has meant that results which are truly comparative are scarce as yet and conclusions drawn from them would therefore be of dubious value.

Instead, it is felt that the reader may be interested in how some examples of numerical data collected from actual cases may be presented in a meaningful and useful manner. Eventually, all factories for which a questionnaire return has been filed will have the collated information returned to them in computer printout form direct from the NATSURV database.

Fig.1 shows the water consumption of two breweries of comparable size. Brewery A is an ageing installation which is being 'run down'; the trends of the water intake and beer production graph lines confirm this. Brewery B (Fig 2), is a state-of-the-art installation which has recently been commissioned but is still being tuned for optimum performance. The trends indicate rising production and contrast strikingly with those for Brewery A over the same time period. Variations in water efficiency (indicated by the water/beer ratio (Specific Water intake, SWI)) for each brewery may be checked at a glance from these plots.

Fig. 3 shows a breakdown of the areas in which water is used in the particular case of a well-run rural abattoir. The case will be of great interest to the meat industry because it shows that utilities i.e. (refrigeration, cooling, hot water and steam) demand some 52% of the total water consumption. Hence it is clear that this area should be the first to receive attention in a search for water and energy savings to reduce costs.

NATSURV PHASE II

With funds now allocated for the continuance of NATSURV through 1985 and 1986, the teams are looking forward to consolidating progress made to date and the prospect of further challenges. To promote speedier progress towards the accumulation of sufficient data to be statistically useful, provision

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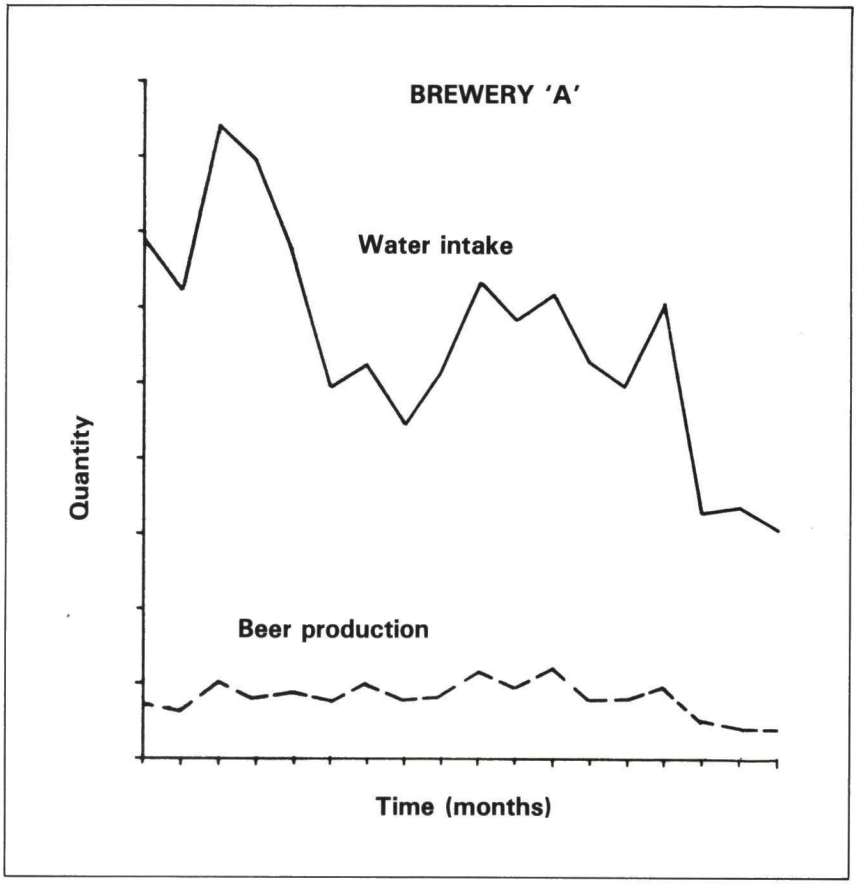
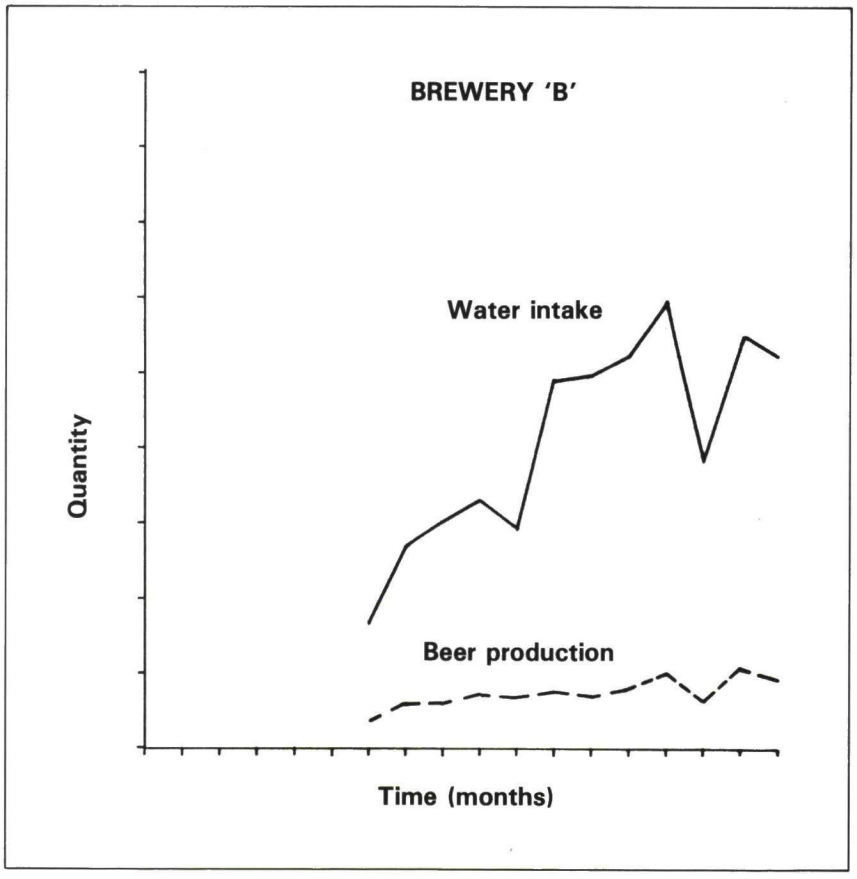


FIG 1



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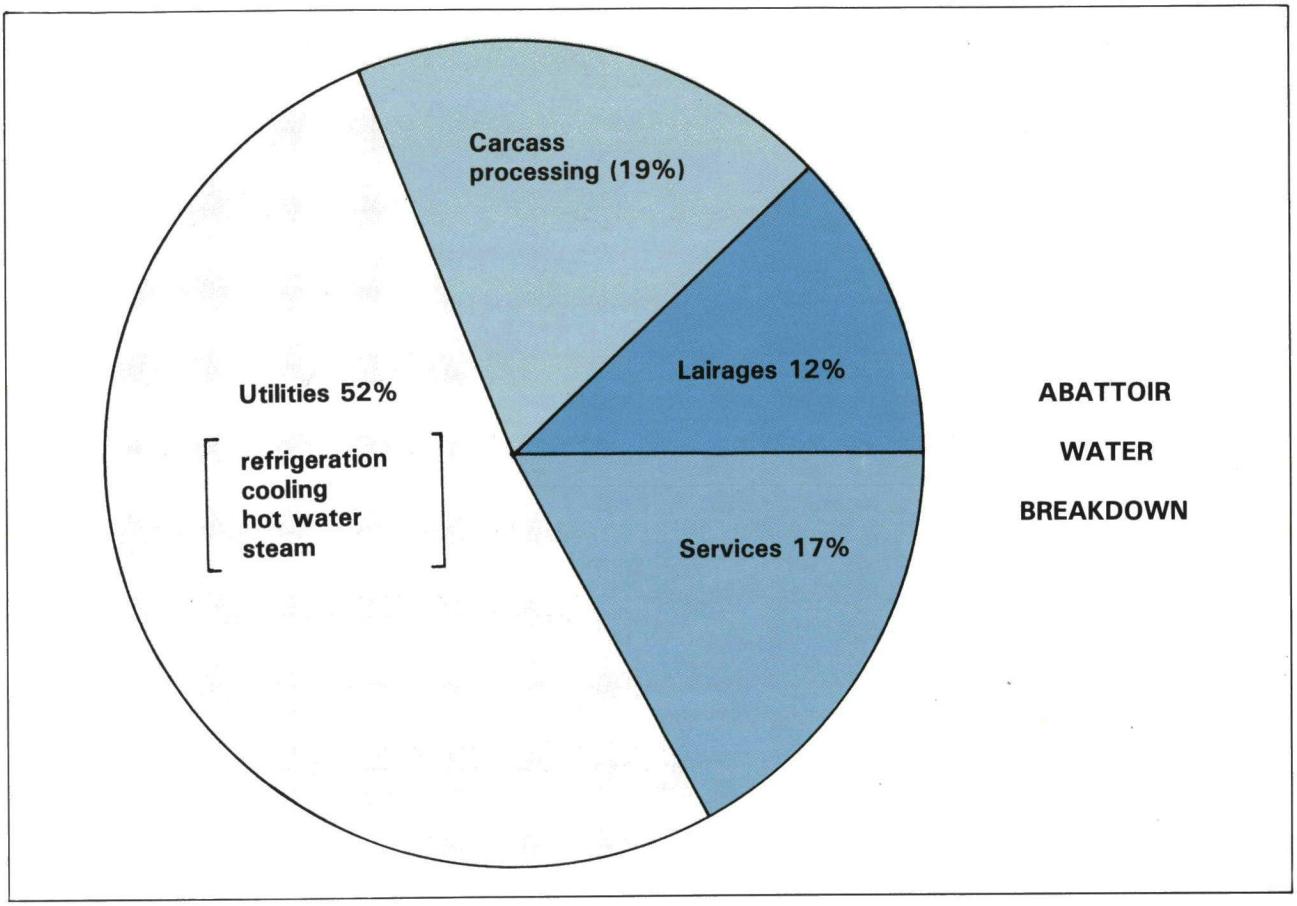

FIG 3

NATSURV

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has now been made for 2 additional surveying teams to be sent into the field.

The advent of Phase II has also brought some policy changes. Foremost among these is the introduction of a selective approach which will be used to decide which premises are to be surveyed. This change has resulted from the need for the more significant data at an early project stage. It has been decided that the selection shall in the first place be based on water intake as defined by the recently promulgated Water Amendment Act.

In order to seek out those industrial premises whose water-related activities may most usefully be evaluated, it will be necessary for the NATSURV teams to liaise more closely with other organisations, particularly the municipalities. This will ensure that maximum effort is directed at those cases most deserving of attention.

Through the columns of *SA Waterbulletin,* the NATSURV project team would like to thank all those who have co-operated so far and appeal to those organisations which are concerned with the water well-being of South Africa to assist them in this immense task if called upon to do so in future.

WATER RE-USE FOR BEVERAGE INDUSTRY

According to an article which appeared in *ChemSa* the beverage industry will have to face the problem of water shortages both now and in the future. ''An industry that generally consumes 10 litres of water to manufacture 1 litre of product has a moral obligation to rationalise water processes'', the writer says.

Diminishing water quality and possible water rationing are problems the industry will have to face. The only controllable solution is to recycle process water.

The beverage industry is in the fortunate position to have bottle washing effluent available for recycling. Technology is available and quite a few bottle washing effluent recycle plants in South Africa are currently operating successfully.

A final thought: a normal bottling facility containing two bottle washers, discharges 50 000 litres of bottle washing effluent to drain ever hour. In a domestic city, such as Durban, where a household was rationed to 400 litres per day, one bottling facility devours the daily ration of 2 000 households! Most of this effluent could have been recycled utilising a bottle washing effluent reclamation plant.

(From left to right) Dave Moore (NBRI), Charles Chapman (WRC), Mervyn Brett (LDS), Paul Odendaal and Piet Swanepoel (Pretoria Municipality) hard at work during a midnight investigation in Queenswood, Pretoria.

Leak detection goes commercial

The Pretoria City Council pioneered the first ever commercial investigation of a municipal water distribution network in South Africa. The investigation has recently been concluded in the Pretoria suburb of Queenswood and initial indications show a cost/benefit ratio exceeding 1:2 based on the cost of water alone.

As reported in the May 1948 edition of SA Waterbulletin, the Commission in collaboration with the NBRI, has developed a methodology for implementing a water loss control programme, using an area of 150 houses in a Pretoria suburb. As a result of that exercise the Pretoria City Council appointed the commercial firm of Leak Detection Services (LDS) to undertake a water loss control investigation in the whole of the Queenswood suburb containing 890 properties including a number of large blocks of flats and a shopping centre.

LDS invited the Commission to monitor the investigations and as the work progressed a number of refinements to the earlier methodology became obvious.

Initially the area was divided into four zones but the complexities associated with a shopping centre and blocks of flats necessitated separating these developments into a fifth zone.

The first problem was encountered on day one when all the pipes shown on the drawings to be supplying the area were found to be in the closed position. It took a day and a half to trace the location of an uncharted 100 mm diameter connection. This situation also explained the low pressures experienced in the area during peak periods.

A recent water loss control programme in a Pretoria suburb consisting of 890 erven yielded inter alia 6,1 m^3/h leaking from water mains, 3,2 m^3/h leaking from house connections, 1,5 m^3/h leaking from fire service, demonstrating the real worth of leak detection.

In this fifth zone, known as Zone South West, the metered connection and the fire service to each complex were operated as internal valves and in this manner leaks on the premises of a garage and a cafe were identified and two blocks of flats were asked to check that night flows were in fact topping up roof tanks, and not leaks. In addition a 1,2 m^3/h leak was located on the fire service to a third block of flats.

In all 18 leaks were discovered with a total flow volume of approximately 23,7 m^3/h. Daily losses therefore amounted to 568,8 m^3/day. Assuming 1 m^3/day per house and a total of 240 m^3/day for the flats and commercial properties (based on 0,8 m^3/day per

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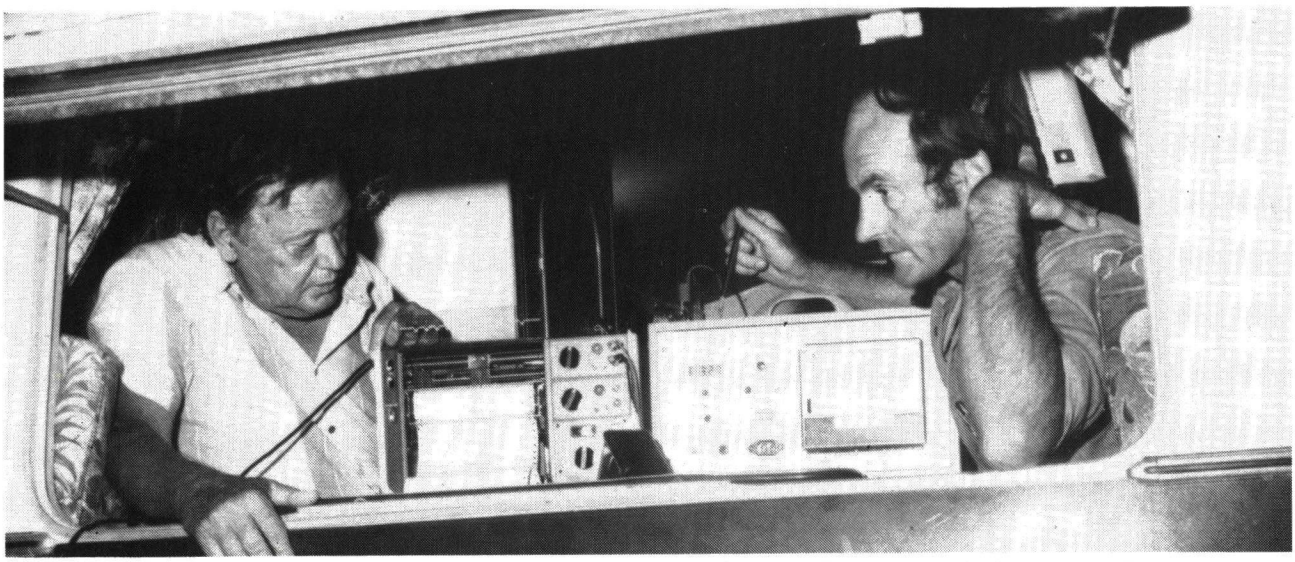

Mervyn Brett (left) and Charles Chapman monitoring the flow on the electronic flow recorder.

Leak detection

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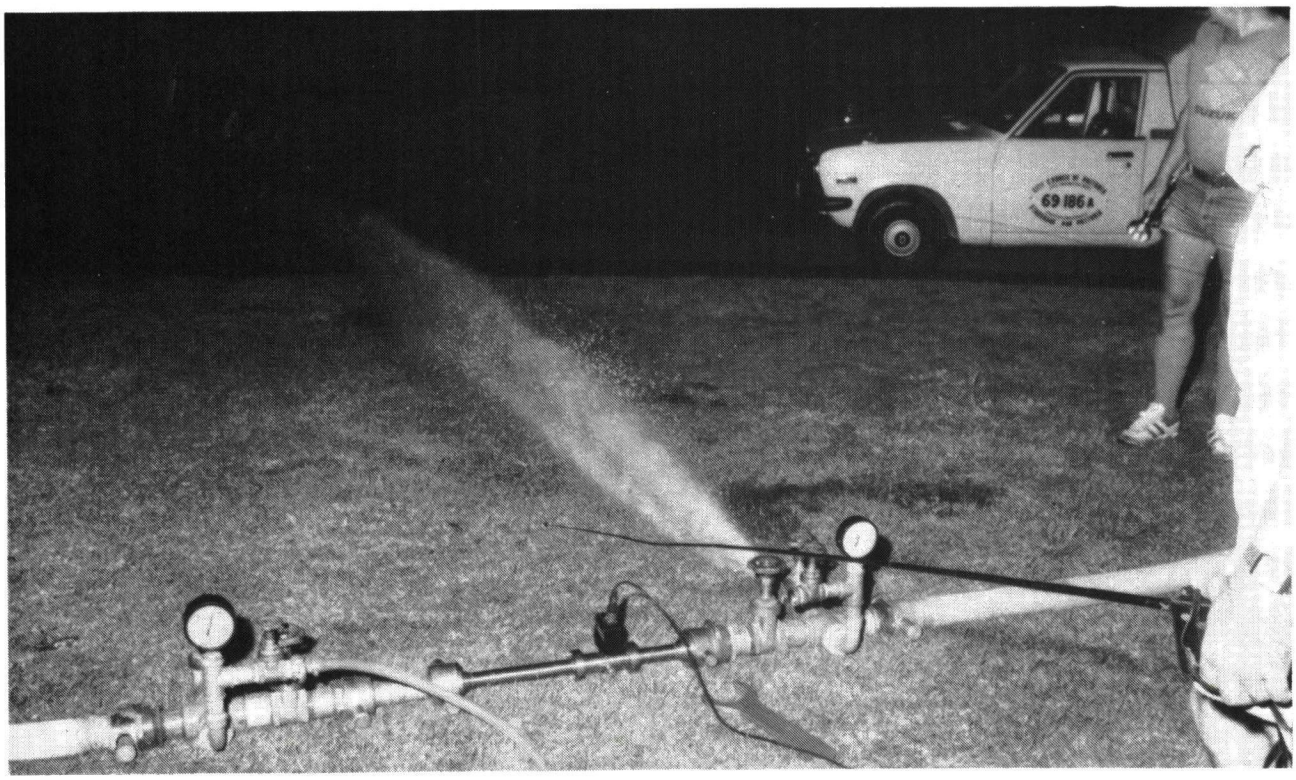
flat unit), then losses are 568,8 divided by (568,8 + 860 + 240) giving 34 per cent. The worst zone was Zone North where 62,4 per cent losses were discovered. Of this, hidden leaks made up 9,2 m^3/h, representing 46 per cent, the rest being mainly valve gland leaks.

Although the Pretoria Water Branch had, prior to the investigation, tested each and every valve in the area, leaking valve glands nevertheless still comprised the largest number of leaks.

During this exercise the approach was to survey each zone in turn, first as an initial survey and then with follow-up surveys. In future surveys, however, it appears that after the initial survey a better approach would be to concentrate on only one zone at a time until an acceptable minimum night flow (MNF) has been achieved. At this stage the local authority would accept the particular zone as having been satisfactorily surveyed and the team would move into the next zone.

The City Council of Pretoria are to be congratulated on being the first local authority in South Africa to tackle the problem of leakage literally at grass roots level by authorizing this survey.



Prior to the commencement of the step test the system must first be flushed. The picture shows the waste flow meter, control manifold and pressure gauge.

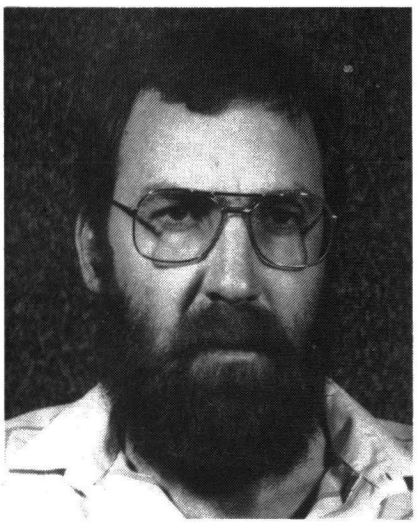
Effects of new phosphate standard:

Final report published

1 August 1985 marks the long expected and much critisized implementation of the 1 mg P/ℓ standard for effluents in sensitive catchments.

Its proponents argue that it will reduce the phosphorus load on the water environment by about 80%. There are, however, two main critisisms against the standard. Firstly, because it is a uniform standard, it ignores the spesific phosphate absorbing capacity of reservoirs and thus may be too stringent in some cases and lacking in others. Secondly, the ratio between point and non-point source contributions to the total phosphorus load from some catchments is such that control of point sources would have a negligible effect on the trophic status of impoundments.

In January 1983 the WRC launched a research project to evaluate the impact of phosphate control on the trophic status of 19 reservoirs in sensitive catchments. The research was executed jointly by Mr DC Grobler, of the Institute of Environmental Sciences of the University of the Orange Free State, and Mr MJ Silberbauer of the Hydrological Research Institute of the Department of Water Affairs. The project was completed towards the end of 1984 and the final report, entitled *Impact of eutrophication control measures on the trophic status of South African impoundments,* has since been published. (Copies can be obtained from the WRC, PO Box 824, Pretoria 0001).



Mr DC Grobler of the Institute of Environmental Sciences.

SA Waterbulletin spoke to Mr Grobler and in this article takes a look at some of the conclusions. The report should be regarded as an initial attempt at evaluating the impact of phosphate control, on the trophic status of impoundments because, as Mr Grobler puts it: "We had to do the best we could with the limited data base, with models which disregarded hydrological variability and within the limited time set aside for completing the assessment."

Mr Grobler said they used the OECD eutrophication modelling approach in their assessment of the effects of phosphate control because it proved to be useful in North America and Europe, it has modest data requirements, and it is relatively easy to apply. However, their results should be used with caution because "this assessment was only possible after making many assumptions and extending the data, often beyond limits determined by cautious scientific practice," he said.

The OECD modelling approach was developed mainly for catchmentwaterbody systems in the North Temperate regions and therefore, strictly speaking, only applies to systems with relatively stable runoff and water levels compared to that in semi-arid regions such as South Africa. Mr Grobler

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The adverse effect of eutrophication on the Hartbeespoort Dam is pictured above.

Phosphate control

(From page 11)

feels that a management orientated eutrophication model, which will allow the effects of the large variability of runoff in South Africa to be incorporated in the assessment of control strategies, should be developed for South African reservoirs.

In their report they found that the responses, to the 1 mg P/ℓ standard, of the 19 reservoirs studied will be mixed. Rietvlei, Hartbeespoort, Bon Accord, Klipvoor, Shongweni and Inanda Dams and Vaal Barrage are, or will soon become, so eutrophic that control will be necessary to prevent serious water quality problems. For two of these reservoirs, i.e. Vaal Barrage and Bon Accord Dam, standards as low as 0,5 and 0,1 mg P/ℓ will respectively be required to have a noticeable effect on the water quality.

A certain degree of eutrophication is expected to occur in Roodekopjes, Koppies, Bloemhof, Laing, Bridle Drift and Misverstand Dams. However, the point source loads on these reservoirs are so small compared to loads derived from non-point sources that the effects of the standard will probably only be marginal for Roodekopjes, Laing and Bridle Drift Dams. For Koppies, Bloemhof and Misverstand Dams no effect of the standard on their trophic status was predicted.

Vaal, Midmar, Albert Fall, Bronkhorst Spruit and Loskop Dams receive such small phosphorus loads that they will probably not require any eutrophication control measures to be taken in the next 15 years.

Mr Grobler said they also looked into removal of detergent phosphorus as a control strategy. They compared only the two ends of the scale, i.e. removal of detergent phosphorus versus introducing the standard. Of the two options only the 1 mg P/ℓ standard was predicted to be effective because it can be expected to reduce point source loads by 80 to 90%, whereas removal of detergent phosphorus alone can only be expected to reduce loads by 30 to 50% at most. However, Mr Grobler pointed out that control of detergent phosphorus could nevertheless play a supporting role in a strategy to reduce the phosphorus load on the water environment.

Their results support the criticisms against enforcing a uniform standard for all catchments. "However," Mr Grobler said, "the Department of Water Affairs should be commended for their possitive approach towards this problem. Their policy of granting permits, in certain cases, for the standard to be exceeded, amounts to the implementation of a variable standard, while at the same time the legal and administrative difficulties involved with a variable standard, are avoided."

A final thought on using eutrophication models for assessing the impact of control measures on the trophic status of reservoirs is that it must be remembered that we are dealing with complex ecosystems. "Even though the models are simple, they should only be applied by persons with professional insight regarding the reasonableness of the model assumptions and the model output for a given application," Mr Grobler said.

Water denitrified with Molasses

A batch-wise denitrification process with molasses as energy source for anaerobic bacteria with a one-time inocculation of sewage sludge was developed by Mr BD Semmelink who claims that after implementing this process his live stock units increased from nine to the fourty units at present. Mr Semmelink is a farmer at Settlers on the Springbok Flats where high nitrate concentration in water is a common phenomenon.

Mr Semmelink says that considering various options to denitrify his well-water, this process was costwise the only affordable process to try. "For more than ten years we moved through a whole series of developments to improve the process towards continuous operation without daily attendance and/or reliance on expertise," he says.

This denitrification process (initially suggested by Mr PGJ Meiring, a consulting engineer) was initiated after Mr Semmelink felt that some of the problems he experienced with his dairy cows were due to the high nitrate content of the water. He says a dairy cow in early lactation normally takes in about 100 litres of water per day and is therefore more affected by the water than beef cattle. As in humans the nitrates cause methaemoglobin formation which cannot carry oxygen.

Mr Semmelink feels that oxygen starvation predisposes the animal to disease and impairs curing. "Metabolism is retarded and reduced. Growth is delayed and the animals are slow to mature and reproduce. The stunted cows produce little milk and cannot maintain lactation for the normal ten months. Calves at birth may weigh around 20 kg instead of 40 kg and the impaired metabolism increases heat stress."

Apart from direct and indirect oxygen starvation, Mr Semmelink also claims that nitrates can block the absorption of Vitamin A.

Mr Semmelink describes the present denitrification unit as one which utilises straight (undiluted) molasses. Innoculation with sludge is superfluous, the ratio of molasses to water is adjustable, but once adjusted it is mechanically maintained, and the design permits utilisation even in areas without electrical supply.

Mr BD Semmelink at his denitrification plant.

"Costwise the unit seldom will require more than one kW to function and the investment involved is largely limited to one motor, two positive displacements pumps, a system of speed control through pulleys, belts, reduction boxes, chains and sprockets, several reservoirs, a stone/sand filter, and an air introducer to render the water even more palatable. Depending on circumstances a ground-level design could be affected with introduction of additional pumps. Our circumstances favoured an overhead placement of reservoirs and a filter with the pump drive at convenient table height," Mr Semmelink says.

A recent chemical analysis has proved that the denitrification process is successful. The nitrate content (as N) fell from 34,3 mg/ℓ to 0,2 mg/ℓ in the groundwater. Other elements and compounds such as nitrite, fluoride, chloride, carbonate, sulphate, bicarbonate, potassium, sodium, magnesium, iron and $NaHCO_3$ as $CaCO_3$ were also acceptable.

Thus far the processed water was found acceptable only for animal use and Mr Semmelink believes with extended filtering it will also be fit and safe for human consumption.

Productive use of water in mining

Grim predictions for South Africa's water situation by the year 2000 led many individuals, organisations and Departments to take a serious look at the economical use of water. At a symposium on "Water and Sanitation Supply for Economic Development" held by the Department of Economics, Potchefstroom University, Mr DJ Bosman, head of the Water and Air Treatment Section of Anglo American Research Laboratories, spoke on the productive use of water in the mining industry.

Spray cooling pond for cooling compressed air.

According to Mr Bosman gold mines of the Chamber of Mines milled 90 million tonnes of ore during 1983. At an average gold content of 7 grams per tonne of ore the production of gold amounted to more than 600 tonnes. "The amount of water consumed by the gold mines varies from 900 to 1 100 litres per tonne of ore milled," Mr Bosman said.

Mr Bosman attributed the loss of water experienced at gold mines to evaporation, underground mining operations, cooling systems used in engineering services and seepage into the ground at residue dams.

According to Mr Bosman sewage effluent treated to the Water Act standards is used where it is available e.g. the irrigation of mine gardens. Recycled sewage effluent, however, often has to be altered by treatment because not all the circuits in the gold recovery process can tolerate the use of contaminated water.

During the mining operation the mining of hard quartzitic gold-containing rock requires blasting by explosives. "The explosives are charged into holes drilled by percussion drills. This drilling operation creates large amounts of fine dust, which is injurious to human health, and has to be suppressed with copious amounts of water. Approximately 1,5 cubic metres of water are supplied per tonne of rock mined for the purpose of dust suppression. After removal of suspended solids in clarifiers this water is recycled while the sludge, which contains substantial amounts of gold, is pumped to surface for recovery of gold," Mr Bosman said.

He continued that substantial amounts of suspended solids are picked up by water in the drilling and dust suppression processes. These suspended solids have to be removed from the water before it can be recycled to the working sites because:

- the suspended solids will rapidly impair the efficiency of the high pressure recirculating pumps,
- people inhale the water vapour when it is sprayed, leading to health problems if the water contains dust, and
- suspended solids will increase the consumption of chlorine (HTH powder) used for disinfection of the water.

During the clarification process chemicals (polyelectrolytes) are added to flocculate the finely dispersed slow settling particles into larger fast settling flocs that can be removed from the water by sedimentation. "The water contained in this sludge, together with the water in the wet rocked hoisted to surface," Mr Bosman also said, "amounts to 110 litres per tonne of rock milled."

However, evidence is now emerging that water quality does have an influence on the gold recovery process. For example the organics in sewage will adversely affect the gold absorption capacity of activated carbon. Therefore, in some cases the quality of water has to be altered by treatment to make it suitable for certain processes.

Evaporation

The mining operation causes the loss of 150 litres of water per tonne milled through evaporation in the ventilation system. In this regard Mr Bosman stressed that evaporation of water causes dissolved solids content of the water in the circuit to increase.

He added that when fissure water, usually saline, enters the circuit and when the water dissolves soluble chemicals from the rock, the dissolved solids content of the mining water also increases. Spillages and washing of unused material from drill holes also add to the dissolved solids content of the underground service water.

Problems caused by a build-up of dissolved solids in the water include corrosion and scaling of mining equipment. To prevent this some water from the underground water circuit is pumped out which varies from mine to mine depending on the amounts of dissolved solids added to the system. A typical volume is 50 litres per tonne of rock. "This water is not lost from the mine complex, but is reused in the metallurgical plant, but which is not always desirable," Mr Bosman said.

With regard to the underground environment he pointed out that many of the South African mines have reached depths of more than 3 000 m, where it becomes too hot for conventional mining operations. "Acceptable productivity can only be obtained by cooling the environment with relatively large refrigeration plants. Refrigeration capacity of 25 000 kW at an average size mine shaft which implies 100 000 tonnes of ore per month is not uncommon," he said.

Although some of these refrigeration plants are situated underground, a new concept is to locate them on surface where they operate more efficiently. According to Mr Bosman this new concept requires the mine service water to be pumped to surface and chilled to cool the underground environment when it is used for drilling and dust suppression. Some of the chilled water is used for cooling the air in ventilating the mine.

Water's vital role in mining also extends to the task of mechanical engineers who have to provide compressed air and refrigeration (in the case of hot mines) to the mining operation.

Certain characteristics of water make it ideal for the purpose of cooling. These characteristics are:

- usually readily obtainable and up to now inexpensive,
- easily handled,
- high specific heat, i.e. it can carry large quantities of heat per unit volume,
- does not expand or compress significantly within normally encountered temperatures,
- does not decompose, and
- technology exists to treat many types of water to prevent corrosion, scaling or fouling of heat exchangers.

Cooling systems

Three water cooling systems namely the open recirculation, closed recirculation and once-through systems are used industrially. Of these three systems the open recirculation cooling process is most widely used.

How does the open recirculation system function? Mr Bosman explained: "After the circulating water has picked up heat in the heat exchange equipment, it is cooled by passing through a cooling tower. The cooling is achieved by evaporation of a portion of the circulating water. The quantity of water lost by evaporation is approximately 2,0 per cent of the rate of circulation per 10°C cooling obtained in the tower. In the process of providing compressed air and refrigeration to a gold mine, 200 litres of water per tonne of rock are lost by evaporation in the cooling systems.

"As water evaporates from a cooling system the dissolved solids in the circulating system become concentrated. If this concentration is not controlled, a stage may be reached where the solubility of some of the salts in the water is exceeded and a scale may be deposited on heat exchange surfaces. It is important, for economic reasons, to prevent scale formation in heat exchangers by proper water treatment. It has been calculated that a scale deposit of only 0,3 mm in a heat exchanger can cause a 10 per cent increase in the power consumption of a refrigeration plant for the same output.

"The principle of cooling water treatment is to allow the dissolved solids in the water to concentrate so that the properties of most make-up waters change from corrosive to slight scale forming. The water is then maintained at a particular dissolved solids concentration by controlling the amount of water bled from the system. The slight scale forming tendency of the water is then inhibited by the addition of chemicals."

Because the bleed-off water has a high concentration of dissolved solids, it is unsuitable for re-use in industry unless it is desalinated. This, however, does not mean that bleed-off water could be of no use. Mr Bosman pointed out that the cooling system bleed-off, with a volume of 120 litres per tonne of rock milled, is transferred to the metallurgical plant water circuits. "As in the case of the water bled from the underground circuit, the quality of the cooling system bleed-off is no worse than e.g. the mill circuit water," he said.

Opleiding van watersuiweringsbedryfspersoneel

"Bedryf en toesig moet verbeter"

"Die miljoene wat belê is in waterversorgingswerke in Suid-Afrika regverdig sekerlik beskerming deur beter bedryf, beter instandhouding en beter toesig," het mnr JS Wium, Hoofbiotegnikus van die NIWN, onlangs gesê by 'n simposium oor water- en sanitasievoorsiening vir ekonomiese ontwikkeling. Die simposium is aangebied deur die Departement Ekonomie van die Potchefstroomse Universiteit.

"Die noodsaaklikheid en eenvormigheid van opleiding van bedryfspersoneel in Suid-Afrika word al baie jare besef, maar daar is nooit iets daadwerklik hieraan gedoen nie."

Volgens mnr Wium is nie-eenvormigheid in die standaard van opleiding in Suid-Afrika te wyte aan 'n tweetal faktore. In die eerste plek was opleiding in die verlede in die hande van drie verskillende Departemente en in die tweede plek is daar 'n gebrek aan geleentheid vir jong werkers in dié veld om verdere onderrig en opleiding te ontvang.

Mnr Wium sê dat die probleem van nie-eenvormigheid in 'n groot mate oorbrug sal word deur die Departement van Waterwese se beoogde regulasies waarvan die konsep reeds gepubliseer is. Dit sal vereis dat alle bedryfspersoneel en waterversorgingswerke geklassifiseer en geregistreer moet word. Voorskrifte ten opsigte van die minimum personeel wat vir 'n bepaalde klas werke benodig word, word ook neergelê.

Om onderrig en opleiding van die operateurs te bevorder, het 'n *ad hoc*-komitee aan die begin van 1984 'n leerplankomitee aangewys om die saak te ondersoek en aanbevelings te doen. Die Departement van Waterwese, Tegniese Kollege Pretoria en die NIWN is verteenwoordig in hierdie leerplankomitee.

Mnr Wium sê die voorgestelde kursus bestaan uit drie modules naamlik NTS1, 2 en 3, 'n Water- en Afvalwaterbehandelingspraktyk met Wiskunde N1 en Aanlegbedieningsteorie N1 as verpligte vakke.

Keusevakke wat beoog word sluit in Ingenieurstekene, Ingenieurswetenskap, Industriële Chemie, Chemiese Laboratoriumtegnologie en op die N2- en N3-vlakke Wiskunde en Aanlegbedieningsteorie. Hy sê verdere kursusse op 'n hoër vlak sal later oorweeg word.

"Indiensopleidingskursusse en verfrissingskursusse moet egter nog baie uitgebrei word, veral wat deelname deur die kleiner munisipaliteite betref."

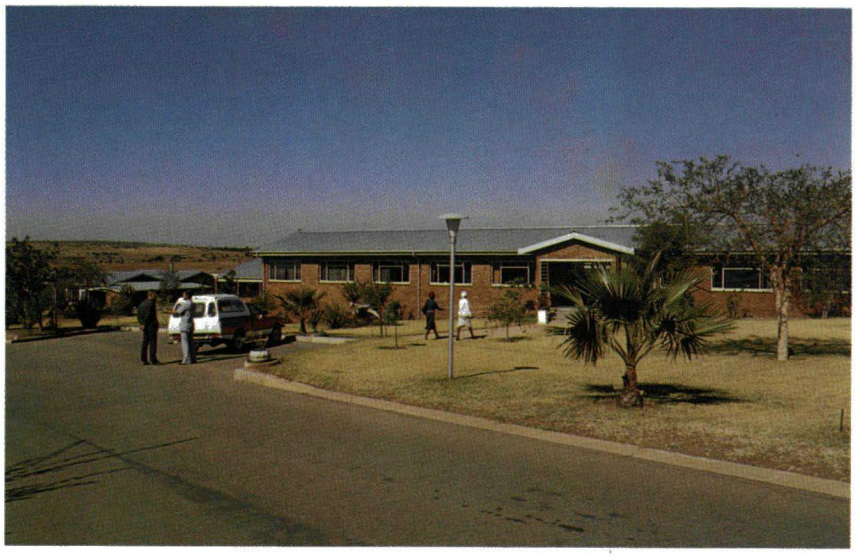
Verskeie vakke, byvoorbeeld watersuiwering, vereis praktiese opleiding na teoretiese skoling. Volgens mnr Wium bied die groter organisasies soos die Departement van Waterwese en Stadsrade voldoende geleenthede vir indiensopleiding met 'n vaste opleidingsprogram sodat nuwelinge nie ernstige probleme ondervind nie.

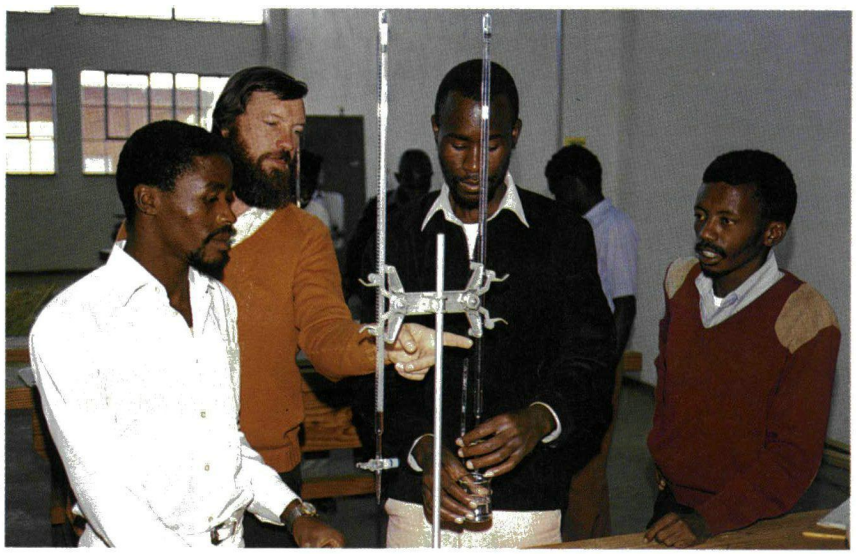
Die probleem sê mnr Wium, lê egter by die kleiner dorpe en gemeenskappe wat heel dikwels niemand in diens het wat reeds een of ander vorm van formele opleiding in hierdie vakgebied ondergaan het nie.

Die toestande in die Nasionale State en onafhanklike Swart State kan geensins uitgesonder word nie. Watervoorsiening- en sanitasiestelsels neem toe in gebiede wat voorheen glad nie so-iets geken het nie en die aanvraag na bedryfspersoneel in hierdie gebiede word ook meer.

Bogenoemde redes het aanleiding gegee dat die NIWN sedert 1966 'n adviserende diens aan die Departement Samewerking en Ontwikkeling lewer ten opsigte van water- en rioolwatersuiwering in die Nasionale State. Streekslaboratoria vir die gereelde monitering van die suiweringsaanleê is ontwikkel in die verskeie gebiede ten einde effektiewe diens te verseker.

Die NIWN se bydrae sluit ook in opleiding op 'n man-tot-man basis, lewering van kursusse wat die meeste van die teorie dek vir beide leerling of gekwalifiseerde operateurs, verskaffing van opleidingsmateriaal asook kursusse vir toesighoudende personeel. Gebruik word ook gemaak van die Indiensopleidingsentrum te Soshanguve.





(Heelbo): Soshanguve Indiensopleidingsentrum naby Pretoria.
(Bo): Onderrig aan operateurs in eenvoudige analitiese metodes vir proseskontrole.

"Voorsiening van die suiweringstelsel en versamel- of verspreidingstelsels is nie naastenby genoeg om bevredigende watervoorsiening of sanitasie te verseker nie."

In die voorsiening van water- en sanitasie-aanleê word verskeie probleme ondervind waarvan die behoorlike motivering en opleiding van bedryfspersoneel waarskynlik die grootste is. Mnr Wium meen swak bedryfsvermoë van operateurs het heel dikwels tot gevolg dat gehaltebeheer en beskerming van toerusting (die primêre funksies van 'n waterversorgingsoperateur) daaronder moet ly.

Kursusse vir operateurs is sedert 1960 deur die Instituut vir die Bestryding van Waterbesoedeling (IBWB) by 'n paar van die groter rioolwatersuiweringswerke in die Republiek aangebied. Hierdie kursusse het egter slegs rioolwatersuiwering gedek. Vanaf 1960-1972 het 505 kandidate hulle sertifikate van die IBWB verwerf, maar geen noemenswaardige erkenning is deur opvoedkundige owerhede hieraan verleen nie.

In Januarie 1973 word twee kursusse, een vir Instandhoudingswerkers en een vir operateurs, by verskeie Tegniese Kolleges en Technikons ingestel. Hierdie kursusse bestaan nog steeds en vir toelating word 'n standerd 6-sertifikaat vir Instandhoudingswerkers en 'n standerd 8-sertifikaat vir operateurs vereis. In beide gevalle is minstens 6 maande toepaslike ondervinding ook 'n voorvereiste.

Instansies waar die kursusse aangebied word is:

- Shikoane Matlala en Edendale Tegniese Kolleges vir Swart persone (beide die kursusse vir Instandhoudingswerkers en operateurs word hier aangebied, terwyl die ander instansies slegs die operateurskursus aanbied);
- Athlone Tegniese Kollege vir Kleurlinge;
- ML Sultan Technikon vir Asiate, en
- Pretoria en Durban Tegniese Kolleges asook die Witwatersrandse Technikon vir Blankes.

Aquaculture: Double Feature

In the following two articles *SA Waterbulletin* takes a look at two countries and their successes in aquaculture. Production of freshwater prawns in Mauritius is viewed and in the second part of aquaculture in Taiwan the achievements of Tungkang Marine Laboratory are discussed.

AQUACULTURE IN MAURITIUS

For some, the freshwater prawn or "camaron" is part of a glorious island memory, but for most it is an unknown delicacy. The project manager for the Camaron Production Co Ltd in Mauritius, Dr Rogene K Thompson, recently visited South Africa and during a brief interview told the *SA Waterbulletin* about her work with the freshwater prawn, and some of the successes achieved in the establishment of commercial prawn culture in Mauritius.

Dr Thompson originally hails from the United States where she received her Ph.D. in invertebrate zoology at the University of California, Berkeley. Her début with freshwater prawns was made in 1972 when she joined the PEACE CORPS, a volunteer organisation from the United States, and was assigned to the Government Ministry of Fisheries' research programme for freshwater prawns in Mauritius.

In 1976 Dr Thompson was approached by the private sector, with whom she has been involved since then, to manage both their hatchery and the commercial development of freshwater prawn culture island-wide, including the training of Mauritian personnel.

Production of the giant freshwater prawn — scientifically known as *Macrobrachium rosenbergii* — in Mauritius involves two aspects;

- hatchery production of juveniles, and
- grow-out of juveniles to market size in freshwater earthen ponds.

The Camaron prawn, a delicacy and national dish in Mauritius. In taste it compares favourably with brackish water prawns.

According to Dr Thompson the hatchery is located near the sea because the developing larval prawns need brackish water.

This centralised hatchery, Camaron Hatchery Co Ltd, produces juveniles for its shareholders, for individual farmers, and for exportation. The hatchery, whose production capacity is 6 to 10 million juveniles per year, limits its production to meet the current market demands of approximately 2.5 million juveniles.

Juveniles have been successfully exported to South Africa, Malawi, La Réunion, and France. These are countries where juveniles are sure to arrive within 36 to 48 hours after departure by air freight from Mauritius, the maximum time for which a high survival rate can be guaranteed. Exportation to countries which cannot be reached within this time limit is therefore discouraged.

The technology used in the hatchery is known as "the green water" method because it uses phytoplankton-rich water as a rearing medium. The larvae do not feed directly on the phytoplankton but are given fish flesh and "brine shrimp" throughout the larval cycle of 30-35 days. The phytoplankton, however, is thought to remove waste products of larval metabolism. This system was first developed in Hawaii by Mr T Fujimura who also introduced the first prawn broodstock into Mauritius. It has the advantage of being easily applied by fairly unskilled labour, but the disadvantage of requiring large quantities of both freshwater and sea water, which necessitates that the hatchery be located near the sea.

The recent trend is to rear larvae in "clear water" recirculating filtered brackish water systems with no phytoplankton. This enables hatcheries to be located inland and to use either transported sea water, or artificial sea salts of the type developed for use in aquaria.

Production of market size prawns in Mauritius between 1977 and 1983 has increased from 2 tonnes to about 28 tonnes per year. There are 12 commercial farms whose pond area is about 17 hectares; there are some 60 ponds island-wide in diverse environmental locations. A reliable supply of juveniles, improved scientific management of the grow-out ponds through provision of an extension service to prawn farmers, and development of locally manufactured water-stable pelleted feed, account for this considerable improvement of production.

A new company, Camaron Production Co Ltd, has been formed which will operate a centralised farm of 20 hectares of grow-out

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(Top): Riche en Eau sugar estate grow-out ponds situated on a 1½ ha facility.
(Above):A 3 ha grow-out pond for juveniles cultured to a market size.

AQUACULTURE SUCCESSES

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ponds, utilising over 3 million juveniles per year. This will enable the centralised hatchery to function at its full production capacity. The new farm should produce 70 tonnes per year of market size prawns, increasing the island-wide production to nearly 100 tonnes.

When asked if prawn farms produce both for the local and export markets, Dr Thompson said that the Mauritian Government's policy does not encourage export until the local market has been saturated. ''Therefore, only the local market (hotels, restaurants, retail outlets) is supplied at present even though a viable export market does exist. Perhaps, when the new centralised prawn farm is in full production, exportation will commence,'' she said.

The growth rate and overall production from grow-out ponds can be affected by water quality and temperature, predators, disease, and stocking density. In Mauritius the standard stocking density is 16 juveniles per square meter or about 160 000 per hectare. About 6 months after stocking the pond, monthly harvests are started to selectively seine out the market size (30 to 40 grams) prawns. The selling price of prawns is currently about R18 (US$8.-) per kilo. Average production is about 2,5 tonnes/hectare/year.

An even higher return and better survival can be obtained by using ''nursery'' ponds as an intermediate step between the hatchery and grow-out ponds. Stocking slightly larger juveniles, between 1,5 and 2 centimeters long, ensures better survival and accountability when transferring into the larger grow-out ponds (0,4 to 1 ha). Nursery ponds are now used by many of the prawn farmers in Mauritius.

Because of the island's ideal climatic conditions and the inherent hardiness of this prawn species, serious diseases are scarce. During the larval rearing phase, occasional bacterial diseases do occur but these can often be controlled by using antibiotics or by improving the water quality. In the ponds major diseases hardly ever occur. Most of the losses are related to moulting — when prawns change their exoskeleton — due to cannibalism of moulting prawns which are soft and vulnerable by other non-moulting prawns and to an inability to successfully complete the moulting process.

In Mauritius major losses are usually due to bad water quality, primarily low dissolved oxygen. Occasionally ''black spots'' due to bacterial infections occur on the exoskeleton of the prawns. This does not usually cause death of the animal but it does affect their market acceptance. This problem is often due to excess organic matter and bad water quality in the pond, both of which can be controlled.

Predators of the species being cultured have been a headache for many aquaculturists, particularly in South Africa, but Mauritius is fortunately not severely plagued with this problem. ''Wild'' tilapia is the only predator worth mentioning other than man, but according to Dr Thompson, if the prawn farmer screens his inlet water sufficiently, problems with predators can be avoided.

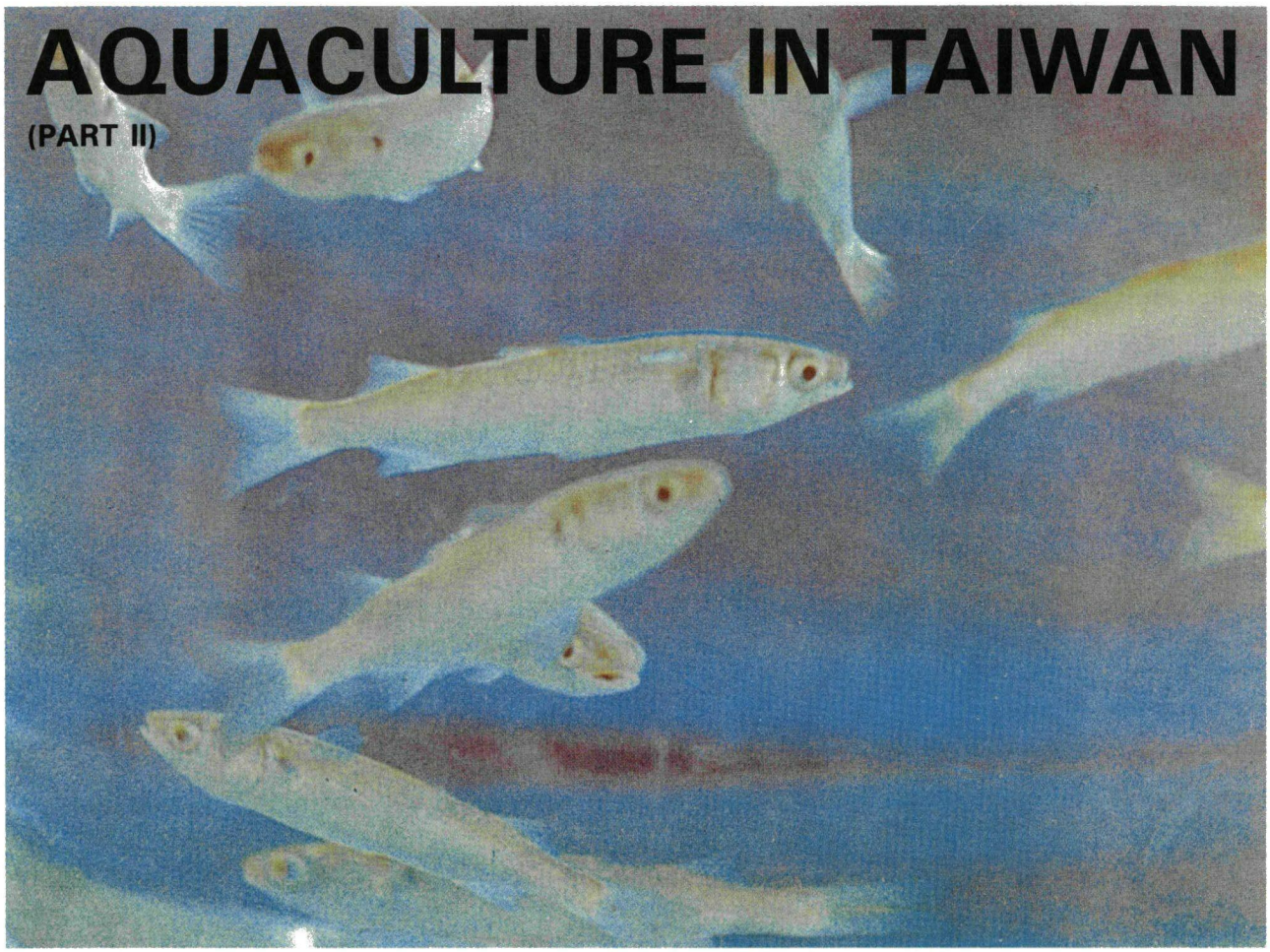
A progressive mind certainly would be eager to know what the possibilities are to cultivate freshwater prawns successfully in South Africa. ''Good, if organised successfully and an appropriate site is chosen,'' Dr Thompson responded. ''A pilot project has already been done in South Africa. Juveniles for this two year project came from Camaron Hatchery Co Ltd, Mauritius, and I understand that despite the limitations of the environment, and Xenopus frog predators, the grow-out of the juveniles was a success.''

The greatest problem facing the development of freshwater prawn aquaculture in South Africa is finding adequate fresh water in areas with the correct year-around temperatures (18 to 32°C). South Africa is in general cooler than Mauritius, and if areas which have adequate freshwater can only be identified in places where the maximum grow-out season is 7 months, then the intensive hatchery and over-wintering nursery system developed for temperate climates in places like Israel and South Carolina (USA), would have to be utilised.

Packing juvenile prawns for exportation to South Africa.

AQUACULTURE IN TAIWAN

(PART II)



Young mullet of second generation brought forth by 'Complete Culture'. (Photo: Tungkang Marine Laboratory)

Located in Southern Taiwan facing the Taiwanese Strait, Tungkang Marine Laboratory (TML) had received world-wide acknowledgement for its achievements in aquaculture.

Tungkang Marine Laboratory, founded in 1968 with financial support from the Rockefeller Foundation, was initially known as the Tungkang Shrimp Culture Centre. The Laboratory's name changed after it became an organisation functioning under the Taiwan Fisheries Research Institute (TFRI) in 1971.

The TML, 7 hectares in size, is enclaved by one of the oldest fishing ports in Taiwan, the village of Tungkang. This setting's good water quality and weather makes it ideal for scientific research in aquaculture. At the head of the Institute is Dr I-Chiu Liao.

Overfishing and water pollution of the sea in recent years emphasises the importance of aquaculture and ocean resources protection. "Since the location and other geographical characteristics of Taiwan makes it superior in exploiting the sea as well as developing aquaculture, the responsibility of the Institute has therefore become more and more demanding," Dr Liao says.

According to Dr Liao the Institute's effort will not only promote the development of aquaculture, "but will also contribute towards solving the problem of food shortages in the world."

Research done by the Institute, amongst others, includes work on seven species of saltwater prawns and one species of freshwater prawn (*Macrobrachium rosenbergii*), Grey Mullet (*Mugil cephalus*), Milkfish (*Chanos chanos*), Tilapia, Sea Bass (*Lates calcarifer*) and the Mudskipper (*Boleophthalmus chinensis*).

Other fields of research include fish diseases, food organisms and the physiological ecology of marine zooplankton.

According to Dr Liao one of the aims with research on saltwater prawns is to intensify prawn culture. Experiments in this field at the Institute mainly centre around;

- the development of formulae for specialised artificial feeds for larval and adult prawn, including experiments on the absorption and digestion of various sources of protein and the optimum contents of other nutrients. Experiments on analysis and comparison of feeds produced by domestic and foreign companies are also carried out;
- the induced maturation of pond-reared prawns by means of eyestalk ablation;
- the effects of environmental parameters such as salinity, dissolved oxygen, hardness, ammonia and hydrogen sulphide on the growth of larval and adult prawns;
- improvements of techniques concerning pond management such as optimum stocking rate, feeding rate, feasibility of polyculture, artificial substrate and pond engineering;

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- techniques of transporting larvae from Taiwan to foreign countries;
- and finally the cross breeding of freshwater prawns with local and foreign species that exhibit better qualities.

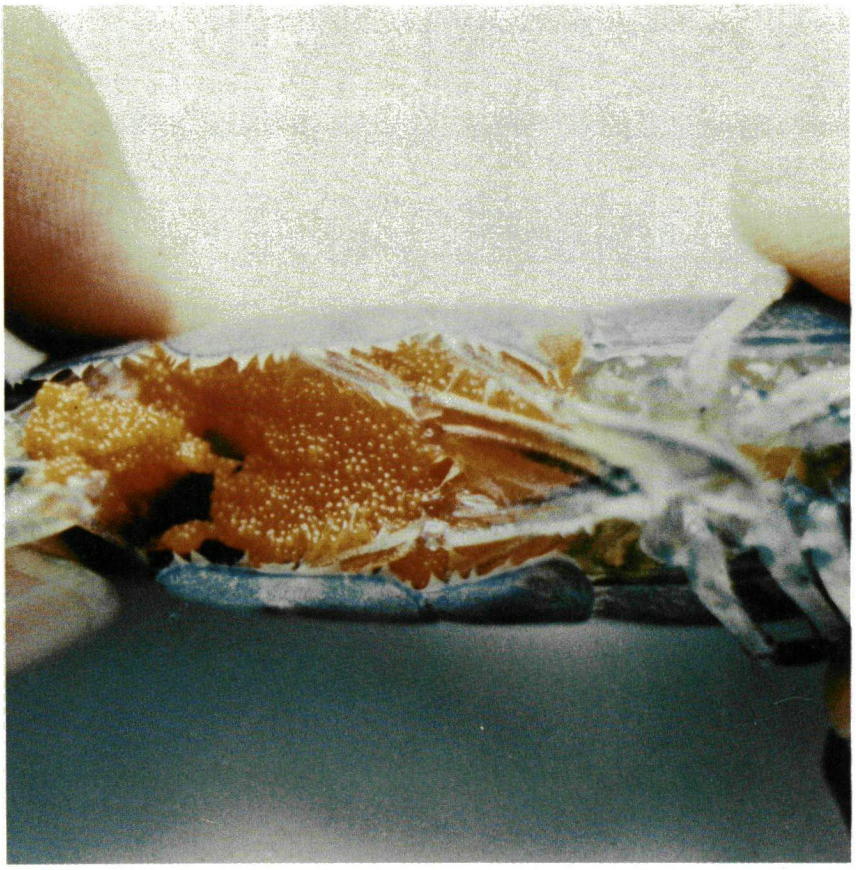
Efforts by the TML to increase harvest from the sea by artificial means and to meet a shortage from natural sources entered a new era when the grass shrimp was first successfully cultured by the TML.

During the cultivation of the grass shrimp, the Institute did not experience great difficulty which Dr Liao attributes to the shrimp's ability to endure high temperatures, its rapid growth and its ability to thrive in various degrees of salinity and on many types of feed.

Another great achievement of the TML was their success in the artificial propagation of the grey mullet in 1970. This project proved that the whole life cycle of the grey mullet can be completely controlled in captivity. They also succeeded in inducing pond-reared mullets, which were originally artificially propagated, to spawn in captivity. Research in this field is currently concentrating on:

- the development of more advanced propagation techniques to assure the mass production of fry;
- the cryopreservation of mullet sperm to ensure reliable sperm sources;
- the variation of hormone contents in the blood in relation to the maturation of fish; and
- the improvement of pond management, including experiments on polyculture with milkfish and grass prawn and a comparison of growth rates of these and other fish in freshwater, brackish water and saltwater ponds.

The TML under the leadership of Mrs NC Liao was also responsible for the introduction and development of the freshwater prawn culture in Taiwan. Compared to the annual production of 15 000 tonnes of grass prawn in Taiwan, fresh water prawn farmers now, after only a number of years, already produce more than 750 000 tonnes of the giant fresh water prawn per year which is all locally consumed.



The female giant freshwater prawn in berry. This industry is currently producing more than 750 t of freshwater prawn annually, approximately 300 million US dollars worth per year.

A lack of milkfish fry in Taiwan and other Southeast Asian countries led the TML to concentrate, in this regard, on the artificial propagation and mass production of its fry.

Milkfish spawners occurring in their natural habitat are difficult to capture and the TML therefore tried to induce the maturation of pond-reared fish by hormone injection. This technique, studied from physiological and ecological aspects, already proved successful.

As a result of the successes obtained in the development of the artificial spawning techniques and mass rearing of larvae and juveniles of fish and prawns at the TML, this Centre plays a very important role in the extension and training programmes of aquaculture in Taiwan for the benefit of the local fish farmers. They provide practical training and aquaculture courses to local and foreign trainees as well as practical help and guidance to farmers.

The goal of the TML for the future as Dr Liao sees it is to "utilize the ocean and the coast of Taiwan for culture purposes. This will enable the Institute to offer the basic knowledge for future implementation of a sea ranching programme," Dr Liao says.

In 1982 het 1 800 liter water in Pretoria sowat 50c gekos — minder as *1* liter koeldrank. ''Probeer nou iemand oortuig dat daar 'n groot tekort is aan 'n produk as dit teen so 'n lae prys verkoop word!'' — mnr De Villiers Loubser, hoofwateringenieur van Pretoria, in 'n artikel in *Die Siviele Ingenieur in Suid-Afrika* (Januarie 1985, *27*, 1) oor

Maatreëls vir waterbesparing

'n Permanente tariefstelsel wat vinnig aangepas kan word tot 'n stelsel wat effektief tot waterbesparing kan bydra, is noodsaaklik,'' sê mnr Loubser in die artikel.

''Die kwota- en glyskaalstelsel is ideaal hiervoor geskik, mits tariewe van tyd tot tyd soos nodig gewysig word. As water volop is, moet die verskil tussen die hoogste en die laagste tarief verminder word en andersom wanneer besparings verlang word,'' sê hy.

Ander aanbevelings wat in die artikel voorkom, is:

- Die kwotastelsel moet vir die groot verbruikers veral nie prysgegee word nie. Plaaslike owerhede wat nog nie dié stelsel gebruik nie kan 'n voorlopige kwota vir elke groot verbruiker volgens vorige verbruik bepaal. Vir die daaropvolgende verfyning van die kwotas moet elke verbruiker mettertyd gekodifiseer en in 'n gepaste verbruikerskategorie gelys word. 'n Databank met al die benodigde inligting ten opsigte van elke perseel sal die werk vergemaklik en die koste verminder.

Inligting

- Die berekening van die waterkwota vir 'n nuwe groot verbruiker moet bepaal word deur die nodige inligting by die aansoeker te verkry reeds wanneer die perseel by die munisipale waterstelsel aangesluit word.
- By alle nuwe gebouekomplekse, sowel as by bestaande geboue, waar dit prakties moontlik is, moet benewens die hoofwatermeter van die perseel, watermeters aangebring word vir elke afsonderlike eenheid, hetsy woonstel, kantoorsuite, nywerheidseenheid, winkel, ensovoorts.

Ontmoedig

- Die installering van apparate en toerusting wat ondoeltreffend ten opsigte van waterverbruik funksioneer, moet ontmoedig word. Dit sluit sekere tipes wasmasjiene, spoelstelsels en lugversorgingstelsels vir geboue in.
- Die ontwikkelaars van groot geboue moet aangemoedig word om geboue op te rig met 'n lae energie- en wateraanvraag.

Mnr De Villiers Loubser.

- Die plaaslike owerheid moet die watermeters elke maand aflees en die verbruikers aanmoedig om hulle eie meters daagliks af te lees.
- Dieselfde gedifferensieerde glyskale moet gedurende noodsituasies deur al die plaaslike besture in die bedieningsgebied van die grootmaatverskaffer, byvoorbeeld die Randwaterraad, toegepas word.

In sy artikel wys mnr Loubser daarop dat beroepe op verbruikers om water te bespaar nie veel sukses behaal nie, hoofsaaklik vanweë die feit dat baie verbruikers nie deur die media bereik word nie en hulle ook nie besef dat hulle sonder ongerief met minder water kan klaarkom nie.

Waterbeperkings is in 'n mate onbevredigend omdat dit veral die huisbewoner en tuinier is wat die spit afbyt. Wetstoepassing is ook duur en moeilik om uit te voer.

Hoeveel glyskale suksesvol is, is dit omslagtig om toe te pas. Aangesien dit moeilik is om die grootte van die gesin in aanmerking te neem, word alle verbruikers nie ewe billik behandel nie. ''Dit is ook wenslik dat die glyskale gelyktydig met waterbeperkings toegepas word, anders word die verbruik van water die voorreg van die welgesteldes,'' sê mnr Loubser.

Die rantsoenering van water waar aan elke verbruiker 'n sekere kwota toegeken word, is bykans 'n onhanteerbare administratiewe las vir die groter plaaslike owerheid.

Ten slotte wys hy ook daarop dat 'n onderbreking van die watertoevoer op bepaalde tye en in sekere gebiede 'n baie drastiese maatreël is wat groot ongerief meebring en ook 'n gesondheidsgevaar kan in hou. So 'n maatreël sal dus slegs in noodsgevalle oorweeg word.

Sanciahs news/nuus

NEWS FROM THE SOUTH AFRICAN NATIONAL COMMITTEE FOR THE INTERNATIONAL ASSOCIATION OF HYDROLOGICAL SCIENCES
NUUS VAN DIE SUID-AFRIKAANSE NASIONALE KOMITEE VIR DIE INTERNASIONALE GENOOTSKAP VAN HIDROLOGIESE WETENSKAPPE

Register praised by IAHS

The register of South African hydrologists has been very well received by the IAHS with a comment from the Secretary-General that it could well serve as a model for other countries to follow.

SANCIAHS has now been requested by the the Secretary-General to make recommendations about the choice of hydrologists from the register for individual membership of the IAHS. This is not an easy task and the national representative has been in communication with officials of the IAHS to determine what criteria are being used by other national committees.

SRK

Word has been received from Peter Rosewarne that Steffen, Robertson and Kirsten has established a ground-water section at their Cape Town office. Centres of expertise for ground water are not common in that area because of the lack of drought, gold and coal but Peter has included a photograph to show how effective the boreholes in the area can be!!

Alexander retires

Mr Will Alexander or "Alex as he is known to many of us, retired from his post of Manager: Scientific Services in the Department of Water Affairs after a career of 34 years. Mr Alexander spent the first eighteen years on Circle and Construction work. He was Resident Engineer of the Floriskraal, Leeuw Gamka and Erfenis Dams, Gamtoos Canals and the Orange-Fish Tunnel. The fact that the Floriskraal Dam did not fail during the extreme January 1981 flood despite being overtopped by 2,4 m above the non-overspill parapets (design head exceeded by 4,5 m) testified to the thoroughness of the construction work!

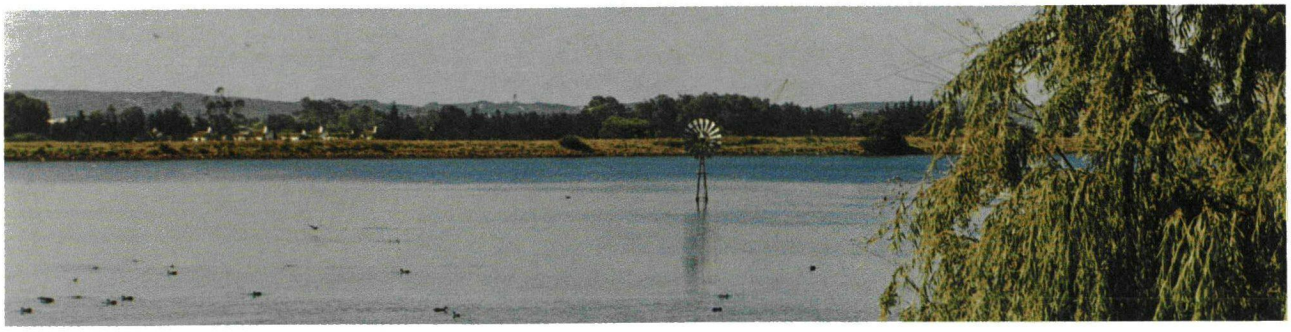
The next eight year phase of his career was in the planning/hydrological field where he served for five years as Chief: Division of Hydrology. Mr Alexander's promotion in 1976 to the position of Manager: Scientific Services was the culmination of a highly successful career where he was able to combine his interests in science, hydrology, technical report writing, photography, public apearances at lectures, symposia and congresses and liaison with many other scientific disciplines.

Professor

Alex has during recent years displayed a great deal of interest in the application of micro-computers. We are pleased to report that he has not left the profession,

Prof W Alexander.

but has taken a new post as Professor of Hydrology in the Department of Civil Engineering, University of Pretoria. We are confident that the profession and students will benefit greatly from Professor Alexander's wealth of practical experience and wish him well with his academic career.



SOUTH AFRICAN NATIONAL COMMITTEE FOR THE INTERNATIONAL ASSOCIATION OF HYDROLOGICAL SCIENCES (SANCIAHS)

SECOND SOUTH AFRICAN NATIONAL HYDROLOGICAL SYMPOSIUM, PIETERMARITZBURG, SEPTEMBER 16-18, 1985
FIRST ANNOUNCEMENT — CALL FOR PAPERS

Following the highly successful first South African National Hydrological Symposium held in Pretoria in September 1983, SANCIAHS is organising a second national hydrological symposium.

Venue : University of Natal, Pietermaritzburg (as part of the University's 75th Anniversary celebrations)

Dates : Papers : September 16 and 17, 1985 (Mon and Tues)
Excursion : September 18 to De Hoek and Cathedral Peak Hydrological Research Stations.

Topics : At this initial stage we are inviting prospective authors to submit titles on any topic relevant to Southern African hydrology, including

- Hydrological modelling
- Statistical hydrology
- Water resources management
- Irrigation
- Catchment management
- Hydrological processes
- Sediment studies
- Hydrometeorology
- Geohydrology
- Land use effects
- Urban hydrology
- Floods/Droughts

Costs : Registration : R50, including social functions.
Students R20
Excursion : R30
Accommodation : University Residence R25, including lunches.
Hotels R40 — R60, according to rating.

Enquiries : Dr PJT Roberts (012) 28-5461 or Prof RE Schulze (0331) 6-3320

SANCIAHS — SECOND NATIONAL HYDROLOGICAL SYMPOSIUM REGISTRATION

Name : _____

Address : _____

_____

_____

☐ I wish to receive further information about the Symposium.

☐ I intend to submit a paper, with tentative title:

_____

_____

_____

Abstracts must be submitted by **March 31, 1985.**

☐ I wish to attend the excursion.

☐ I wish to reserve accommodation in a University residence.

Please return as soon as possible (before March 31, 1985) to

Prof R.E. Schulze
Department of Agricultural Engineering
University of Natal
Pietermaritzburg
3201

HYDRO 85
&
DREINERING 85

REGISTRATION FORM REGISTRASIEVORM

CLOSING DATE 1985-05-31 SLUITINGSDATUM

ENQUIRIES/POSTAL ADDRESS TEL (021) 420-2438 NAVRAE/POSADRES

Prof A Rooseboom
Department Civil Engineering
University of Pretoria
PRETORIA 0002

Prof A Rooseboom
Dept Siviele Ingenieurswese
Universiteit van Pretoria
PRETORIA 0002

NAME/NAAM: _____

ORGANISATION/ORGANISASIE: _____

ADDRESS/ADRES: _____

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DREINERING 85 ☐

COSTS* : HYDRO WORKSHOP – R165; HYDRO COURSE – R220; DREINERING 85 – R45;
KOSTE* : WORKSHOP + COURSE + DREINERING 85 – R395;
WORKSHOP + COURSE – R345;
COURSE + DREINERING 85 – R245

COURSE FEES INCLUDED ☐ KURSUSFOOIE INGESLUIT
20% DEPOSIT INCLUDED ☐ 20% DEPOSITO INGESLUIT

*Provides for lunches, notes, teas *but not* for NTC Manual which is available at R20.
*Voorsien vir middagetes, aantekeninge, tee *maar nie* vir NVK—Handleiding wat teen R20 beskikbaar is.

HYDRO 85
&
DREINERING 85

JULY 1985 **UNIVERSITY OF PRETORIA UNIVERSITEIT** **JULIE 1985**

AFDELING WATERBOUKUNDIGE INGENIEURSWESE
DIVISION OF HYDRAULIC AND WATER ENGINEERING

HYDRO 85 — WORKSHOP AND COURSE IN APPLIED HYDROLOGY AND HYDRAULICS FOR ENGINEERS AND SENIOR TECHNOLOGISTS OFFERED BY THE UNIVERSITY OF PRETORIA AND THE DEPARTMENT OF WATER AFFAIRS

WORKSHOP (Includes lectures and computer sessions)

Theme : THE PLANNING AND OPERATION OF MULTI-PURPOSE, MULTI-SITE WATER RESOURCE SYSTEMS

Dates : 10 – 12 JULY 1985

Lecturers : WJR ALEXANDER, S VAN BILJON et al

Topics :
1. Rainfall, runoff and evaporation relationships in Southern Africa
2. Statistical properties of river flow and inter-basin relationships
3. Capacity/yield/risk relationships for a single dam, single purpose system
4. Stochastic hydrology and the generation of synthetic records
5. Optimisation methods for water resource systems
6. Simulation methods for complex water resource systems

The workshop will include lectures and "hands-on" computer based practicals. No prior knowledge of computer programming is required.

COURSE (Includes lectures and tutorials)

Theme : HYDROLOGICAL ANALYSES AND HYDRAULIC DESIGN CALCULATIONS RELATED TO OPEN CHANNEL FLOWS

Dates : 15 – 18 JULY 1985

Lecturers : WJR ALEXANDER, CPR ROBERTS, S VAN BILJON, AMN MULLER, A ROOSEBOOM, et al

Topics : Flood discharge calculations, flow measurements, backwater calculations, flood routing, sediment yield and reservoir sedimentation analyses, river mechanics

DREINERING 85 — PRAKTIESE EENDAGKURSUS OOR DIE TOEPASSING VAN DIE NVK-DREINERINGSHANDLEIDING BY DIE UNIVERSITEIT VAN PRETORIA

Datum : 19 JULIE 1985

Sprekers : MS BASSON, JH WIGGETT, A ROOSEBOOM

Onderwerpe : Dreineringshidrologie, ontwerp van komponente soos randsteeninlate, roosters, duikers, kanale, ondergrondse dreinering, erosiebeskerming, ens.

REGISTRATION FORM : page 26
REGISTRASIEVORM : bladsy 26

ENQUIRIES : Tel (012) 420-2438
NAVRAE : Tel (012) 420-2438

Phosphate removal

SA STILL A LEADER

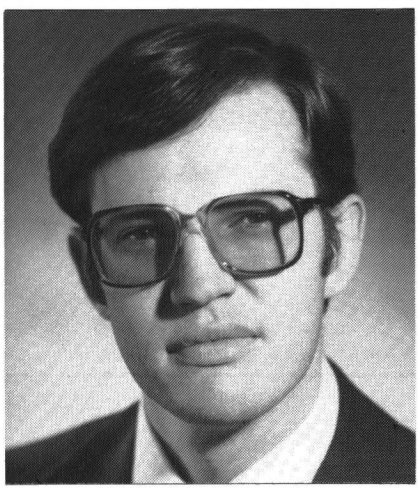
Dr HNS Wiechers, senior adviser of the Water Research Commission, last year visited Europe to acquaint himself with the latest progress in the field of wastewater treatment and particularly phosphate removal. He also attended the IAWPRC Conference in Amsterdam and the post conference seminar on enhanced biological phosphorus removal from wastewater in Paris. The following is a brief overview of his impressions.

AMSTERDAM

One of the more promising new technologies for phosphate removal presented and discussed at the Amsterdam conference, was chemical phosphate removal by calcium phosphate crystallization. This was achieved in either an upflow fixed bed or fluidized bed reactor configuration.

A thorough investigation for more than five years by Dutch and Japanese researchers at both laboratory as well as pilot scale, has generated a broad data base for evaluating the potential of this process.

Its major advantages over conventional chemical phosphate removal techniques are that no sludge is produce, i.e. only solid calcium phosphate pellets, and hence the handling, treatment and disposal problems associated with conventional chemical sludges are circumvented. The fixed-bed process configuration also has demonstrated stability and suspended solids removal capability.



Dr HNS Wiechers, secretary of the IAWPRC study group on phosphate removal in biological wastewater treatment processes.

Potential disadvantages of the technique are the use of lime with its associated operational problems and the increased hardness and pH of the treated effluent. The process appears to have considerable potential for phosphate removal from biological filter effluent as well as activated sludge process effluent.

Various new technologies aimed *inter alia* at phosphate removal from wastewaters from small communities, using filamentous algae in the RSA, water hyacinth in Malaysia and reedbed systems in the USA, were presented. Although these systems are still only in an experimental development phase, they offer significant potential for adequately dealing with nutrients in effluents from small communities where relative little control is maintained over sewage treatment.

PARIS

The IAWPRC's Paris seminar on biological phosphorus removal from wastewater was a great success in terms of stating and discussing the current state-of-the-art of biological phosphate removal. It was attended by over 200 delegates from all over the world, including 26 from South Africa. It dealt with biochemistry, modelling, microbiology, and chemical precipitation, as well as pilot and full-scale enhanced biological phosphate removal from wastewaters.

The Seminar was characterized by fairly general agreement between independent researchers on a number of findings related to biological phosphate removal. For example there was agreement that —

- biological phosphate removal was not brought about by only one micro-organism, but by a number of different ones, i.e. *Acinetobacter calcoaceticus, Acinetobacter ewoffii, Pseudomonas vescularis* and *Klebsiella pneumoniae.*
- there were certain bacteria in the anaerobic zone which broke down complex organics to short chain organics which in turn served as substrates for phosphate release and ultimately enhanced biological phosphate accummulation.

Wastewater Seminar

A specialized international seminar on modelling of biological wastewater treatment will be held from 28 to 30 August 1985 in Copenhagen, Denmark. The seminar is sponsored by the International Association on Water Pollution Research and Control and organized by the Department of Environmental Engineering, Technical University of Denmark.

The objective is to discuss activated sludge processes, including nitrification, denitrification and biological phosphorus removal. Emphasis will be put on attempts to synthesize the theoretical diversity of conceptual as well as mathematical modelling.

Enquiries may be directed to Prof Mogens Henze, Department of Environmental Engineering, Building 115C, Technical University of Denmark, DK-2800 Lyngby, Denmark.

- volatile fatty acids could be generated in primary settlers (or elsewhere) by the fermentation of raw sewage sludge and could be elutriated from this sludge by recirculation to head of works. Both results at the Johannesburg Northern Works, RSA, and the Kelowna Works, Canada, demonstrated the successful application of this technique.

The seminar focussed attention on a number of important facets of the biological phosphate removal process:

- Progress with research on the microbiology, biochemistry and chemistry of biological phosphate removal has developed substantially since the IAWPRC seminar in Pretoria in 1982. Important gaps in our knowledge remain, but a firm foundation has been laid. Biochemical pathway and chemical aspects are still ill-defined and merit further research.
- On a practical level biological phosphate removal was demonstrated to work successfully on a number of full scale plants. The reasons for unstable and insufficient phosphate reduction are understood and design and operational procudures exist to deal with them or are being actively researched.
- The possible importance of chemical phosphate removal and the need to consider this in design and operational procedures was highlighted. As a first step the Schmidt-Tannhauser-Sneider phosphate fractionation method needs to be refined to adequately distinguish between metal bound poly-phosphates and other types of phosphates. Should this phenomenon be widespread or hold potential, e.g. to stabilize phosphate-rich biological sludges, it should receive further research attention.

The seminar demonstrated that South Africa is still a leader in this field, although very significant interest and research money is now being spent on biological phosphate removal in many overseas countries, particularly Japan, France, the Netherlands and the USA.

ROME: WATER RESEARCH INSITUTE

The Water Research Institute of the Italian National Council situated in Rome has conducted research on biological and physical/chemical techniques for nutrient removal from wastewaters. A particularly interesting finding in the ''biological'' removal of phosphates was the formation of large quantities of precipitated calcium phosphate. This again pointed to the importance of chemical precipitation in ''biological'' phosphate removal processes.

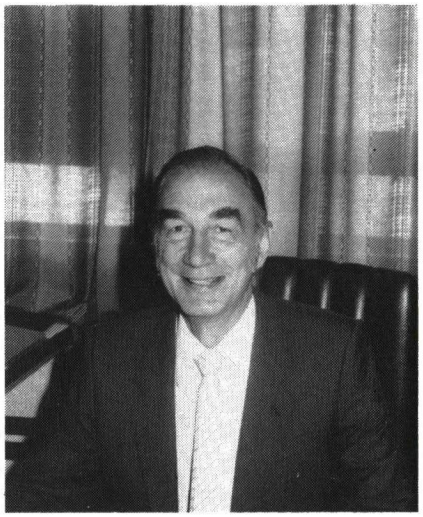
A novel technology has been developed at the Institute for the removal of ammonia and phosphate from wastewater by ion-exchange, with subsequent precipitation from the regenerant solutions by magnesium chloride addition and magnesium ammonium phosphate precipitation. This process is claimed to be cost-competitive with chemical (ferric chloride and aluminium sulphate) phosphate removal, since the problems of chemical sludge formation and salt addition are largely circumvented.

SWITZERLAND

The Sulzer Company of Switzerland has developed a technology for removing phosphate from secondary effluent from levels of 1 to 2 mg/ℓ down to 0,1 to 0,2 mg/ℓ (as total P). This process represents one of the few technologies, if not the only, available to consistently reduce effluent total phosphates to the 0,1 mg/ℓ (as P) level. This technology was developed at pilot-scale over a three year period and is currently applied at full-scale at four works in Switzerland and one in Germany. The largest installation is at Zürich's Werdhölzli works where an average dry weather flow of 4,5 m^3/sec will be treated by 1986.

Although this process is capital intensive, its running costs are low because only about 3-5 mg/ℓ iron salts are required for phosphate precipitation. Sulzer demonstrated that for the Swiss situation this process consitutes only about 10 percent of the total process cost for wastewater treatment. It is in fact cheaper than simultaneous chemical phosphate removal when applied to achieve a 1 mg/ℓ (as P) effluent standard, and gives a much higher quality effluent, i.e. a total phosphate of less than 0,2 mg/ℓ and suspended solids less than 5 mg/ℓ. This technology represents a cost-effective means of achieving very low effluent total phosphate concentrations and it should be considered, for local investigation in anticipation of stricter future effluent phosphate standards.

AANGESTEL



Mnr FPM Marais is aangestel as komiteesekretaris by die WNK. Hy volg mnr Dirk Thiart op wat aan die einde van verlede jaar met pensioen afgetree het.

Mnr Marais is in 1933 op Oudtshoorn in die Kaapprovinsie gebore. Hy matrikuleer aan die Hoërskool Victoria-Wes en studeer daarna aan die Universiteit van Pretoria waar hy 'n graad in lettere en wysbegeerte behaal. Hy is getroud met Wilhelmina Booysen, 'n Kapenaar uit Britstown se wêreld, en die egpaar het vier kinders en drie kleinkinders.

Mnr Marais was voorheen verbonde aan die Transvaalse Raad vir die Ontwikkeling van Buitestedelike Gebiede.

Ons wens graag namens die lesers van *SA Waterbulletin* vir mnr Marais 'n lang en gelukkige dienstyd by die Kommissie toe.

IBWB: 1985-KONFERENSIE

Die Suid-Afrikaanse tak van die Instituut vir die Bestryding van Waterbesoedeling (IBWB) hou sy tweejaarlikse konferensie en uitstalling van 27 tot 30 Mei 1985 in die Hotel Elangeni in Durban. Lesers wat die verrigtinge wil bywoon, moet die registrasievorm hiernaas voltooi en voor 30 April 1985 indien.

Die program vir die konferensie is as volg:

REFERATE

Maandag 27 Mei

SAAL A

Verwelkoming deur die Burgermeester van Durban en amptelike opening deur die Adjunk-minister van Landbou-ekonomie en Waterwese.

President se rede

1. "Water legislation and its implementation".
   HJ Best
2. "Expected impact of the phosphate standard on receiving waters".
   D Grobler

TEETYD

3. "Nutrient removal activated sludge plant at Bethal using fine bubble diffused air".
   N Thirion, PBB Vosloo & APC Warner
4. "Experiences with nutrient removal at Borcherd's Quarry".
   PJ King & I Palmer
5. "Operation and performance of Pinetown's Umlaas Works".
   D Kerdachi & MR Roberts

MIDDAGETE

6. "Biological phosphorus removal — Johannesburg experience" AR Pitman & H Nicholls
7. "Design of the nutrient removal plant at Vereeniging".
   JL Barnard

TEETYD

8. "Guidelines for chemical phosphorus removal from municipal wastewaters".
   H Wiechers
9. "Chemical phosphate removal at Boksburg's Vlakplaats Works".
   AS Louw & H Basson

SAAL B

MIDDAGETE

10. "Water conservation under drought conditions in a chemical process industry".
    CJ Breyer-Menke, B. Moffat & EN Schramm
11. "Defluoridation plants".
    J Buchanan

TEETYD

12. "The use of pure oxygen to uprate the activated sludge plant at Rondebult Sewerage Works".
    J Borland, R. Forrest, M Preston-White & PH van der Merwe
13. Die uitwerking van swaarmetale en patogene mikroörganismes teenwoordig in rioolslyk op 'n alkaliese duinsand en die gewasse daarop verbou.
    J Nell & JFP Engelbrecht

Dinsdag 28 Mei

SAAL A

14. "Mechanical dewatering of heat treated and untreated sewage sludges".
    J Slim
15. "Expperiences in filter press operation for sludge dewatering at Durban's Northern waste water treatment works".
    DG McIntyre
16. "Sludge dewatering characteristics".
    W Ross & M Smollen
17. "Sludge stabilization and disinfection by means of autothermal aerobic digestion using oxygen".
    BC Trim

TEETYD

18. "Biothermal stabilization of sewage sludges".
    J Nell & J McGlashan
19. "Sludge disposal to Sea".
    DJ Livingstone
20. "The effect of anaerobically digested sludge on the growth of sugar cane on a red sandy Hutton subsoil".
    JS Easton & MB Richter

MIDDAGETE

21. "Limnological studies on phosphorus cycling in Hartebeespoort Dam (1981 – 1984) and their management implications".
    FM Chutter

REGISTRASIEVORM

Naam .....

Adres .....

.....

..... **Kode** ..... **Tel.** .....

Vergesel deur .....

Registrasie vir volle tydperk LID R150,00

NIE-LID R200,00

Registrasie vir een dag LID ..... R 40,00

NIE-LID ..... R 50,00

Registrasie vir dames ..... R 75,00

Na-konferensietoer ..... R 10,00

Vordering vir laatregistrasie ..... plus 20%

Banketgaste (per persoon) ..... R 30,00

BEDRAG HIERBY INGESLUIT ..... R .....

(Tjeks moet uitgemaak word aan: IBWB (Konferensie))

Hierdie vorm (met gelde) moet VOOR 30 APRIL 1985 gestuur word aan: Sekretaris, Posbus 81249, Parkhurst 2120.

LET ASSEBLIEF OP:

Volle registrasie sluit referate in; asook vervoer na en van die burgelike onthaal; tee, middagetes (Maandag tot Woensdag) en die banket.

Registrasie vir een dag sluit nie die banket in nie.

Dames is welkom om die na-konferensietoer mee te maak.

SLEGS VIR KANTOORGEBRUIK

Datum ontvang .....

Bedrag ontvang .....

Registrasienommer .....

Opmerkings .....

22. "Water pollution from a solid waste landfill".
J Ball
23. "The training of personnel for the operation of modern waste water treatment plants in Johannesburg".
SC Deacon

SAAL B

MIDDAGETE

24. "Comparison of measurement methods for readily biodegradeable COD fraction in municipal wastewater".
G v R Marais & P Dold
25. "The effect of acetate and other short-chain carbon compounds on the kinetics of biological nutrient removal".
A. Gerber, CT Winter & RH de Villiers
26. "A laboratory study of biological phosphorus removal using the UCT process on a waste water having a high TKN/COD ratio".
E Schayek

Woensdag 29 Mei

SAAL A

27. "Disposal of sludge from a potable water treatment plant".
NR Acton & SW van der Merwe
28. "Some options for the treatment of alum sludges".
IH Palmer
29. "Pilot and full scale investigations on the use of combined dissolved air flotation and filtration for water treatment".
PBB Vosloo & PG Williams
30. "Pilot and full application of DAF technology to treat entrophic waters from Lake Insezi".
BW Bernstein & LRJ van Vuuren

TEETYD

31. "The optimisation of Natal's water supplies during the 1983/4 drought".
J Lovel
32. "Eutrophication in the Vaal Barrage; past present and future".
FC Viljoen & AJH Pieterse
33. "Water quality and cardiovascular death rates in South African urban areas".
CW Derry & JA Lusher
34. "Metal finishing effluents: survey of the SA situation with special reference to effluent load reduction, effluent treatment and water recycling".
CA Buckley
35. "A compact plant to treat effluent with high nitrogen content from a biotechnology industry".
Nicol, JM Faup (France)

TEETYD

36. "The application of a cross flow microfiltration unit to the thickening of water works alum sludge and sewage works waste activated sludge".
K Treffry-Goatley
37. "Reclamation of secondary sewage effluent by reverse osmosis — a pilot plant study".
JW Vail & JP Barnard

SAAL B

38. "Industrial water treatment with ozone in South Africa".
J van Leeuwen
39. "Chlorine dioxide vs. chlorine for the disinfection of underground mine service waters".
IA Pearson & GW Leach
40. "Practical application of physico-chemical techniques to industrial effluent treatment".
J Trope
41. "Treatment of pulp with bleach effluent for water reuse".
Groves *et al.*

TEETYD

42. "Electrodialysis of industrial effluents".
FGN de Wilde *et al.*
43. "The status of electrodialysis technology".
JJ Schoeman
44. "Timeous removal of solids from pig (waste) slurries assists in reducing odours".
AJ du Toit

MIDDAGETE

45. "Relationships between activated sludge settleability parameters and secondary settling theory verification".
G Ekama & G v R Marais
46. "A survey of filamentous bulking and panning problems in activated sludge plants in Southern Africa".
J Blackbeard & G Ekama

ALGEMEEN

Uitstalling

'n Uitstalling van vervaardigers en verskaffers van toerusting sal vanaf Maandag 27 Mei tot Woensdag 29 Mei 1985 in aangrensende sale van die Hotel Elangeni gehou word.

Verblyf

Hotel Elangeni (plek van konferensie)

Enkel B & O	R65,00 per persoon
Dubbel B & O	R44,00 per persoon

Hotel Malibu

Enkel B & O	R54,00 per persoon
Dubbel B & O	R33,00 per persoon

Hotel Maharani

Enkel B & O	R77,00 per persoon
Dubbel B & O	R54,00 per persoon

Afgevaardigdes moet self hotelverblyf reël. Blokbesprekings is by bogenoemde hotelle gereël en afgevaardigdes wat verblyf aldaar bespreek moet meld dat hulle die konferensie bywoon. Dit staan afgevaardigdes egter vry om by enige hotel van hulle keuse tuis te gaan.

Ander gebeure

Registrasie	: Maandag 27 Mei	: 07h30-08h25
Burgerlike onthaal	: Maandag 27 Mei	: 18h00-19h00
Banket	: Dinsdag 28 Mei	: 19h00
Afskeidsgeselligheid	: Woensdag 29 Mei	: 17h00

Opsionele na-konferensietoer: Donderdag 30 Mei (slegs oggend)

Tegniese uitstappie

òf 1. Noordelike werke (geaktiveerde slyk, OL Flotasie-eenheid, filterpers, ens);
òf 2. Wiggings watersuiweringswerke (konvensionele behandeling plus gevorderde behandeling — osonering)

Dames

Maandagnamiddag	:	Mt Edgecombe Suikernavorsingstasie
Dinsdagoggend	:	Haainavorsingseenheid
Woensdagoggend	:	"Oosterse" oggend

Windhoekwaterwerke nog volstoom

Die inleidende stelling van mnr PGJ Meiring in die *SA Waterbulletin* (p 19) van Augustus 1984 ". . . dat Windhoek se waterherwinningswerke . . . moontlik binne enkele jare oorbodig sal wees en gesluit sal kan word . . ." word in 'n ander lig gesien weens die volgende redes:

Windhoek ontvang tans water van die Staatswaterskema en eie bronne soos die boorgate, die Avis- en Goreangabdam en herwinningswater.

Vanuit alle beskikbare bronne sal in die toekoms, net soos in die verlede, water geproduseer word om spitsaanvraag tevrede te stel en kort onderbrekings in die lewering van enige bron te oorbrug.

Die Stadsraad van Windhoek het derhalwe in Augustus 1984 besluit om die herwinningswerke se kapasiteit met 50% uit te brei en om terselfdertyd die besinking- na 'n flotasieproses te verander wat buiten bogenoemde redes, die volgende voordele inhou:

- **Die moontlikheid van optimale, meer ekonomiese en meer koste-effektiewe benutting van herwinningswater gepaardgaande met 'n beter kwaliteit;**
- **Groter buigsaamheid in die onttrekking vanuit die gemeenskaplike suiweringswerke van Goreangabdam- en herwinningswater om sodoende sover moontlik aan drinkwaterbehoeftes te voldoen en ontspanningsaanwending tevrede te stel.**

Inagnemend die huidige voorsienings- en onttrekkingspotensiaal sal die bydrae van herwinningswater tot Windhoek se totale waterverbruik persentasiegewys oor die volgende 30 jaar afneem, maar is dit in 'n waterarm land soos Suidwes-Afrika te verwagte dat lewering van herwinningswater na die jaar 2014 weer onontbeerlik sal word.

BL HAUSSMAN PR. ING.
Stadsingenieur: Windhoek

AANGESTEL

Mev Ingrid Buchan is onlangs by die WNK aangestel as wetenskaplike redaktrise van WATER SA.

Mev Buchan het in 1962 gematrikuleer aan La Rochelle Hoër Meisieskool in die Paarl waarna sy 'n B.Sc-graad in 1965 behaal aan die Universiteit van Stellenbosch met Chemie en Mikrobiologie as hoofvakke.

In 1966 begin sy haar loopbaan by die NIWN en doen navorsing op die afbreekbaarheid van papierafval. Mev Buchan was onder andere ook werksaam by Johannesburg Munisipaliteit se stadsgesondheidsafdeling vir kwaliteitskontrole op varsmelk.

Gedurende haar dienstydperk by Pretoria Portland Cement (PPC) van 1978 tot 1983 is mev Buchan gemoeid met die kwaliteitskontrole van grondstowwe vir sementproduksie.

Voor mev Buchan se aanstelling by die WNK was sy 'n onderwyseres by Hartbeespoort Hoërskool.

Mev Buchan is getroud met John Buchan en het drie kinders.

ANALYTICAL CHEMISTRY COURSES

The Technikon Natal has announced its analytical chemistry certificate and non-certificate courses for 1985. A selection of those which may be of interest to readers is presented below. More information may be obtained from Dr H Greenberg, Analytical Chemistry Training Unit, Technikon Natal, PO Box 953, Durban 4000. Telephone (031) 31-8711.

Certificate courses

Basic atomic absorption spectroscopy (10 to 14 June; 26 to 30 August);

Basic ultra-violet/visible spectrophotometry (22 to 25 April);

Basic infrared spectrophotometry (18 to 22 March; 14 to 18 October);

Flameless techniques in atomic absorption (6 to 10 May; 16 to 20 September);

Fundamentals of gas chromatography (24 to 28 June);

Basic gas chromatography (15 to 19 April; 28 October to 1 November);

Gas analysis by gas chromatography (6 to 8 November);

Fundamentals of liquid chromatography (20 to 23 May);

Basic liquid chromatography (11 to 15 March; 2 to 6 September);

Basic capillary gas chromatography (15 to 19 July).

Non-certificate courses

Troubleshooting and maintenance of the gas chromatograph (4 to 5 November);

Water analysis (31 July to 2 August);

Basic gas chromatography/mass spectrometry (25 to 27 November);

GC: Special Techniques (12 to 14 August);

Gas chromatography/mass spectrometry applications (28 November).

2nd International Conference on

The Hydraulics of Floods and Flood Control

24-26 September, 1985, Cambridge: England.

The consequential costs of flooding in terms of lives, property, land and livestock are always high, and in third world countries the effect on the national economy may be critical. In recent years, the use of both mathematical and physical models to analyse flood flows and investigate the behaviour of structures under flood conditions, as well as methods of flood control, have brought about many improvements in flood prediction and control. Reliable computer programs are now available for flood flow prediction, and better hydraulic designs have been developed for a variety of structures such as spillways, channels and culverts, side weirs, and gates. However, there is still room for greater understanding of flood hydraulics leading to improved flood alleviation schemes throughout the world. This conference will provide the opportunity for practical engineers and researchers to discuss current practice as well as suitable subjects for further research and development in an international context.

The conference will provide an ideal forum for delegates to discuss current practice, research and development and the areas where further advancements need to be made. Papers are invited on the following subjects and relevant related topics.

- ★ Structures under flood conditions — dams, bridges, culverts, weirs, gates and spillways
- ★ Flood problems during construction
- ★ High-head structures under flood conditions
- ★ Flood damage to and near structures (including problems of erosion)
- ★ Control of floods by embankments, detention reservoirs, diversion channels, weirs, barriers, pumping stations and river regulation works
- ★ Real-time simulation and control of flow through hydraulic structures and channels
- ★ Design and application of physical and mathematical hydraulic modelling techniques in the analysis of floods and design of measures of flood control
- ★ Effects of floods on the environment — water quality, flood plains, groundwater, settlements and industry, recreation, etc.
- ★ Non-structural alternatives to flood-control measures, their combination with structural measures and emergency flood control measures.
- ★ Economic appraisal and financing of flood control structures and measures.

Enquiries should be addressed to:
Conference Organiser
2nd Floods and Flood Control
BHRA, The Fluid Engineering Centre
Cranfield
Bedford MK43 OAJ
England

Telephone: (0234) 750422
Telex: 825059 BHRA G

COURSE ON QUALITY MONITORING

A Short course on the Design of Water Quality Monitoring Networks will develop, in detail, a systematic procedure for designing a water quality monitoring network with the objectives of determining ambient water quality and assessing trends. This year the short course is placing more emphasis on groundwater monitoring including well placement and sampling procedures than the previous courses given in the United States in 1979, 1980, 1981, and 1983. The monitoring requirements specified in the Resource Conservation and Recovery Act (RCRA) will be summarized and discussed, emphasizing application of the regulations.

Criteria

The monitoring network design is developed by delineating the water quality variables to be observed and establishing the criteria for both surface and subsurface monitoring networks used to determine sampling station location, sampling frequency and data analyses in such a manner that representative and quantitative data are obtained.

Actively

The short course is directed to persons actively involved with the design, operation and/or management of a water quality monitoring network for both surface and subsurface monitoring. It assumes that attendees have little or no background in statistics. For additional information, please contact: Mr C Chapman, Water Research Commission (28-5461) or write to: Thomas G Sanders, Programme Leader, Environmental Engineering, Department of Civil Engineering, Colorado State University, Fort Collins, Colorado 80523.

Off the press . . . Off the press . . . Off the press . . . Off the press . . .

Lys van droogtebestande plante gepubliseer

Vir tuiniers wat raad-op is met droogtes, waterbeperkings en dors plante is daar nou 'n oplossing: dróógtebestande plante.

En om hulle te help om die regte watersku plante vir hulle tuin te kies, het die Navorsingsinstituut vir Plantkunde van die Direktoraat Landbou-inligting onlangs die eerste omvattende lys van droogtebestande plante vir die verskillende klimaatstreke van Suid-Afrika gepubliseer.

Die titel van die publikasie is: *'n Voorlopige lys van plante vir waterbesparende tuinmaak in Suid-Afrika.*

Volgens die redaktrise, mev DMC Fourie, het die tuinmaakpatroon in Suid-Afrika die afgelope aantal jare baie verander weens die knellende ekonomiese posisie en verhoogde arbeidskoste.

"Die aanplant van massas eenjarige blomme in klein beddings en die pynlike versorging van fyngrasperke het verdwyn. Baie huiseienaars hou nie meer voltydse tuiniers aan nie en omdat al hoe meer huisvroue gaan werk, word tuine met die minimum instandhouding verkies."

Onbewustelik is dit die eerste stap in die rigting van water besparende tuinmaak, sê mev Fourie.

"Die tweede stap is beter tuinbeplanning, want sodra waterbeperkings ingestel word, word die belangrikheid van water in die tuin besef."

Die plantlys is in agt afdelings verdeel: Bome, struike, halfstruike, meerjarige kruidagtige plante en vetplante, grondbedekkings, rankplante, heinings en bolplante.

Die publikasie is verkrygbaar in Engels of Afrikaans. Dit kos 70c (eksklusief) en kan bestel word by die Direkteur, Direktoraat Landbouinligting, Privaatsak X144, Pretoria 0001.

Buried rigid pipes

On looking at the title of this book one might be forgiven for wondering what new information can there possibly be to warrant the publication of a new reference work covering a subject which has already survived centuries of proven field performance.

Although aimed in the first instance at practice within the United Kingdom, attention is frequently drawn to variations that may arise under different economic, technological and physical conditions existing in other parts of the world.

Being possibly the most comprehensive book ever written on the subject, it covers all aspects of pipeline design and although specifically concerned with pipes of rigid materials, some information on flexible pipes is also included for comparative purpose.

This book will be of great benefit in aiding the professionals to make the correct choice between conflicting requirements at all stages of the design and construction.

Although headed "Special Conditions", chapter 4 concerns common problems encountered in most pipelines where poor or unstable soil conditions exist and also covers the effects of aggressive liquids both internally and externally.

Commonly occurring faults and failures and the interpretation of these failures is another interesting chapter which includes hints on how to avoid such failures from occurring.

To summarize then, I found this book of great interest, covering every aspect of rigid pipe laying from the design, soil considerations through to construction and backfilling and I have no hesitation in recommending this comprehensive work to everyone in any way associated with pipes and piping, whether in pressure or gravity applications.

HC CHAPMAN

Reference: Buried Rigid Pipes by OC Young and JJ Trott, Elsevier Applied Science Publishers Ltd 1984 Ripple Road, Barking, Essex, England. 234 pp.

Handleiding vir mishantering

'n Handleiding vir mishantering by intensiewe dierevoerstelsels wat verlede jaar deur die Waternavorsingskommissie in Engels gepubliseer is, is nou ook in Afrikaans beskikbaar. Die handleiding is opgestel deur mnr JW Funke van die WNK in samewerking met mnre JG Knoesen en JC Venter van die Departement van Landbou, Afdeling Landbou-ingenieurswese.

Die inhoud van die publikasie is gebaseer op 'n omvattende literatuuroorsig van mishanteringstelsels asook 'n studie van oorsese en plaaslike praktyke. Die skrywers meen dat die wêreld se groeiende vleismarkte sal lei tot 'n toename in die grootte en getal intensiewe dierevoerstelsels.

"Afgesien van die reuk- en gesondheidsprobleme wat dit meebring, kan hierdie afval, indien dit nie behoorlik bestuur word nie, 'n ernstige bron van waterbesoedeling wees, veral in Suid-Afrika met sy beperkte watervoorrade. Doeltreffende afvalbestuur is dus nie slegs 'n belangrike aangeleentheid vir Landbou in die algemeen nie, maar ook spesifiek vir watervoorsieningsowerhede."

Spesiale aandag is in die gids geskenk aan die keuse van veilige en ekonomiese gebruike wat by Suid-Afrikaanse toestande pas en een van die basiese beginsels is dat afvalbestuur 'n belangrike element in die geïntegreerde beplanning, ontwerp en bedryf van intensiewe dierevoerstelsels moet wees.

Eksemplare van die publikasie is gratis verkrygbaar by die Voorsitter, Waternavorsingskommissie, Posbus 824, Pretoria 0001.

finally . . .

Sea song

'Have you given it (wherever it may be, currently) a thought (or a farthing) lately,' Nogden Ash asked me whilst putting a Nelson onto a haggis tentacle, 'that we lead extremely dull lives? Have you contemplated the romantic ecstasies of the sailors on the goliaths that paddle the oceans like plastic ducks in a bath?'

I admitted, lamely, that apart from the rise in fuel and drop in gold prices, my dishwasher's rash and other Assorted Ills, Aigues and Indispositions; the divorce proceedings of a bigamist second cousin thrice removed, and removing the toy whistle (hidden in the breakfast serial) now wheezing behind my upper right wisdom tooth, I had not contemplated any romantic ecstasies.

'Did you know,' Nogden continued warmly, 'that sailors daily spot exotic things such as shearwaters, herring gulls and terns; brown boobies in the Gulf of Tehuantepec; Saury Pike skippers, Madeiran storm petrels; Painted Ladies off Punta Durnford, and myctophids and comb-jellies — not to mention some odd thing caught in a Kolmogorov-Smirnov one-sample test? If not, you know truly next to zero.

'A snap poll that I have conducted amongst the three members of my family, a group of anti-chlorophyll protesters (''the greener, the meaner'') and a suspended pub darts player shows that we see very little around us to exhilarate and stimulate.

''Not so the sailor, as you will see from the touching little ditty sung at the last male models' shampoo symposium:

At sea it is hard to discern
the smooth soaring flight of the tern.
Of course, at dawn,
drunk, drenched and drawn
you may decide that it's not your concern'.

WASTE TREATMENT

1st Asian Conference of IAWPRC on treatment, disposal and management of human wastes will be held in Tokyo from 1 to 3 October 1985.
Enquiries: IAWPRC, Alliance House, 29-30 High Holborn, London WC 1V 6BA, UK.

(To page 35)

SA WATERBULLETIN

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

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

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

Redakteur: Anton Prinsloo
Asst-redakteur: Jan du Plessis
Red. asst: Marietta Theron

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

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

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

Editor: Anton Prinsloo
Asst editor: Jan du Plessis
Ed. asst: Marietta Theron

DIT & DAT

FANCY NANCY

The urban district of Nancy and the Town of Nancy have taken the initiative of creating an International Centre of Water (Centre International de l'Eau à Nancy — NAN.C.I.E.) in association with two Universities, six Engineering Colleges, the Research Centres of Nancy, the Rhine-Meuse Basin Agency and the Chamber of Commerce and Industry.

The aim of this Centre is to promote research and technology transfer in the areas of water and sanitation. It will initiate in 1985 a research programme drawing on the experience of 350 researchers and engineers of various disciplines who have already been assigned to research in these fields.

The themes, the majority of which will be multidisciplinary, concern aspects of hygiene and health, the engineering of industrial processes, water resources and the environment and agriculture.

This International Centre will also constitute a technical support point for the United Cities Water Agency (l'Agence de l'Eau des Cités Unies) which has just been created in Nancy. This agency is an emanation of the World Federation of Twinned Cities designed to form an information link between the Cities.

More information: M. Richard Pouille, Président, D.U.N., 4 rue Albert — 1er, 54600 Villiers-lès-Nancy, FRANCE.

SJOE!

'n Pomp wat hitte van grondwater onttrek is in 'n Nederlandse dorp Deventer, amptelik in werking gestel. Die Nederlandse tydskrif *H_2O* sê dat eksperimente die afgelope maande getoon het dat 350 000 m^3 gas, dit wil sê 33% van die gasverbruik vir verwarming, op hierdie manier bespaar kan word.

Abseiling is a sport usually connected with mountains, but definitely not with water towers.

Jenny Hymans of the East Worcestershire Waterworks Company graciously slid down a water tower at Droitwich, England, in aid of publicity and funds for WaterAid.

An extremely ambitious Jenny's next goal is to abseil down the ten highest water towers in the country within a week. Mazeltov to a towering success, Jenny.

NUWE INSTITUUT

Europa is nog 'n instituut, die Europese Instituut vir Water, ryker. Die Instituut is amptelik in Varese, Italië gesetel.

Volgens die tydskrif H_2O het die Instituut 'n proeftydperk van 1984 tot 1985 waarna besluit sal word of die Instituut nog met sy werk mag voortgaan.

Gedurende die proeftydperk bied die Instituut 8 kursusse aan wat onder meer sal handel oor drinkwaterriglyne, suurreën, behandeling van afvalslyk en probleme wat deur droogtes en oorstromings veroorsaak word.

Ofskoon die meeste mense daarvan bewus is, gebruik slegs 'n klein persentasie van die Nederlandse bevolking 'n fosfaatvrye wasmiddel.

Die Instituut vir Omgewingsvraagstukke van die Vrye Universiteit in Amsterdam skryf hierdie houding toe aan fosfaatvrye wasmiddels se swakker kwaliteit en duurder prys.

Die Instituut beveel aan die owerhede moet die publiek beter inlig oor omgewingsprobleme en in besonder oor waterbesoedeling. Die noodsaaklikheid van fosfaatvrye wasmiddels moet meer benadruk en beter verduidelik word, aldus die tydskrif *H_2O*.