

WATER TREATMENT AND SUPPLY



KV 198/07
WATER RESEARCH COMMISSION
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WATER TREATMENT AND SUPPLY

The provision and supply of affordable and reliable water of sufficient quantity and quality for domestic and economic (industrial/commercial and mining) activities, remain continuous challenges. The objective of this thrust is to develop innovative technologies, process methods and procedures that address aspects related to bulk and rural water treatment technologies, water quality and health, and water distribution and distribution systems. The four programmes are:

1 POTABLE WATER TREATMENT TECHNOLOGY

The programme aims to acquire adequate understanding of potable water treatment processes and related activities and to be able to assist in treating our scarce water resources in the most effective and cost-efficient way to an acceptable quality for potable and industrial use. Expected outcomes include improved and more cost-efficiency of treatment plants and improve manpower training level and knowledge base.

2 WATER TREATMENT FOR DEVELOPING COMMUNITIES

This programme aims to provide, through research products, adequate quantity and quality water to rural communities on a sustainable basis. Expected outcomes required to achieve sustainable water services include community involvement, improved sustainable and more cost-efficient process technologies, and effective operation and maintenance.

3 POTABLE WATER QUALITY

The programme aims to protect human health by ensuring that water supplies are of acceptable quality and standards. Outcomes include improved analytical and detection methodologies, and improved treatment technologies and hygiene practices.

4 WATER DISTRIBUTION AND DISTRIBUTION SYSTEMS

The programme aims to optimise the quality, quantity and reliability of the distribution and supply of treated, potable water to end-users. Expected outcomes include improved predicting of, and improved operational efficiencies in, distribution systems, with the purpose of reducing both capital and operational costs; ensuring that the quality and quantity of water is maintained in the distribution system - to the furthest end user; and the development of innovative methods, tools and processes that will improve system integrity and reliability.

WATER RESEARCH COMMISSION

The WRC is a dynamic hub for water-centred knowledge, innovation and intellectual capital. We provide leadership for research and development through the support of knowledge creation, transfer and application. We engage stakeholders and partners in solving water-related problems which are critical to South Africa's sustainable development and economic growth, and are committed to promoting a better quality of life for all.



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WATER RESEARCH COMMISSION

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WATER TREATMENT AND SUPPLY

The provision and supply of affordable and reliable water of sufficient quantity and quality for domestic and economic (industrial/commercial and mining) activities, remain continuous challenges. THE OBJECTIVE OF THIS THRUST is to develop innovative technologies, process methods and procedures that address aspects related to bulk and rural water treatment technologies, water quality and health, and water distribution and distribution systems.

THE FOUR PROGRAMMES ARE:

1



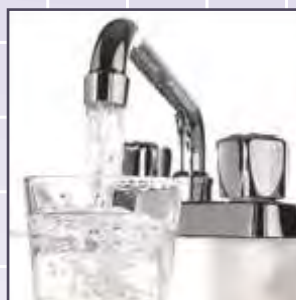
**POTABLE WATER
TREATMENT TECHNOLOGY**

2



**WATER TREATMENT
FOR
DEVELOPING COMMUNITIES**

3



POTABLE WATER QUALITY

4



**WATER DISTRIBUTION
AND
DISTRIBUTION SYSTEMS**

1 POTABLE WATER TREATMENT TECHNOLOGY

THE PROGRAMME AIMS to acquire adequate understanding of potable water treatment processes and related activities and to be able to assist in treating our scarce water resources in the most effective and cost-efficient way to an acceptable quality for potable and industrial use. Expected outcomes include improved and more cost-efficiency of treatment plants and improve manpower training level and knowledge base.



CASE STUDY 1

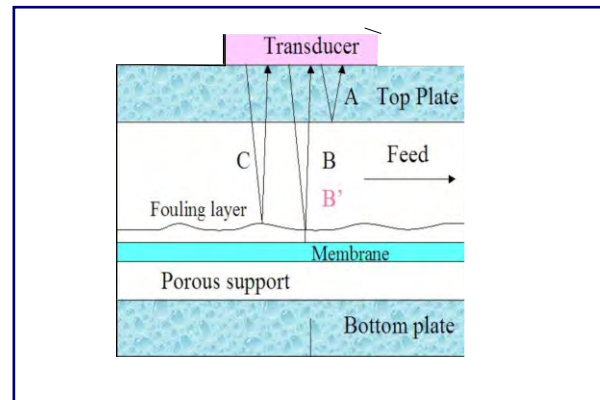
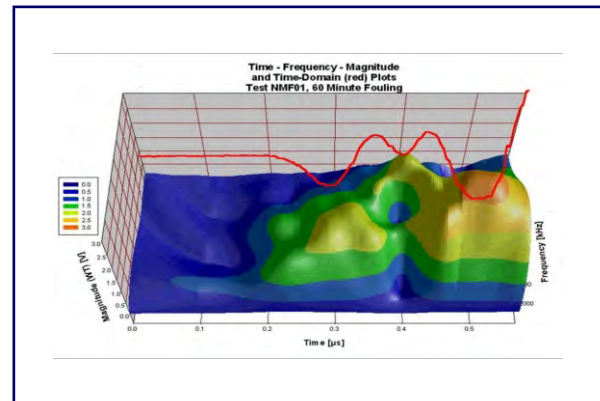
Computational Fluid Dynamics (CFD)

Computational Fluid Dynamics (CFD) provide a tool by which a detailed analysis may be done of the hydrodynamic behaviour of process tanks. A series of analyses performed on a number of process tanks - such as flocculation channels, sedimentation tanks, sand filter under-drains and ozonation contact tanks - demonstrated the potential in improving the current understanding and working of these processes.



1 POTABLE WATER TREATMENT TECHNOLOGY

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CASE STUDY 2

A Non-Invasive Membrane Fouling Meter

A novel method for the detection and characterization of fouling layers on membranes has been developed. The method is based on the use of differential ultrasonic waves and fouling can be detected on a (membrane) surface within seconds of initiation thereof. It is possible to subtract a spectrum of the unfouled membrane from the fouled membrane and therefore get very accurate analyses of fouling. This technology has been applied with success to the fouling of membranes by real effluents and a fouling detector produced.



LIST OF REPORTS AVAILABLE FROM THE WRC

See www.wrc.org/publications.reports.htm

POTABLE WATER TREATMENT TECHNOLOGY			
	Report Number: TT 266/06 A desalination guide for South African Municipal Engineers Du Plessis JA; Burger AJ; Swartz CD; Musee N International Price: \$25.00		Report Number: 1075/1/05 Applications of computational fluid dynamics modelling in water treatment Brouckaert CJ; Huang Tzu-Hua; Buckley CA International Price: \$20.00
	Report Number: TT 265/06 Handbook for Waterworks Operation Christiaan Frederick Schutte (Editor) International Price: \$25.00		Report Number: TT 222/04 Feasibility of water fluoridation for South Africa Genthe B; Herold CE; Haarhoff J; Hosking S; Sykes G International Price: \$25.00
	Report Number: 1393/1/06 Nanoporous polymers for the removal of organic contaminants in water Mamba BB; Krause RW; Malatsetse TJ; Mhlanga SD; Nxumalo NE; Bambo FM International Price: \$20.00		Report Number: KV 151/04 Understanding the sustainable management of small water treatment plants in rural communities: a systems thinking study Murray K; du Preez M; Lebone M; Pearson IA International Price: \$20.00
	Report Number: 1165/1/06 Development of technology for the selective removal of bioactive pollutants by ligands, non-covalently immobilised on membranes Jacobs EP; Swart P; Bredenkamp; Allie Z; Govender S; Liebenberg L; van Kralingen; Williams WT International Price: \$15.00		Report Number: 1325/1/04 The feasibility of IN SITU groundwater remediation as robust low-cost water treatment option. Tredoux G; Israel S; Cave LC International Price: \$30.00
	Report Number: TT 244/05 Benchmarking of leakage from water reticulation systems in South Africa McKenzie RS; Seago C International Price: \$25.00		Report Number: 1196/1/04 Removal of organic components and bacteria from water by electrochemical combustion Cronje M; Baker PGL; Knoetze JH; Sanderson RD; Crouch AM International Price: \$20.00
	Report Number: 1387/1/05 The application of advanced control techniques in water treatment and supply systems Mulholland M; Brouckaert CJ; Pastre A; Biscos D; Buckley CA International Price: \$20.00		Report Number: 1225/1/04 Quantification of factors affecting coagulation of water with cationic polymers and laboratory methods for determining these effects Freese SD; Hodgson KG; Nozaic DJ; Borain G International Price: \$20.00
	Report Number: 1148/1/05 Effects of land application of water treatment residue Hughes JC; Tlshall LW; Buyeye SM; Johnston MA; Moodley M; Pecku S International Price: \$35.00		Report Number: 1184/1/04 Manual for testing of water and wastewater treatment chemicals Freese SF; Trollip DL; Nozaic DJ International Price: \$30.00

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	Report Number: 1172/1/04 The evaluation and design of sludge dewatering and water filtration systems using tubular woven fabric technology Rajagopal R; Pillay VL International Price: \$20.00			Report Number: 965/1/03 Ultrafiltration capillary membrane process development for drinking water Jacobs EP; Pillay VL; Botes JP; Bradshaw SM; Pryor M; Swart P International Price: \$20.00
	Report Number: 1166/1/04 Real-time observation of fouling in membrane filtration by non-invasive ultrasonic techniques Li J; Sanderson RD; Humdall MJ; Hallbauer DK; Hallbauer- Zadorozhnaya VY International Price: \$25.00			Report Number: 930/1/03 A preliminary investigation into the application of ultrasonic techniques to membrane filtration Sanderson RD; Jianxin Li; Hallbauer DK; Koen LJ; Halbauer-Zadorozhanya VY; Humdall M International Price: \$20.00
	Report Number: 1127/1/04 The development and evaluation of new South African ozoniser technology for removal of enteric viruses and tastes and odours present in Hartespoort dam water Strydom R International Price: \$15.00			Report Number: 924/1/03 Characterisation and chemical removal of organic matter in South African coloured surface waters Swartz CD; Morrison IR; Thebe T; Engelbrecht WJ; Cloete VB; Knott M; Loewenthal RE; Krüger P International Price: \$25.00
	Report Number: 1124/1/04 Evaluation of powered activated carbon (PAC) for the removal of taste and odour causing compounds from water and the relationship between this phenomenon and the physico-chemical properties of the PAC and the role of water quality Linde JJ; Freese SD; Pieterse S International Price: \$20.00			Report Number: 920/1/03 Evaluation of a filter backwash recovery plant to establish guidelines for design and future operation Linde JJ International Price: \$20.00
	Report Number: TT 206/03 WATREX: Expert system for water treatment plant design user manual - Release 5.0 Sutherland FR Local Price: R500.00 International Price: \$200.00			Report Number: 769/1/03 Fabrication and production protocol for capillary ultrafiltration membranes and modules Jacobs EP; Yanic C; Bradshaw SM; Marais C; Bredenkamp MW, Swart P International Price: \$15.00
	Report Number: 1103/1/03 Development of a membrane photobioreactor for the study of microcystin production by cyanobacteria Leukes WD; Strong J; Downing TC International Price: \$20.00			Report Number: 1077/1/02 The use of life cycle assessment in the selection of water treatment processes Friedrich E; Buckley CA International Price: \$15.00

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POTABLE WATER TREATMENT TECHNOLOGY			
	Report Number: 1027/1/02 Assessment of the limestone mediated sidestream stabilisation process, with emphasis on use thereof by Rand Water for stabilisation of the Lesotho Highlands Scheme Water Mackintosh GS; Du Plessis GJ; De Souza PF International Price: \$30.00		Report Number: 963/1/00 Trouble shooting guide for the domestic consumer De Fontaine J-L International Price: \$15.00
	Report Number: 932/1/02 Enzymatic defouling of ultrafiltration membranes: A defouling-on-demand strategy using immobilised enzymes Leukes W; Edwards W; Buchanan K; Bezuidenhout J, Jordaan J, Watcham C, Way-Jones N International Price: \$20.00		Report Number: 923/1/00 Supercritical fluid regeneration of exhausted granular activated carbon - Potential application to water purification Zolfi CM; Steenkamp CJH; Breet ELJ International Price: \$15.00
	Report Number: 836/1/02 Evaluation and development of physical water treatment processes for the reduction of CaCO₃ scale Coetzee PP; Meyer J International Price: \$15.00		Report Number: 922/1/00 Stasoft IV for Windows 95, 98 and NT Water Research Commission and University of Cape Town Local Price: R50.00 International Price: \$40.00
	Report Number: TT 166/01 Standardisation of the use of particle counting for potable water treatment in SA Ceronio AD; Haathoff J; Pryor M International Price: \$20.00		Report Number: 834/1/00 Photocatalytic purification of drinking water Engelbrecht WJ; Shephard GS; De Villiers D; Stockenstrom s; Cloete V; Wessels GFS International Price: \$20.00
	Report Number: 931/1/01 Transverse-flow module fabrication technology development Jacobs EP; Van der Walt A; Nel C; Rose PD, Hendry BA International Price: \$15.00		Report Number: 832/1/00 The application and efficiency of "mixed oxidants" for the treatment of drinking water Geldenhuys JC International Price: \$10.00
	Report Number: 737/1/01 Additional treatment requirements of water abstracted from the Vaal River System following the importation of Lesotho Highland water Geldenhuys JC; Jones M; Joubert JHB International Price: \$15.00		Report Number: 694/1/00 The treatment of eutrophic water using pre-and intermediate ozonation, peroxone and pica carbon Pryor MJ; Freeze SD International Price: \$20.00

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POTABLE WATER TREATMENT TECHNOLOGY			
	Report Number: 567/1/00 The occurrences, distribution and removal of algal species and related substances in a full-scale water purification plant Pieterse AJH and co-workers International Price: \$30.00		Report Number: TT 105/98 Enhanced coagulation for the removal of disinfection by-product precursors Pryor MJ; Freese SD International Price: \$20.00
	Report Number: 446/1/00 The use of ozonation in combination with lime and activated sodium silicate in water treatment Geldenhuys JC; Giard JC; Harmse M; Neveling K; Potgieter M International Price: \$10.00		Report Number: 618/1/98 Development of specialised cross- and transvers-flow capillary-membrane modules Domrose SE; Sanderson RD; Jacobs EP International Price: \$20.00
	Report Number: KV 118/99 Water reclamation for direct reuse in urban and industrial applications in South Africa and its projected impact upon water demand Grobicki A; Cohen B International Price: \$15.00		Report Number: 615/1/98 Modelling the water quality in impoundments within the Umgeni Water operational area and the consequences for potable water treatment costs Graham PM; Dickens CWS; Mbowa S International Price: \$30.00
	Report Number: 791/1/99 Defouling of ultrafiltration membranes by linkage of defouling enzymes to membranes for the purpose of low cost, low maintenance ultrafiltration of river water Leukes W; Buchanan K; Rose PD International Price: \$15.00		Report Number: 613/1/98 Stabilisation of soft acidic waters with limestone Swartz CD; De Villiers HA; Du Plessis GJ; Loewenthal RE International Price: \$20.00
	Report Number: 381/2/99 Research on the corrosion performance of various non-metallic piping materials and coatings in potable water Ramothola JS; Cromarty C; Ringas C International Price: \$30.00		Report Number: 534/1/98 Guidelines for the treatment of Cape coloured waters Swartz CD; De Villiers HA International Price: \$30.00
	Report Number: 363/1/99 The use of small-scale equipment for evaluating water treatment plants Kaiser CJ International Price: \$25.00		Report Number: 568/1/98 The development of an EXPRESS unit for the dewatering of waterworks sludges and the consequences for water treatment Pryor MP; Mullan DJ International Price: \$25.00

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POTABLE WATER TREATMENT TECHNOLOGY			
	Report Number: TT 92/97 Water purification works design Van Duuren FA Local Price: R150.00 International Price: \$50.00		Report Number: 443/1/97 Guidelines for the use of peroxone and other oxidants for the treatment of eutrophic and coloured waters in South Africa Van der Walt CJ International Price: \$20.00
	Report Number: 632/1/97 Capillary membrane production development: Final report Jacobs EP; Sanderson RD International Price: \$20.00		Report Number: 354/1/97 Evaluation of direct series filtration for the treatment of South African surface waters Swartz CD; Van der Walt CJ; Van der Merwe PJ International Price: \$25.00
	Report Number: 619/1/97 Preparation of tolerant membranes Hurdall MJ; Sanderson RD; Morkel CE; Van Zyl PW, Burger M International Price: \$20.00		Report Number: 558/1/96 Algal rupture during abstraction from reservoirs and the consequences for water treatment Dickens CWS; Graham PM; Freese S International Price: \$20.00
	Report Number: 591/1/97 Provision of point-source water by air-gap membrane distillation Sanderson RD; Aldrich C; Lorenzen L; Chemaly BF International Price: \$25.00		Report Number: 585/1/95 Modelling of flow phenomena in porous media Du Plessis JP; International Price: \$15.00
	Report Number: 557/1/97 Optimization of combined flotation and filtration at a large water treatment plant Van Beek JC; Haarhoff J International Price: \$20.00		Report Number: 538/1/95 Investigation of inorganic materials derived from water purification processes for ceramic applications Boucher PS; Van Eeden JJ International Price: \$25.00
	Report Number: 529/1/97 Characterisation of membranes using electro-chemical impedance spectroscopy (EIS) and computational fluid dynamics (CFD) Smit JJ; Greyvenstein GP International Price: \$25.00		Report Number: 449/1/95 Non-conventional disinfection technologies for small water systems Solsona F; Pearson I International Price: \$20.00
	Report Number: 450/1/97 Package water treatment plant selection: 1. Guidelines 2. Limited comparative performance study Voortman WJ; Reddy CD International Price: \$30.00		Report Number: 448/1/95 Die verfyning van inspuitsossels vir opgelostelugflottasie Rykaart EM; Haarhoff J International Price: \$20.00

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POTABLE WATER TREATMENT TECHNOLOGY			
	Report Number: 325/1/95 Research on the modelling of tubular reverse osmosis systems Brouckaert CJ; Wadley S; Hurt QE International Price: \$25.00		Report Number: 337/1/90 Removal of algae from water by ultrafiltration Strohwalde NKH International Price: \$10.00
	Report Number: KV 55/94 Occupational competencies for the occupation of water care operator and water care manager Ernst EA International Price: \$20.00		Report Number: 210/1/90 Elektrochemies-geproduseerde metaalkoagulante vir die suiwering van besoedelde water Johannes WG; Pretorius WA Report Number: 75/1/90
	Report Number: 472/1/94 Die evaluasie van Suid-Afrikaanse filtermedia vir diepbedfiltrasie Ceronio AD; Haarhoff J		Construction and operation of the Cape Flats water reclamation plant and the surveillance of the reclaimed water quality Beekman HG; Klopper DN; Fawcett KS International Price: \$30.00
	Report Number: 445/1/94 Removal of colour from Cape Waters using ozonation and membrane filtration Juby GJG; Botha GR International Price: \$20.00		Report Number: 217/1/89 Investigation into requirements for research in surface water treatment in South Africa Reid IK; Loewenthal RE International Price: \$10.00
	Report Number: 467/1/93 Development of an ultrafiltration pretreatment system for seawater desalination by reverse osmosis Strohwalde NKH; Jacobs EP; Wessels A International Price: \$20.00		Report Number: TT 24/86 Softening and stabilisation of municipal waters Loewenthal RE; Wiechers HNS; Marais GvR
	Report Number: 244/1/91 Development of a two-stage counter-current powdered activated carbon-dissolved air flotation system for the removal of organic compounds from water Le Roux JD; Van der Walt CJ International Price: \$20.00		Report Number: TT 12/82 A guide for the planning, design and implementation of a water reclamation scheme PGJ Meiring & Partners
	Report Number: 202/1/91 Dissolved air flotation for the pretreatment of eutrophied surface water for potable use Gehr R; Swartz CD; Offringa G International Price: \$25.00		

2 WATER TREATMENT FOR DEVELOPING COMMUNITIES

THIS PROGRAMME AIMS to provide, through research products, adequate quantity and quality water to rural communities on a sustainable basis. Expected outcomes required to achieve sustainable water services include community involvement, improved sustainable and more cost-efficient process technologies, and effective operation and maintenance.



CASE STUDY 1

A Small Membrane System for Rural Water Supply

A series of membrane systems development projects funded by the WRC at the Institute for Polymer Science, University of Stellenbosch, culminated in a very successful and sustainable unit for the provision of potable water to small and rural communities. Based upon locally developed ultra-filtration membranes, they are capable of not only removing suspended clay particles, but also the dangerous micro-organisms not killed by chlorine disinfection, such as single-celled parasites. Water treated by these membranes is much clearer than with conventional water treatment systems and already partly disinfected at source before the addition of the required residual chlorine. Operation is much simpler than conventional treatment as no coagulants or other chemicals dosing is normally required on a constant basis.



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CASE STUDY 2

An Affordable Solar Distillation System for Brackish Groundwater Treatment

This simple and affordable solar still was developed to provide potable water for drinking and cooking purposes to single households and small communities. The project revolved around re-designing an international unit with a view of making it more affordable as well as applicable to South African rural conditions. The project team succeeded in bringing the retail cost of the unit down to less than a third of the original cost. Single household units were firstly evaluated in the far Northern Cape. Thereafter, a system consisting of 15 single units in parallel were evaluated at Kerkplaas in the Karoo, where it is now supplying desalinated water to a church community of 40 people.



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WATER TREATMENT FOR DEVELOPING COMMUNITIES			
	Report Number: TT 249/05 Guidelines for ensuring sustainable effective disinfection in small water supply systems Momba MNB; Brouckaert BM International Price: \$30.00		Report Number: 1289/1/04 Removal of fluoride from drinking water with clay-based defluoridators Coetzee PP; Haarhoff J; Chibi C International Price: \$20.00
	Report Number: TT 247/05 An illustrated guide to basic water purification operations Bouwer JL; Haylett IE International Price: \$30.00		Report Number: 1230/1/04 Evaluation of nanofiltration for the treatment of rural groundwater for potable water use Modise SJ; Krieg HM International Price: \$25.00
	Report Number: 1232/1/05 The development and evaluation of a reverse flow microfilter Pillay VL; Jacobs EP International Price: \$20.00		Report Number: 1185/1/04 Guidelines for planning and design of small water treatment plants for rural communities, with specific emphasis on sustainability and community involvement and participation Swartz CD; Ralo T International Price: \$20.00
	Report Number: 829/1/05 A critical evaluation of sand abstraction systems in Southern Africa (Vol 1) Clanahan M; Jonck JL International Price: \$25.00		Report Number: 1034/1/04 Guidelines for routine monitoring of membrane performance for potable water production in small water treatment plant Odhav B International Price: \$20.00
	Report Number: TT 221/04 A guidebook on household water supply for rural areas with saline groundwater Goldie I; Sanderson RD; onna JD; Delcarne BA; Daries LM; Lodewyk L-A International Price: \$30.00		Report Number: 1070/1/04 The development of small-scale ultrafiltration systems for potable water production Pillay VL; Jacobs EP International Price: \$20.00
	Report Number: 1392/1/04 Performance testing of operational basin solar stills Goldie I; Theunissen A; Bonthuys J; Cloete V International Price: \$15.00		Report Number: TT 205/03 Elementary handbook of water disinfection Carlsson FHH International Price: \$20.00

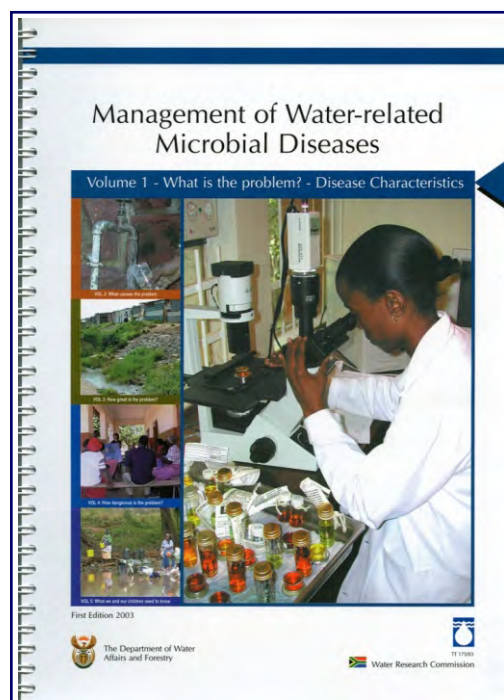
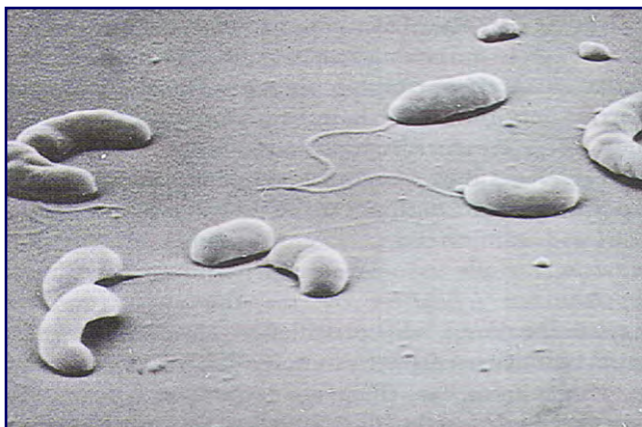
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WATER TREATMENT FOR DEVELOPING COMMUNITIES					
	Report Number: 1032/1/03 Economically viable solar still units for use in remote, rural areas of South Africa Goldie I; Theunissen A; Bonthuys J; Cloete V International Price: \$25.00			Report Number: TT 132/00 The Development of Effective Community Water Supply Systems using Deep and Shallow Well Handpumps. Hazelton DG International Price: \$25.00	
	Report Number: 1271/1/03 An investigation of water supply issues in typical rural communities – Case studies from Limpopo Province Maselaganye PM International Price: \$15.00			Report Number: TT 124/00 Defluoridation, denitrification and desalination of water using ion - exchange and reverse osmosis Schoeman JJ; Steyn A International Price: \$20.00	
	Report Number: 919/1/03 Optimisation of an autonomous valveless gravity filter for the cost effective production of potable water for rural areas Brouckaert B; Rajagopal P; Pryor MJ International Price: \$25.00			Report Number: 764/1/00 Water supply to rural and peri-urban communities using membrane technologies Jacobs EP; Pillay VL; Pryor M; Swart P International Price: \$20.00	
	Report Number: 662/1/03 Evaluation and optimization of a crossflow microfilter for the production of potable water in rural and peri-urban areas Pillay VL; Buckley CA International Price: \$10.00			Report Number: 738/1/00 Guidelines for the upgrading of existing small water treatment plants Swartz CD International Price: \$20.00	
	Report Number: 1026/1/02 Consolidation and transfer of limestone mediated stabilisation technology for small to medium scale water users Mackintosh GS; Du Plessis GJ; De Souza PF; De Villiers HA International Price: \$25.00			Report Number: 671/1/99 The South African fog water collection project Olivier J; Van Heerden J International Price: \$30.00	
	Report Number: 1042/1/01 Development of a solar-powered reverse osmosis plant for the treatment of borehole water Louw GJ International Price: \$15.00				

3 POTABLE WATER QUALITY

THE PROGRAMME AIMS to protect human health by ensuring that water supplies are of acceptable quality and standards. Outcomes include improved analytical and detection methodologies, and improved treatment technologies and hygiene practices.



CASE STUDY 1

Guidelines for the Management of Water-related Microbial Diseases

The need for this series of guides on the management of water-related microbial diseases arose as a result of the cholera epidemic. [Volume 1 What is the Problem? Disease Characteristics](#) provide general information on water quality with respect to microbial status and health issues. It further discusses the role of microbes in the transmission of the disease - how it is transmitted and how it can be prevented. The guide further provides a summary of management issues essential for the minimisation of water related microbial issues.



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CASE STUDY 2

Water Quality Guidelines

Volume 1: Assessment Guide (TT 101/98)

This guide answers the following questions: Is the water suitable for domestic use? If not, what can be done to make it more suitable for use.

Volume 2: Sampling Guide (TT 117/99)

Provides information on the correct procedure that must be followed to collect a representative water quality sample from a water supply intended for domestic use.

Volume 3: Analysis Guide (TT 129/00)

Provides information on a variety of aspects of water quality analysis.

Volume 4: Treatment Guide (TT 181/02)

Provides general information on the treatment of water for domestic use.

Volume 5: Management Guide (TT 101/98)

Covers planning of a new domestic water supply schemes, aeration and management aspects and identification of the responsible authority in a water Supply scheme.



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POTABLE WATER QUALITY			
	Report Number: 1276/1/06 Prevalence, survival and growth of bacterial pathogens in biofilms in drinking water distribution systems September SM; Burke L; Els FA; Venter SN; Brozel VS; Franck M; Swart R; Genthe B; Jagals P; Ntsherwa J; Nala NP; Jagals C International Price: \$20.00		Report Number: 821/1/04 A study of viable-but-not-culturable pathogens in water Pillay B; Pillay D International Price: \$20.00
	Report Number: 1398/1/05 Origin, fate and clinical relevance of water-borne pathogens present in surface waters Said M; le Roux WJ; Burke L; Said H; Paulsen L; Venter SN; Potgieter N; Masoabi D; de Wet CME International Price: \$25.00		Report Number: TT 175/03 Management of water-related microbial diseases DWAF; WRC International Price: \$25.00
	Report Number: 1399/1/04 An investigation into levels of cadmium in the Umtata river and associated health impact. Fatoki OS; Owofula OR; Genthe B International Price: \$10.00		Report Number: 1031/1/03 The occurrence of emerging viral, bacterial and parasitic pathogens in source and treated water in South Africa Venter SN International Price: \$25.00
	Report Number: 1288/1/04 Cyanobacterial monitoring 1990-2000: Evaluation of SA data Downing TG; van Ginkel CE International Price: \$25.00		Report Number: 925/1/03 The impact of introducing treated water on aspects of community health in a rural community in KwaZulu-Natal Bailey IW International Price: \$20.00
	Report Number: 1224/1/04 [NB: only available on CD] The use of ultraviolet light alone, or in combination with cavitation flow and ultrasonic devices, to inactivate protozoan cysts and ecocysts in the small and large scale treatment of drinking water van der Walt E; Grundling M International Price: \$15.00		Report Number: 831/1/03 Development and implementation of gas and liquid chromatographic organic water profiles as a management tool Selala M; Phirwa S; Segoe N; Rhower EJ, Schoeman C International Price: \$25.00
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	Report Number: 743/1/02 Executive summary: The health impact of waterborne viruses and methods of control in high risk communities Grabow WOK; Taylor MB; Vivier JC; Potgieter N, Gaobepe MG International Price: \$5.00		Report Number: 470/1/99 Application of health risk assessment techniques to microbial monitoring data Genthe B; Rodda N International Price: \$20.00
	Report Number: TT 162/01 Quality of domestic water supplies. Volume 5: Management Guide DWAF; Dept of Health: WRC International Price: \$30.00		Report Number: 381/1/99 Exposure of generic coating systems in raw South African dam waters Ramoethola JS; Ringas C; Cromarty C International Price: \$30.00
	Report Number: 741/1/01 Enteropathogens in water; rapid detection techniques, occurrence in South African waters and the evaluation of epidemic risks (health related) Du Preez M; Venter SN; Theron J; Mattala M; Gericke M; Singmin Y International Price: \$15.00		Report Number: 254/1/99 Research on the effects of varying water quality on the corrosion of different pipe materials in the PWVS/Klerksdorp areas Ringas C; Strauss FJ; Gnoinski J; Callaghan BG International Price: \$30.00
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	Report Number: TT 117/00 Quality of domestic water supplies, Volume 2: Sampling guide DWAF; WRC; Dept of Health International Price: \$15.00		Report Number: 541/1/98 Biodegradable compounds and microbial regrowth in water Grundlingh JA; Nel C; Kotze E; De Wet CME International Price: \$25.00

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POTABLE WATER QUALITY			
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	Report Number: 584/2/96 An atlas of potentially water-related diseases in South Africa Volume 2: Bibliography Coetzee N; Bourne DE International Price: \$15.00		Report Number: 38/1/87 Studies on health aspects of water reclamation during 1974 to 1983 in Windhoek, South West Africa/Namibia Isaacson M; Sayed AR; Hattingh WHJ International Price: \$15.00

4 WATER DISTRIBUTION & DISTRIBUTION SYSTEMS

THE PROGRAMME AIMS to optimise the quality, quantity and reliability of the distribution and supply of treated, potable water to end-users. Expected outcomes include improved predicting of, and improved operational efficiencies in, distribution systems, with the purpose of reducing both capital and operational costs; ensuring that the quality and quantity of water is maintained in the distribution system - to the furthest end user; and the development of innovative methods, tools and processes that will improve system integrity and reliability.



CASE STUDY 1

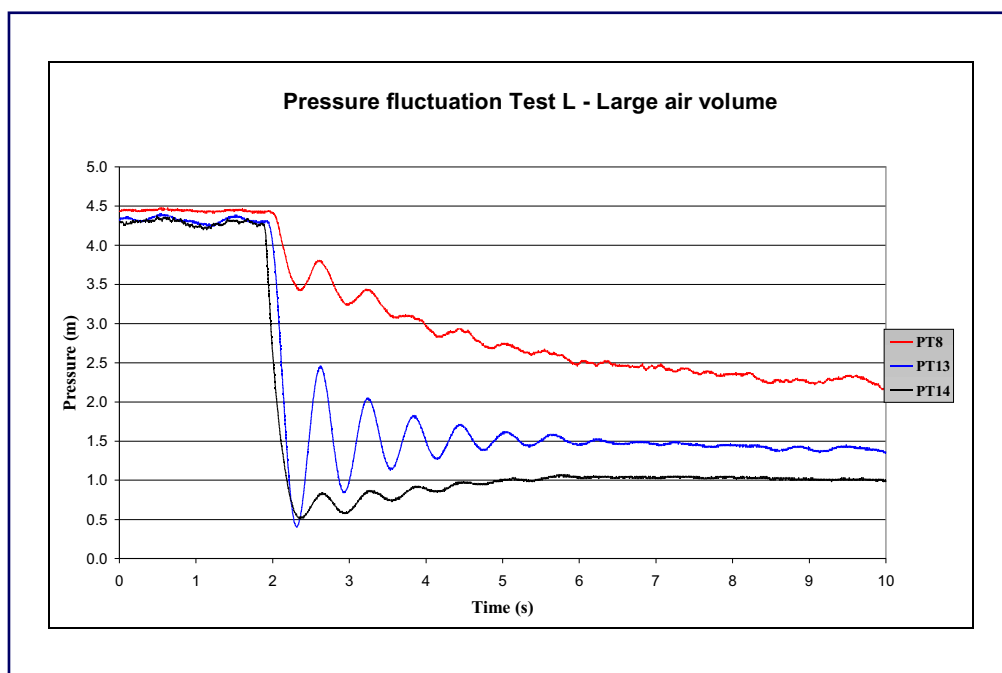
Leakage Reduction by Pressure Management

Due to various historical factors and the policy of Free Basic Water in South Africa, there tends to be abnormally high levels of leakage in certain areas where residents cannot afford to implement the necessary repairs. Water reticulation systems in many parts of South Africa are in very poor condition and will gradually degenerate unless action is taken. Pressure management remains one of the key elements of leakage which can often provide the greatest saving at the least cost. The WRC have supported the development of five models, with software, as well as a full bench marking project. Several schemes have recently been commissioned involving the implementation of advanced pressure control which have been recognised by many international organisations including the EU and World Bank as “world’s best practice”. This expertise and software are currently highly regarded and sought after in countries such as Australia and Thailand where large investments are being made using support from South Africa.



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CASE STUDY 2

Determination of the Existence, Location and Size of Free Air in a Pipeline

The research developed a methodology to determine the existence, location and size of free air in a pipe system and the position of leaks, by means of the characterisation of wave propagation of an induced inverse transient. Assessing the propagation and decay of an induced inverse pressure transient provides a footprint of the disturbances that influence the wave movement and reveal the presence of air or a leakage in the pipeline. A negative pressure wave is introduced by an abrupt increase in the flow on the downstream side of a pipeline and the pressure-time history captured at different positions along the pipeline. Results from practical experiments confirmed that it is possible to identify the presence of air and leaks in the pipeline, by employing reverse transients. This procedure is of interest to contractors and infrastructure managers to establish the presence of air during the first time filling and the potential influence on the hydraulic capacity of the pipeline.



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	Report Number: 1177/1/04 Quantifying the influence of air on the capacity of large diameter water pipelines and developing provisional guidelines for effective de-aeration: Volume 1 van Vuuren SJ; van Dijk M; Steenkamp JN International Price: \$30.00		Report Number: 948/1/00 Domestic water meters: Influence of various fittings and installation configurations on accuracy of 15 mm water meters Cipindu P; Wantenaar CJ International Price: \$15.00
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	Report Number: 985/1/02 Sizing of bulk water supply systems with a probabilistic method Haarhoff J; Van Zyl JE International Price: \$15.00		Report Number: TT 112/99 Corrosion brochure for local authorities Ramoethola JS; Ringas C International Price: \$15.00
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	Report Number: 432/2/99 Microbial corrosion of pipe linings Ramothola JS; Ringas C International Price: \$20.00		Report Number: 488/1/97 Optimisation of Rand Water's distribution system Turner KN; Fowler TG; Manson NJ; Stephenson D International Price: \$30.00
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	Report Number: 704/1/97 The prediction for chlorine decay from potable water in pipeline systems Viljoen OJ; Haarhoff J; Joubert JBH International Price: \$20.00		Report Number: 177/1/88 Water consumption and possible water savings in apartment buildings Malan GJ International Price: \$10.00