

Screen filtration in seawater pretreatment: A pilot trial of the Forsta Filter

ENG460: Engineering Thesis Final Report

Michael Ambrose

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Academic Supervisors: Dr Martin Anda
Dr Linda Li

Table of Contents

Abstract	4
Acknowledgments	5
Acronyms	6
Units	6
List of Figures	7
List of Tables	8
Introduction	9
Report problem.....	9
Previous work.....	9
Report Goals and Objectives	10
Goals.....	10
Objectives.....	10
Report constraints.....	11
Report scope.....	11
Background	12
Seawater Composition.....	12
Desalination pretreatment.....	12
Conventional pretreatment methods.....	13
Alternative pretreatment methods	17
Chemical dosing	19
Limits of current pretreatment technology	20
Materials and Equipment.....	22
Location.....	22
Plant Control.....	23
Materials.....	24
Forsta Filter unit	24
Experimental Setup components	26
Data Logger: Campbell Scientific CR200X.....	27
Methods.....	28
Experimental Design	28
System Design	31
Forsta Filter: Mode of operation.....	34
Feed water: Polished Seawater	35
Sampling Parameters.....	36
Water quality parameters.....	36

Temperature.....	37
Physical Deterioration	37
Pressure	37
Backwashing	38
Measurement and Logging	38
Parameters to influence results	39
Assumptions and Limitations of Trial	39
Implementation.....	41
Results and Discussion	44
Preliminary Testing	44
Results	44
Discussion	46
Evaluation of full-scale design (projected).....	46
Sizing.....	46
Footprint, Corrosion Potential and Filtration Area.....	47
Recommendations and Future Works	49
Conclusion.....	51
References	52
Appendices	54
Appendix A: Specifications of Experimental Setup Components.....	54
Appendix B: Hydrogeological cross-section of the Rockingham Area.....	57
Appendix C: Information on the three groundwater wells at the NCEDA, Rockingham	57
Appendix D: Preliminary Testing	59
Appendix E: Job Safety Analysis for Project Implementation.....	62
Appendix F: Project Issues.....	64

Abstract

This project set out to design, build and monitor a pilot trial of the self-cleaning ninety series Forsta Screen filter using polished seawater as the feedwater. The trial's task was to investigate if a five micron self cleaning screen filter can be an effective technology when used near the end of the seawater pretreatment stream found in a conventional seawater reverse osmosis desalination plant. To assess the performance of the screen filter several key parameters were identified including backwash frequency, silt density index testing, turbidity, and pressure. The project originated from the desalination industry's desire to look for alternative fine filtration technologies away from the commonly used cartridge filters. This project also outlines the scalability of the filter in an industrial setting with comparisons to the cartridge filters found at the Perth Seawater Desalination Plant (PSDP).

The design required the filter to treat seawater from the Perth Seawater Desalination Plant, with the testing to occur at the National Centre of Excellence in Desalination Australia (NCEDA) in Rockingham, Western Australia. The trial was to last up to 6 weeks during the teaching period. The project faced several unexpected issues in implementing the design over the semester and unfortunately could not fulfill the requirement to conduct the pilot trial within this time.

However preliminary testing was completed which confirmed the effective operation of the filter system. Primary objectives for the test were to see if the system design fulfilled its function and verify if certain parameters were attainable in regards to pressure, flow rate, and backwash cycle. The feedwater was brackish groundwater. Results showed: the filter system operated effectively; attained a system flow rate of 5 kiloliters per hour; attained the minimum system back pressure of 40 PSI; and successful automation of the backwash cycle and system.

Further work is anticipated to be carried out after the semester to gain closure on the project.

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Acronyms

<i>SWRO</i>	<i>Seawater Reverse Osmosis</i>
<i>RO</i>	<i>Reverse Osmosis</i>
<i>NCEDA</i>	<i>National Center of Excellence in Desalination Australia</i>
<i>PSDP</i>	<i>Perth Seawater Desalination Plant (Synonymous with Kwinana Desalination Plant)</i>
<i>UF</i>	<i>Ultra-filtration</i>
<i>MF</i>	<i>Micro-filtration</i>
<i>dP</i>	<i>Differential Pressure</i>
<i>SDI</i>	<i>Silt Density Index</i>

Units

<i>kL</i>	<i>Kilolitres</i>
<i>L</i>	<i>Litres</i>
<i>G</i>	<i>Gallons</i>
<i>gpm</i>	<i>Gallons per minute</i>
<i>lpm</i>	<i>Litres per minute</i>
<i>psi</i>	<i>Pounds per Square Inch</i>
<i>NTU</i>	<i>Nephelometric Turbidity Units</i>
<i>Mg/L</i>	<i>Milligrams per Litre</i>

List of Figures

- Figure 1: Streams in typical desalination processes (Water Corporation, 2004)*
- Figure 2: From ascending order: Melt Blown Cartridge, String wound Cartridge, Pleated Filter Cartridge, and Media Cartridge filter (Cal Water)*
- Figure 3: Micron Cartridge filter assembly at a desalination plant in Israel (Science Photo Library)*
- Figure 4: Typical Conventional Pre-treatment versus Membrane Pre-treatment in a seawater RO system (Voutchkov, 2010)*
- Figure 5: (1) Wedge-wire screens formed by laying steel wires; (2) An example of a Dutch Weave screen with discrete openings (Allhands, 2004)*
- Figure 6: Applications of the Amiad's AMF² model (Amiad, 2012)*
- Figure 7: Picture of Tank B and other tanks at NCEDA Facility*
- Figure 8: Pump for Tank B: Grundfos model CRT 16-4*
- Figure 9: Included parts with filter. From ascending order: Air Actuator; Solenoid valve; Backwash Controller; Differential Pressure Gauge*
- Figure 10: Filter unit taken apart into its individual units*
- Figure 11: Control box of Backwash controller (Forsta Filter)*
- Figure 12: The Campbell Scientific CR200X Datalogger (Campbell Scientific)*
- Figure 13: Principle of Filter in Trial*
- Figure 14: Air compressor used in the trial's Experimental Setup*
- Figure 15: Setup of Solenoid-Compressor Backwash system*
- Figure 16: PI&D of Experimental Setup*
- Figure 17: Predicted efficiency curve of Grundfos pump*
- Figure 18: System process for trial*
- Figure 19: The backwash cycle*
- Figure 20: 0-6 bar pressure transmitter used in the trial*
- Figure 21: Left to right – the piping measured and cut as required; the general setup for the filters inlet and outlet points, note the pink-taped threaded fittings are reduced to 40mm*
- Figure 22: Comparison of the Manufacturers arrangement and the implemented design for the trial (Forsta Filter)*
- Figure 23: The different stages of welding the skid and placing the filter setup onto it*
- Figure 24: The controller, solenoid valve, and different pressure gauge mounted on a wooden board above the setup*
- Figure 25: The completed filter system setup with key features labeled*
- Figure 26: Conductivity recorded over a preliminary testing session*
- Figure 27: Differential pressure recorded at a preliminary testing session*
- Figure 28: Estimation of plant area for Cartridge filter Banks*
- Figure 29: Water Based Solenoid Valve (B.T. Best)*
- Figure 30: Possible testing configuration for two filter technologies in parallel*

List of Tables

Table 1: Objectives for the project with respect to each goal.

Table 2: The project's constraints.

Table 3: Ninety-nine percent of the salts found in a typical seawater sample at 3.5 % salinity (Anthoni, 2006).

Table 4: Typical chemicals used in RO seawater pretreatment systems (Voutchkov, 2010; Hans-Gunter Heitmann, 1990).

Table 5: Components comprised in the trial.

Table 6: Key Characteristics of Forsta Filter (Forsta Filter)

Table 7: General requirements before entering Reverse Osmosis membranes in a conventional pretreatment process

Table 8: Variables to be logged during trial.

Table 9: Parameters with potential to influence results and their control measure.

Table 10: Assumptions for the Trial.

Table 11: Limitations during trial.

Table 12: Material component and quantity.

Table 13: Preliminary Goals and the resulting observations.