

## SUPERVISOR'S DECLARATION

I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of Master of Engineering in Chemical Engineering.



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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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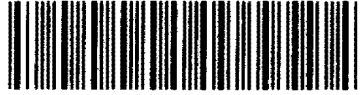
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DEVELOPMENT OF SC

PERFORMANCE ANALYSIS

ICATION AND ITS

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Thesis submitted in fulfillment of the requirements  
for the award of the degree of  
Master of Engineering

Faculty of Chemical Engineering & Natural Resources

UNIVERSITI MALAYSIA PAHANG

JULY 2017

PERPUSTAKAAN 021519 UNIVERSITI MALAYSIA PAHANG	
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## ACKNOWLEDGEMENTS

Firstly, I would like to express my sincere gratitude to my supervisor, Dr. Syarifah, for her continuous support, patience, motivation, and immense knowledge during the course of my master's study. Her invaluable guidance has helped me throughout the research and writing of this thesis. I could not have imagined having a better advisor and mentor.

Besides my advisor, I would like to thank the rest of my thesis committee members: Dr. Omar Elhadad and Dr. Chew for their insightful comments and encouragement, but also for the challenging questions which led me to widen my research from various perspectives.

I would also like to thank my husband who has never failed to inspire me in every single thought and give his full attention to me during the course of my study. He has been my motivator, guide, helper and supporter at times when I seemed at a loss, felt lonely and alone along this journey.

Finally, my appreciation and thanks go to the University Malaysia Pahang members of staff, especially to the lecturers at the Faculty of Chemical and Natural Resources Engineering for their kind assistance on academic matters.

## ABSTRAK

Proses penyahgaraman menggunakan penyuling suria adalah merupakan teknik yang paling menjimatkan kos kerana teknik ini menggunakan sumber tenaga yang didapati secara percuma. Kelemahan utama alat ini ialah kadar produktivitinya yang rendah. Oleh itu, pelbagai bentuk penambahbaikan telah diperkenalkan sejak sekian lama hingga kini untuk meningkatkan prestasi alat ini. Dalam kajian ini, penambahbaikan dibuat terhadap penyuling suria dengan penambahan tiga peralatan yang mudah iaitu pam, kanta pembesar, dan agen pemindahan haba (HTA). Empat siri eksperimen telah dijalankan untuk membandingkan prestasi penyuling suria dengan peralatan peningkat yang berbeza: Set 1 (pam), Set 2 (pam + HTA), Set 3 (pam + kanta) dan Set 4 (pam + HTA + kanta). Gabungan peralatan dan penyuling suria yang menunjukkan prestasi yang tertinggi diguna balik dengan menggunakan bahan yang berbeza iaitu air laut (Set 5). Kadar penyejatan air yang paling tinggi dicatat oleh Set 4 dengan jumlah 4.86 L manakala Set 1, Set 2 dan Set 3 masing-masing mencatatkan bacaan 0.68 L, 1.45 L dan 3.43 L. Penyejatan air didapati berkadaran dengan kecekapan seperti yang boleh dilihat, Set 4 mencatat kecekapan tertinggi sebanyak 70%, diikuti oleh Set 3, Set 2 dan Set 1 masing-masing dengan peratusan kecekapan sebanyak 51%, 42% dan 31%. Oleh itu, dapat disimpulkan bahawa sungguhpun terdapat sedikit peningkatan dengan penggunaan HTA, namun kesan daripada penambahan HTA ini tidaklah signifikan. Walau bagaimanapun, jika penambahan HTA dalam penyuling suria vakum ini digabungkan dengan kanta, kesannya didapati sangat signifikan. Melalui analisis perbandingan air, perbezaan yang ketara pada nilai parameter dapat diperhatikan di permulaan, akan tetapi bacaan air selepas disuling bagi Set 5 dan Set 4 adalah persis.

## ABSTRACT

Desalination process through solar still has been found to be the most economical technique, as it makes use of a free source of energy. The main drawback of this equipment is its low productivity. Thus, numerous enhancements have been developed throughout the years to improve its performance. In this study, the solar still underwent improvement using three simple enhancers, namely, aspirator, magnifying glasses (lenses), and heat transfer agent (HTA). Four sets of experiment were carried out to compare the performance of the solar still with different set-ups: Set 1 (aspirator), Set 2 (aspirator + HTA), Set 3 (aspirator + lenses) and Set 4 (aspirator + HTA + lenses). The experiment using the set with the highest efficiency was repeated with different feed which is seawater (Set 5). The highest collected evaporated volume was achieved by Set 4 at a total of 4.86 L while Set 1, Set 2 and Set 3 had a total of 0.68 L, 1.45 L and 3.43 L, respectively. The evaporation rates were proportional to the maximum instantaneous efficiency as Set 4 recorded the highest thermal efficiency of 70%, followed by Set 3, Set 2 and Set 1 with the percentage of efficiency at 51%, 42%, and 31%, respectively. For Set 5, the total collected evaporated volume is 4.23 L. Therefore, it can be concluded that although a slight improvement was observed, the effect of introducing the HTA was not significant. Nevertheless, if the HTA were combined with lenses in a vacuum solar still, the effect would be enormously significant. The water comparison analysis shows a very significant value between Set 4 and Set 5 at the initial state but small distinction at the final state. The results show that the performance of solar still increase significantly with the presence of lenses and HTA together. However, when the solar still is applied with HTA alone, only slight improvement is achieved compare to the application of lenses alone.

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