Development of A Decision Support System for Drinking Water Treatment Process Design (WATER-DSS)

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To my beloved parents, Heng Siaw Ling & friends,

Thank you for your support, guidance and confidence in me.

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ABSTRACT

A decision support system (DDS), named WATER-DSS has been developed to assist engineers and researchers on drinking water treatment plant. The objective of WATER-DSS was to assist designers to perform process design for drinking water treatment. WATER-DSS contains two main components: (i) knowledge-based information and (ii) programming tool. The design of drinking water treatment plant in WATER-DSS depends on the characteristic of raw water and the water quality objectives. Visual Basic 6.0 was selected to develop WATER-DSS because its capability of object oriented programming. WATER-DSS has user-friendly interfacing capability, which provides the parameters inputs, standard parameters value list, raw water treatment process information, graphical and explanations features .WATER-DSS was validated by the manual calculations and has shown the relationship between WATER-DSS output and manual calculation output is significant.

ABSTRAK

Satu sistem sokongan keputusan, yang dinamakan WATER-DSS telah dibangunkan untuk membantu para jurutera and dalam proses merekabentuk system logi air. Objektif pembinaan WATER-DSS adalah untuk membantu jurutera dan penyelidik membuat keputusan dalam merekabentuk proses awal loji rawatan air. WATER-DSS mengandungi dua bahagian: (i) Pengetahuan, dan (iii) Perisian Pengaturcaraan. Rekabentuk proses awal rawatan air mentah dalam WATER-DSS adalah bergantung kepada parameter air rawatan. Visual Basic 6.0 dipilih sebagai perisian rekabentuk kerana keupayaan bahasa pengaturcaraannya. WATER-DSS mempunyai halaman yang mudah difahami dan dikenalpasti yang terdiri daripada ruang untuk memasukkan parameter air, senarai nilai standard quality air, maklumat proses air rawatan mentah, gambar beserta ulasan yang berkaitan. Keputusan yang diperolehi melalui WATER-DSS menunjukkan hubungan yang erat dengan kaedah pengiraan manual.

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CHAPTER 1

INTRODUCTION

1.1 Research Background

The concept of DSS emerged in the 1970s, as a family of computer systems in the field of decision theory (Gorry and Scott, 1971) showing a great potential in the field of environment management. In the last decades, numerous DSS have been developed in the field on environmental management to assist designers in making decision related to various aspects of planning, monitoring and design facilities. DSS development integrates various concepts such as spreadsheets, databases, networks, hypermedia, expert systems, visual programming, intelligent agents, neural networks, etc. (Beynon *et al*., 2002). Any system supporting decision-making, including executive information systems, executive support systems, geographic information systems and software agents, may be called a DSS (Power, 1997).

DSS serves three main purposes. DSS gives us a framework to assemble our process understanding and to explore the implied system behaviours that come from that understanding. The second purpose is as a mechanism for testing data, to check for inconsistencies and errors, and fill in missing information. The third is to explore scenario options under a range of different output conditions (Silberstein, 2005). In an engineering field, DSS can assist engineer to perform complete calculation design procedures in a short time compared to manual calculation (Sairan, 2005).

Conventional water treatment plant include screening, grit removal, aeration, coagulation, flocculation, sedimentation, filtration, fluoridation, disinfection and conditioning. The treatment processes of raw water before it can be used for public consumption must be based on removal level of impurities to comply with various guidelines. The quality of water depends upon it physical, chemical, microbiological and radiochemical characteristic. The extent of treatment depends upon the quality of the raw water and the desired quality of treated water. The treated water constituents should meet the standard set by The Ministry of Health, Malaysia.

1.2 Problem Statement

Most of the design procedures for water treatment plant have been developed using manuals or spreadsheet calculations which are time consuming and costly. Therefore, a DSS is required to speed up the design process and reduce the design cost. In this study, a DSS called WATER-DSS will be developed to reduce the design time and cost.

1.3 Objective of Study

The main objectives of this study are to:

i) To develop an easier, cheaper and user-friendly DDS to assist in selecting appropriate and essential procedures for water treatment process.

ii) To validate the DSS with manual or spreadsheet calculation.

1.4 Scope of Study

The scope of the study covers conventional drinking water treatment process in Malaysia.

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