



A Proposed Framework of Life Cycle Cost Analysis for Petrochemical Wastewater Treatment Plants

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Abstract. Stringent regulations has made it mandatory for petrochemical industries to have wastewater treatment plants for the discharge of safe and environment friendly water. Lack of comprehensive and easy to use framework for life cycle cost analysis hinders the economic evaluation of wastewater treatment plants. This paper presents a comprehensive and easy to use framework for life cycle cost analysis of wastewater treatment plants. The framework includes the purpose of analysis, cost categories, LCC methodology, data collection, calculation of LCC and analysis to select the best alternative process. A brief overview of existing frameworks, need analysis and wastewater process flow is also presented. The proposed framework will provide the foundation through which the life cycle cost of different alternatives can be estimated for effective decision making.

Keywords: Life cycle cost analysis · Cost breakdown structure · Framework · Cost data · Wastewater treatment plant · Petrochemical industries

1 Introduction

Petrochemical wastewater contains various organic and inorganic components. Appropriate treatment is required for reuse, discharge, or final disposal. The composition of wastewater and environmental regulations requires a combination of different treatment methods in petrochemical industries. [1]. Wastewater treatment plant (WWTP) is a combination of various processes to treat wastewater and reproduce environmentally safe water. The processes may include filtration, clarification, biodegradation, oxidation, ozonation and sludge disposal [2].

Malaysia has made it mandatory for industries to have wastewater treatment plants and made regulations for WWTPs to ensure the discharge of environment-friendly and safe water [3]. The quality of effluent from treatment plants is regulated by the Environmental Quality Act 1974 and its regulations such as the Environmental Quality (Sewage) Regulations 2009 and Environmental Quality (Industrial Effluent) Regulations 2009 [4]. Since wastewater treatment is mandatory in petrochemical industries and priority agenda of the national government and international organizations, their