DENITRIFICATION PATH AND NUR IN BULKWATER PHASE OF MUNICIPAL SEWER NETWORKS USING NATURAL WASTEWATER.

By

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DECLARATION BY THE CANDIDATE

I Salmah Binti Yatim, UiTM no 2001304518 declare that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The appropriate credit has been given where reference has been made to the work of other.

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ABSTRACT

In conventional view, Wastewater Treatment Plants (WWTPs) have been considered as stand-alone units, separate from the sewer system. Treatment, which comprises of physical, chemical and biological processes, is assumed to begin when the wastewater arrives at WWTPs.

Recent findings established that wastewater treatment could occur in sewer. Now, sewer accepted to act as a reactor for microbial changes of the wastewater during transport and thereby affects the successive treatment processes or receiving water impacts during combined sewer overflows.

It is well known that hydrogen sulfide which is the main source of problems related to odor, human health, toxicity and corrosion of piping and pumping system produced under anaerobic conditions. Anaerobic can be suppressed by adding nitrate to the wastewater to change anaerobic to anoxic condition.

The purposes of this study are to verify denitrification pathway in bulkwater phase of sewer networks and to determine nitrate utilization rate (NUR) during anoxic transformations of municipal sewer wastewater.

This study is basically of experimental works. The samples for this study are taken from a man-hole near the Civil Engineering Laboratory and wastewater treatment plant located at Jalan Ilmu, UiTM Shah Alam. 2 samples *i.e.*, liquid and gas samples were taken periodically. The liquid samples were analyzed for nitrate (NO_3) and nitrite (NO_2), while gas samples were analyzed for nitric oxide (NO) and nitrous oxide (N_2O).

The denitrification pathway of bulkwater phase of municipal sewer networks follows the denitrification pathway of bulkwater proposed by Abdul-Talib *et al.* (2002). NUR for bulkwater is found to be in the range of 0.396 – 2.123 g NO_3-N/m^3h with the average of 0.829 g NO_3-N/m^3h.

KEYWORDS

Anoxic transformation, denitrification, in-sewer processes, microbial transformation, nitrate utilization rate, nitrate, nitrite, nitric oxide and nitrous oxide.

CHAPTER 1

INTRODUCTION

1.1 GENERAL

Wastewater is conveyed in pipes, known as sewers. The system for this purpose is called a sewer network. This network consists of individual house connections, sewer lines, and a number of installations like inlet structures and pumps to facilitate collection and transport of wastewater. In conventional design and management practice, sewer network serves the sole function of collecting and conveying wastewater from source to treatment while treatment plant will take full task on the wastewater treatment.

Design procedure of sewage system in Malaysia is given in MS 1228: 1991 Code of Practice for Design and Installation of Sewage Systems. Design of sewers as outlined by MS 1228 (1991), only focus on two main aspects *i.e.* the structural integrity of the sewers to withstand applied loads and hydraulics of flow to ensure that sedimentation is avoided. Structural consideration provided by the MS 1228 (1991) focus on pipe materials, depth of sewer, size of sewer, alignment of sewer, points between sewers and foundations or bedding for sewer.

Wastewater Treatment Plants (WWTPs) have been traditionally considered as stand-alone units, separate from the sewer system. Treatment, which comprises of physical, chemical and biological processes, is assumed to begin when the