"Cost-effective Wastewater Treatment using Advanced Immobilized Cell Reactor Technology"

Yale Wong* , Abdullah Al-Mamun **
EcoClean Technology Sdn. Bhd. Kuala Lumpur, Malaysia
*Author : yahloo.wong@gmail.com
Department of Civil Engineering, Kulliyyah of Engineering, International Islamic University Malaysia (IIUM),
Jalan Gombak, 53100 Kuala Lumpur, Malaysia
**Author: mamun@iium.edu.my

Introduction

Despite the importance of water as a valuable life supporting resource, it is under continuous threat as a consequence of climate change, booming population, industrial activities, and generation of huge amount of waste (Jhansi and Mishra 2013; Ouyang 2005; Battaglin et al., 2007). Due to the drastic improvement of living standards, generation of emerging pollutants has also increased from many activities (Trépanier et al. 2002). On the other hand, water resource is becoming scarce day by day (Esteban and Miguel 2008). Therefore, it has become essential to treat the wastewater and reuse it as much as possible. Though wastewater reuse was initially preferred for agricultural use (Angelakis et al. 1999; Fatta-Kassino et al. 2011; Pedrero et al. 2009), the reuse of wastewater for urban and industrial purposes has now become paramount in several countries. However, feasibility of reclaimed water for municipal and industrial applications is dependent upon the level of wastewater treatment (Kellis et al. 2013).

Methodology

As a case study, we take up the fish processing ETP put up in Ghana using this technology. Fish processing effluent is one of the complex effluents that can be treated. Treatment methodology using Advanced Immobilised Cell Reactor (AICR) Technology was designed for this to meet the local Pollution Control Board Guidelines. One major issue was that the site is close to the port and on the highway leading to it and hence there should be no smell or foam from the ETP. It has been performing well for the past 2 years. This technology uses a specially manufactured activated carbon catalyst to solve most of the problems posed by conventional sewage treatment plants (STPs). High surface area (218 m^2/g) of the activated carbon allows high bacterial density per gram of the media. This system requires less energy and mechanical equipment (in fact, no moving parts inside the reactors) compared to conventional STPs. It uses a closed modular system which reduces odour, and can be scaled up to any size to meet specific requirements. The plant itself can be designed and built by adding suitable modules as per the requirement (like Std A or B, or even river water standards in Malaysia). It is capable of treating organic wastewater completely organically to high reusability levels. One of the main benefits of this technology is the modular nature of the system, where multiple reactors can be built, and added as and when needed for treatment instead of one big reactor with excess capacity built many years in advance. In fact, it is ideal for decentralizated sewage treatment, which will help is high level of reuse, at much lower cost of underground sewerage, whose cost is typically several times the cost of sewage treatment plants themselves.

Results & Discussion

The effluent samples from the inlet and the final treated water were tested and the following were the results obtained:

S. No	Parameter	Raw Water	Treated Water
1	BOD (mg/l)	2640	31
2	COD (mg/l)	4280	300
3	TSS (mg/l)	1760	116
4	TDS (mg/l)	1710	1147
5	Oil & Grease (mg/l)	533	<3
6	Total Coliforms (MPN/100ml)	70000	1100

Conclusions

In a world of otherwise exponentially exploding technologies addressing all kinds of problems, unfortunately, in the realm of wastewater treatment, we still use only old technologies even in the most developed countries. All of them suffer from a combination of some of the major problems like inadequate and inconsistent quality of treated water, high, large size of plants, skilled O&M manpower requirement, frequent replacement of costly parts, deterioration of over time etc. This is because developed world has legacy wastewater treatment systems which are still working, and the need for their replacement is slow in coming. A modern technology, built around the Immobilised Cell Oxidation Process, addresses most of these problems and is emerging as a viable alternative in recent times.

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