

# Biotreatment of aqueous solutions contaminated with hydrocarbons

## Background

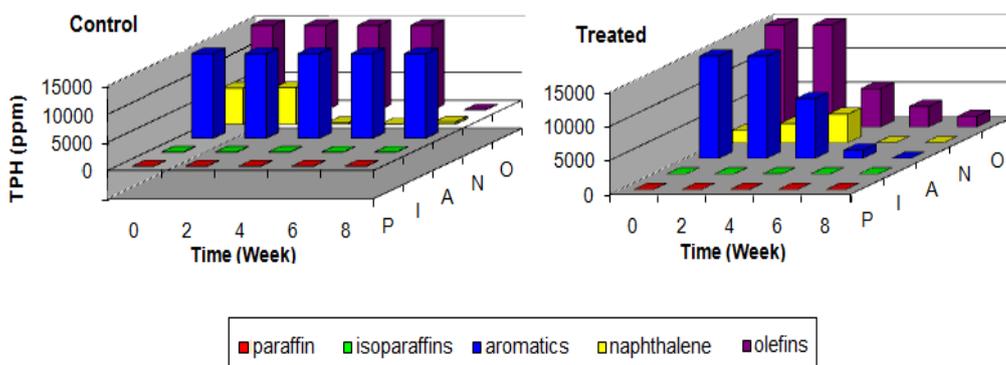
The treatment of industrial wastewater in the petrochemical industry has traditionally been a 2 stage engineering solution, with possibly a 3rd stage in some processes. The primary stage involved a chemical and/or mechanical process where as the secondary stage would have involved the use of microorganisms in a black box context. In recent years, the application of microbial technology has evolved beyond being a black box into the new discipline of environmental biotechnology. This high efficiency system bypasses need for a primary stage and goes directly into the secondary stage.

## Abstract

The application of biofilm technology to specifically target the hydrocarbon components in the industrial wastewater stream from a petrochemical plant has been successfully demonstrated in the lab and in the field. While the standard method for measuring wastewater discharge in compliance with regulatory body requirements uses Carbon Oxygen Demand, COD, we have gone another step further to perform GC-FID analysis for Total Petroleum Hydrocarbon, TPH content using PIANO standards performed on bio-treated samples in the laboratory.

The method used was based on an adaptation of USEPA method 8015 (modified), with PIANO; PIANO analysis is a hydrocarbon analysis carried out to determine the amount of paraffin (P), isoparaffins (I), aromatics (A), naphthalene (N), and olefins (O). These were done in duplicates; the TPH start values were about 250Kppm and the end values below 200ppm.

Fig 1: The graphs below are a comparison between treated and untreated high TPH wastewater samples based on GC-FIF PIANO analysis.



## Key Feature

- Targets petroleum hydrocarbons

## Potential Application

- High COD wastewater biotreatment plants from petrochemical industry

## Patent

- 1 patent has been granted with patent no: 200702388-0 in Singapore

## Contact Us

Department for  
Technology, Innovation and  
Enterprise (TIE)  
Singapore Polytechnic  
500 Dover Road  
Singapore 139651

Email: [tie@sp.edu.sg](mailto:tie@sp.edu.sg)

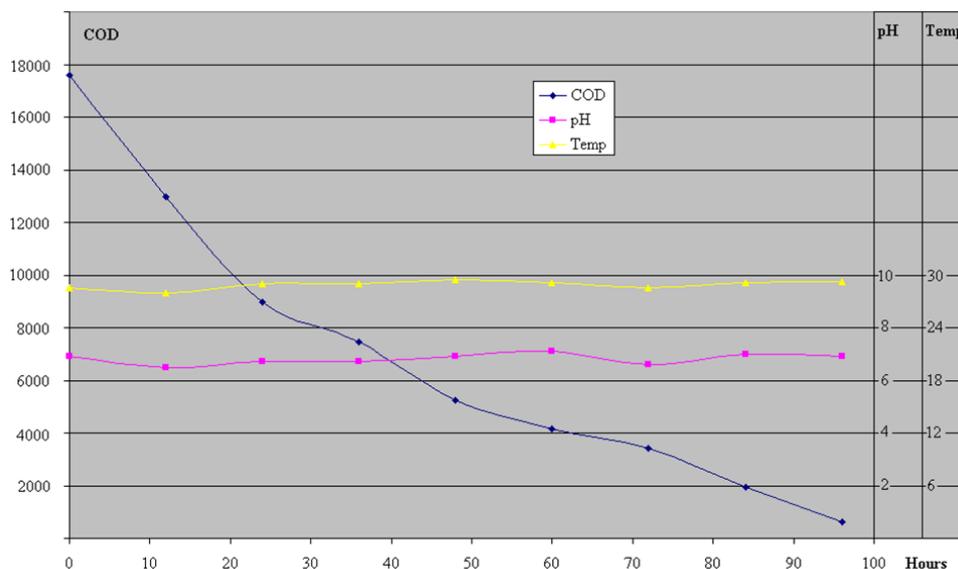
## Disclaimer

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**Competitive Advantage**

- The patented process does not require a primary stage involving chemical and/or mechanical treatment.
- This translates into reduced carbon footprint as the energy required is far less than a conventional system.
- By bypassing the primary stage, the infrastructure cost in construction of the sedimentation tanks and pumps are drastically reduced.
- This results in reduced power cost and the need for additional chemicals.
- The biological component is based on the application of biofilm technology that is reliable and reproducible.
- This technology specifically targets the recalcitrant petrochemical compounds that make this particular type of wastewater stream so difficult to treat.
- The process has been field tested on site at a petrochemical plant under standard operational conditions. One sample of the pilot plant data is shown below in Figure 2.

Fig 2: Graph of data from the biotreatment of industrial wastewater with a high initial COD value from a petrochemical plant containing hydrocarbons.



**PILOT PLANT DATA**

Starting at COD = 17,600  
 End COD < 640  
 Time < 100h (actual=96h)  
 Volume = 750L

**Commercialisation Opportunities**

- Technology is ready to be commercialized in the market.
- Technology is available for licensing from Singapore Polytechnic.
- Interested companies are invited to submit their plans to Singapore Polytechnic Technology Transfer and Enterprise Centre (TTEC) for exploitation of the technology locally.

**Contact Us**  
 Jonathan Ng

Department for  
 Technology, Innovation and  
 Enterprise (TIE)  
 Singapore Polytechnic  
 500 Dover Road  
 Singapore 139651

Email:  
 jonathan\_ng@sp.edu.sg

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