

One Time Service- Case Study

An Effective and Economical Solution for Accumulated Wastewater

Introduction

Wastewater treatment operations may encounter some unexpected conditions such as process failures, storm-water overflow, fire-fighting, leakages and other upsets, that result in large volumes of accumulated wastewater. The most common solution for treating such accumulated water is to gradually drain it into the main water treatment process. This solution is often very costly as it requires a long term storage arrangement and extra costs due to the extra volumes. Furthermore, it can often lead to operational difficulties due to the additional capacities and the different contaminants composition that may lead to systems overload.

One of the largest crude-oil refineries in South Africa encountered a plant upset that resulted in 5,000 m³ of highly contaminated wastewater. For several months, the water was stored in a storage tank within the plant. Due to the high contamination level which specifically included a high concentration

concentration, while monitoring the system with a fully automated control unit.

BPC's Solution

Considering the volume (5,000 m³) and the high contamination level (especially the phenols concentration), as well as the current infrastructure, the client's requirements and the space restraints, it was decided to treat the water separately from the other wastewater streams, and directly inside the tank in which the water was initially stored. This option ensured that the overall levels of the discharged water were stable and constant, so once the water was treated, it could be directly discharged in one batch.

Preliminary lab results

As a preliminary step, the client's water was sampled and analyzed in BPC's laboratories in order to develop optimal biodegradation. The lab analysis was performed in two stages: (i) Water characterization and (ii) Biological treatment. In the first stage various water parameters, such as Ammonium, Nitrate, TOC, Oil & Grease, TSS, pH, COD, were measured in order to determine the water contamination level and its biodegradability. In the second stage the bacterial activity was characterized and the optimal conditions identified in these experiments were applied in further implementation. The results of this preliminary analysis were presented to the client in a detailed report that included comparison values of all measured parameters and associated treatment protocols, cost and time frame

estimation, and a full P&ID. The effect of BPC-ACT™ biodegradation on the client's water samples is demonstrated in table 1.

Field implementation

Upon completion of the laboratory analysis BPC has erected a full implementation. The tank, in which the 5,000 m³ water was stored, was turned into a bioreactor.

After approximately two weeks, the project was successfully completed and the contamination level was decreased to the acceptable discharge levels. Furthermore the level of the biomass formed during the biodegradation process was lower than the discharge requirement. This allowed disposal of the water to the municipal sewer without any separation of the sludge.



of phenols, the water could not be drained into the municipal sewer. According to the plant's production manager: "we were determined to find a solution that would not only treat the water, but would be a cost-effective and environmentally-responsible".

BPC's innovative technology

BPC's innovative biological method for wastewater treatment is known as the Automated Chemostat Treatment™ (ACT). This new biological concept is based on maintaining a pre-selected bacterial "cocktail" at a stable and low



Table 1: Lab analysis before and after BPC-ACT™



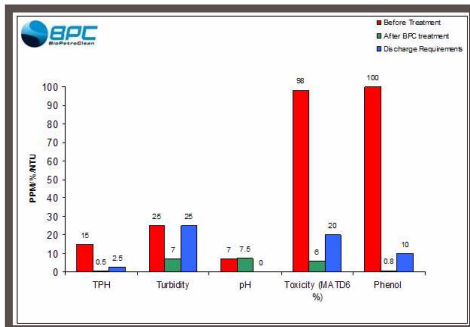
Parameter	Unit of Measure	Before Treatment	After BPC Treatment (BIO1)	% Reduction	Analytical Method
COD	ppm	2,000	400	80%	EPA 410.4
Sulphides	ppm		<0.1		EPA 376.2
TPH	ppm	15	0.5	97%	FTIR, EPA 418.1
Phenol	ppm	85	2	98%	GC-MS EPA 8270
Turbidity	NTU	20	10	50%	Photometric DIN EN 27027
pH		7	7.5		Electrode

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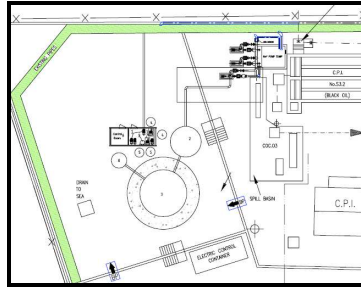
Field results

As shown in graph 1, the contamination levels were reduced to government discharge requirements. The main challenge the client encountered in the treatment of this accumulated water was the phenol level. The implementation of the BPC-ACT™ technology resulted in a significant phenols reduction from 100 ppm to below 1 ppm, exceeding the required level for discharge (10 ppm). Similarly, TPH was reduced significantly below regulation levels, from 15 to <0.5 ppm, again lower than the required levels. The turbidity was reduced from 25 NTU to 7 NTU, while COD was 95% reduced from 2000 to 100 ppm.



At the beginning of the process, the local EPA agents tested the wastewater for toxicity levels (MATD6 testing). This analysis is used to determine the overall quality of the water. It is done by measuring the toxic effect of the bulk water on different organisms. The organisms are exposed to increasing concentrations of the tested sample and their ability to survive, grow, and reproduce is empirically measured. This

test is an additional indication for the successful treatment of BPC-ACT™ as the toxicity was decreased from 98% to 6% by the end of the biological treatment (less than half of EPA discharge requirements).



The valuable contribution of BPC

BPC's approach for the challenges the client has encountered with the 5,000 m³ of highly contaminated water was simple and elegant. The one-time service performed at the client's site was advantageous for the following reasons:

1. Minimizing the storage occupied by the wastewater- once the service is available at a short response time, customers may empty the storage as soon as it is filled up preventing the need for large storages.
2. Cost savings – considering the option of transporting the water to a treatment plant, the BPC service saved more than 50% of the operational cost
3. Tailored service - The one off service is designed to treat very specific water storage, this enabled an optimal treatment with effective biodegradation of problematic compounds such as Phenols, Ammonia etc. that may be rejected by the common

treatment plants.

4. Technology demonstration- Customers may experience the new ACT technology at no risk, and learn how the recent developments in bioremediation may help improve their main stream water treatment.

The next step

A few months after the completion of this one-time service, the client has approached BPC with a request to treat additional 10,000 m³ of wastewater. This water again was accumulated due to an unexpected upset, and included a high level of phenols. Once again, the BPC-ACT™ technology proved to be very efficient and the water contamination parameters exceeded the legislative requirements. It is worth noting that the time frame in the second project was significantly shorter.

Following the two successful one-time projects, the client was very pleased with the system's performance and decided to hire BPC to build a full on-going system.

Summary

Wastewater treatment operations often encounter the challenge of treating highly contaminated water that has been accumulated unexpectedly. In these cases, the disposal of such water can bring up logistic and operational problems, as well as an economical burden. As an efficient and cost effective alternative to existing options, BPC offers a one-time service for cleaning this water at the customer's site. This case-study describes the successful implementation of such a one-time service in one of South Africa's largest refineries. Thanks to BPC's innovative biological concept, based on maintaining a pre-selected bacterial "cocktail" at a stable and low concentration, while monitoring the system with a fully automated control unit, the final contamination level was extremely low.

Considering the satisfying results of this one time service, the customer is now interested in a full on-going system of BPC-ACT™.

Parameters	Before Treatment	After BPC Treatment	Discharge Requirements	% Reduction
Oil / TPH (ppm)	15	<0.5	2.5	97%
COD (ppm)	2,000	100	100	95%
Turbidity (NTU)	25	7	25	72%
pH	7	7.5	5.5-9.5	
Toxicity (MATD6 %)	98	6	20	94%
Phenol (ppm)	100	0.8	10	90%
Settleable Solids %		<0.04	0.2% (= 2ml/Lit)	