



Warwick Chemicals
Mostyn, Holywell, Flintshire

Report on the potential impact by fungal hyphae on the COD/BOD levels in discharged waste water

Introduction

The Environmental Permit (BU 2357 as varied) for Warwick Chemicals specifies a limit (250mg/l) for the quantity of solids in the waste water that is discharged from the site.

Historically there have been a number of issues with the origin of the solids being discharged with the fungal hyphae content being the main contributor rather than process related material.

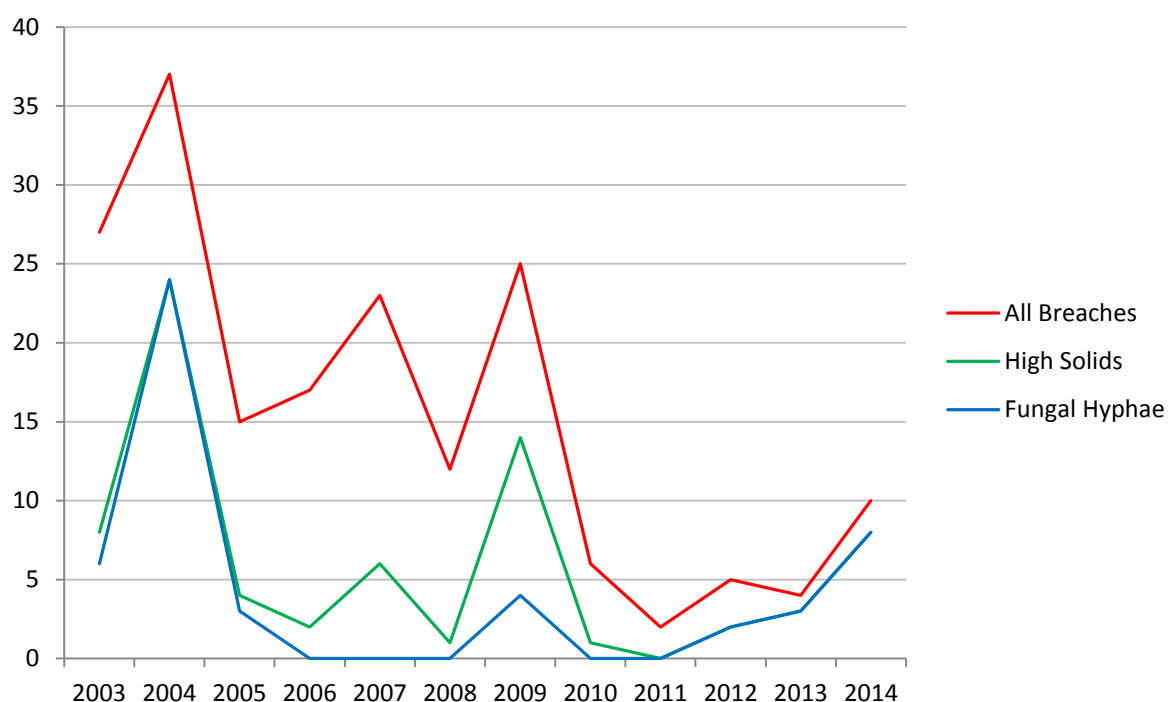
During the EPR compliance assessment visit in October 2014 the NRW Inspector requested a study to be carried out to review the following:

- *Site to assess the impact of hyphae from a BOD / COD perspective (criteria ref: E3, CCS Category C3).*

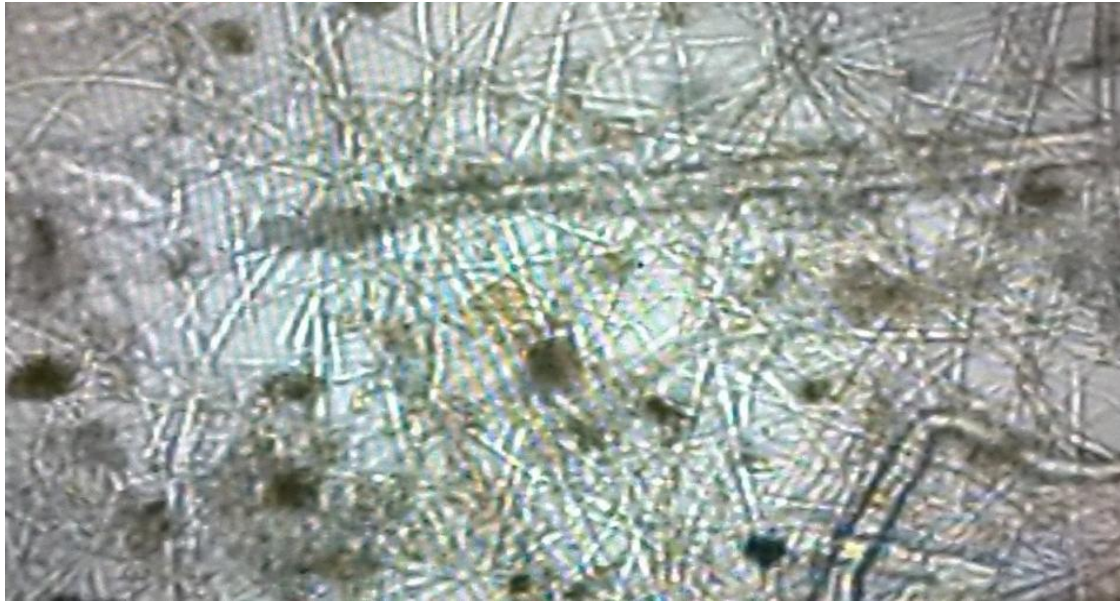
Background

Looking at the historical data it can be seen that over the lifetime of the Permit there have been issues with the solids content in the discharged waste water with the fungal hyphae playing a large part in the cause of the emission breach.

It can also be seen that in 2003, 2004, 2005 and 2013 the emission breaches occurred during the winter months. However, this pattern is not consistent as in 2009, 2012 and 2014 the emission breaches have occurred throughout the whole year.



This naturally occurring fungal hyphae, when viewed under a microscope, is made up of long filamentous threads. The two pictures below are examples of fungal hyphae material found in samples of the discharged waste water.



Picture 1



Picture 2

Discussion

Sampling and testing is carried out for each waste water discharge and this has provided a lot of useful data.

Statistical analysis was carried out on this data using Minitab statistical software, performing a standard correlation test, a Pearson's correlation coefficient test and a paired T- test.

Looking at the historical data when there were high instances of fungal hyphae in the discharged waste water (2004) statistically there appears to be no correlation between the solid content and the COD levels in the waste water. This statistical analysis was performed on data from the years 2005 to 2014 and produced very similar results.

Further analytical tests were carried out on waste water samples where a portion of the sample was filtered to ensure that the fungal hyphae were removed from the waste water and a COD test was then carried out. The results from this testing were then compared with the results from the standard analysis (unfiltered sample).

There was very little difference in the COD results between the filtered and unfiltered samples.

Previous testing has been able to demonstrate, for the site's waste water, a consistent relationship between COD and BOD, a 2:1 ratio.

Although the number of BOD samples used in this comparison was not as great as the COD sample numbers, the statistical correlation tests again were able to demonstrate that there was no correlation between the solid content and the BOD levels in the site waste water.

Conclusions

The conclusions from the statistical analysis of the sample results is that that there is no, or very minimal, impact on the COD/BOD levels in the waste water discharge due to the presence of fungal hyphae.

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HSE Manager

11th December 2014