



The Wastewater Specialists

Optimising your assets

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Geothermal Mud Inhibition Testing

Dear Alison,

We have undertaken respiration-based toxicity testing of the geothermal mud samples.

Methodology

Geothermal mud samples from [REDACTED] (separate samples of [REDACTED]), [REDACTED] and [REDACTED] were submitted for analysis. We prepared 10% w/w solutions of each of the four muds for initial screening testing. On samples which showed significant inhibition during the screening test, we undertook detailed testing to determine the inhibition curves for each.

Physical Characteristics

The physical appearance of the four samples were as follows:

- > [REDACTED] Wet paste
- > [REDACTED] Wet paste
- > [REDACTED] Slurry
- > [REDACTED] Dry cake

After making up 10% w/w solutions, the physical characteristics of the samples differed considerably. The 10% w/w solutions of [REDACTED] created suspensions which were colloidal in appearance, with minimal settling occurring even over a 5-day period. The [REDACTED] sample settled comparatively well, while the [REDACTED] sample contained a mixture of settleable and colloidal solids. The suspended solids concentration of the [REDACTED] sample was visibly lower than the other three samples, which isn't surprising given the [REDACTED] sample provided for testing was a slurry. These physical characteristics of the samples can be seen in Figures 1 (immediately after solution makeup) and 2 (after 5 days undisturbed).

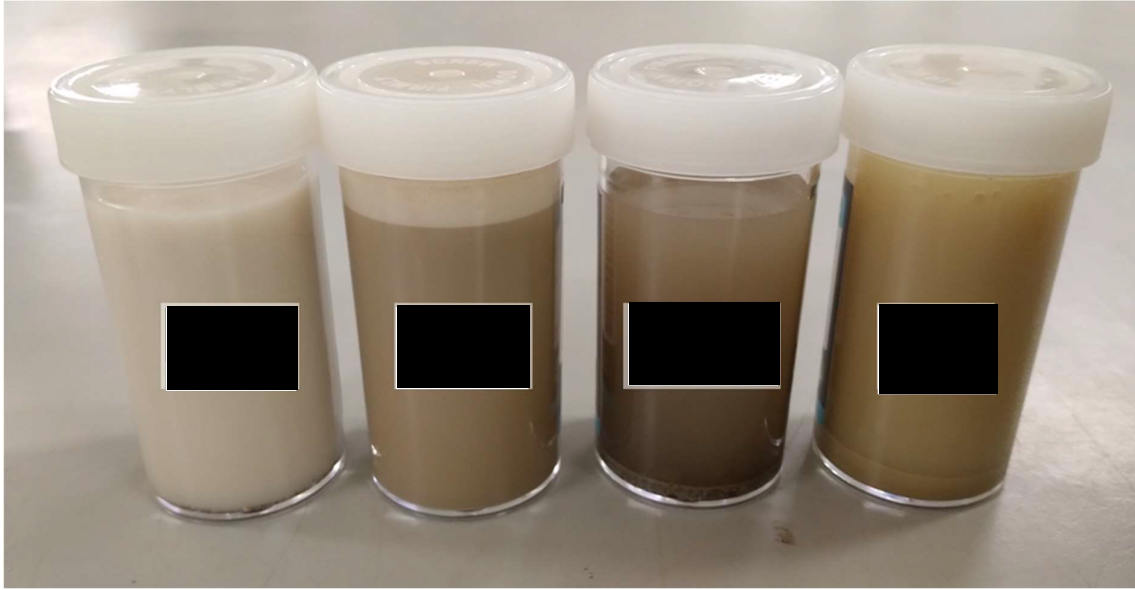


Figure 1: 10% w/w Solutions – Immediately after makeup

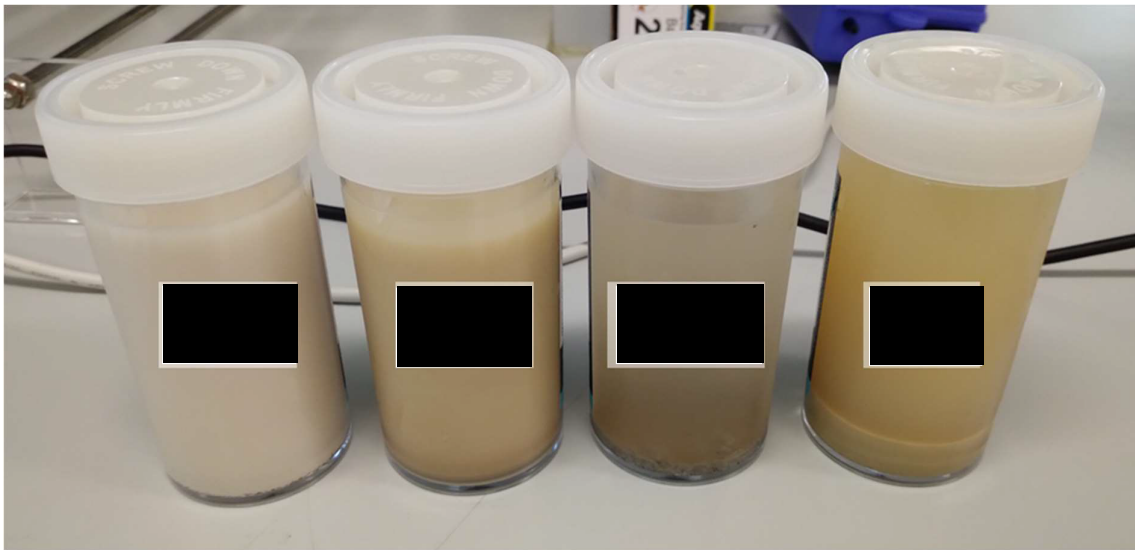


Figure 2: 10% w/w Solutions – After 5 days “settling”

Results – Screening Test

The inhibition results from the initial screening test are shown in Figure 3. This clearly demonstrates that the two [redacted] samples ([redacted]) have the potential to adversely affect biological wastewater treatment processes, with both of the [redacted] 10% w/w solutions inhibiting the activity of nitrifying bacteria by ~80%. In addition, the [redacted] solution inhibited the general,

heterotrophic biomass, by approximately 60%. When diluted to 10% w/w solutions, the [redacted] and [redacted] samples were not inhibitory to wastewater treatment biomass.

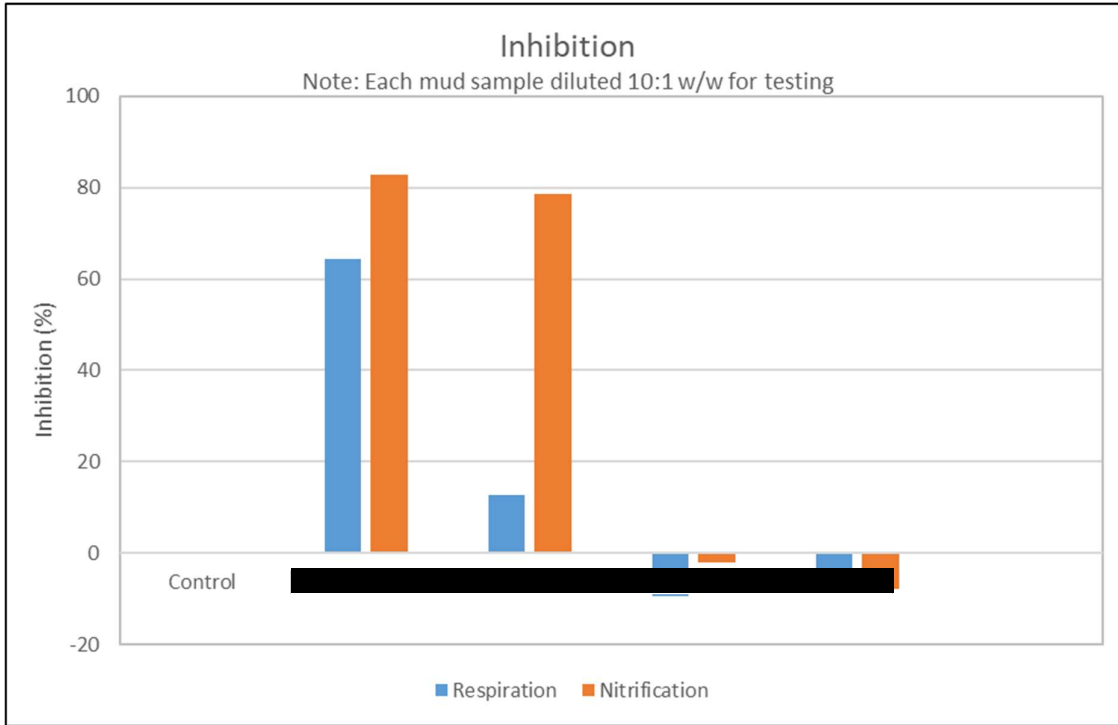


Figure 3: Initial Screening Tests - Inhibition

Results – Detailed Tests

Detailed tests were undertaken on the [redacted] and [redacted] samples. Samples were tested at 0.5, 1, 2, 5 and 10% w/w. This testing confirmed the results of the initial screening test, with the 10% w/w solutions significantly inhibiting nitrifying biomass. The 10% w/w [redacted] solution was also inhibitory to the heterotrophic biomass.

When diluted to 1% w/w solutions, the [redacted] samples had little, if any, inhibitory effect on microbial oxygen uptake. The inhibition curves for these two samples are shown in Figures 4 and 5.

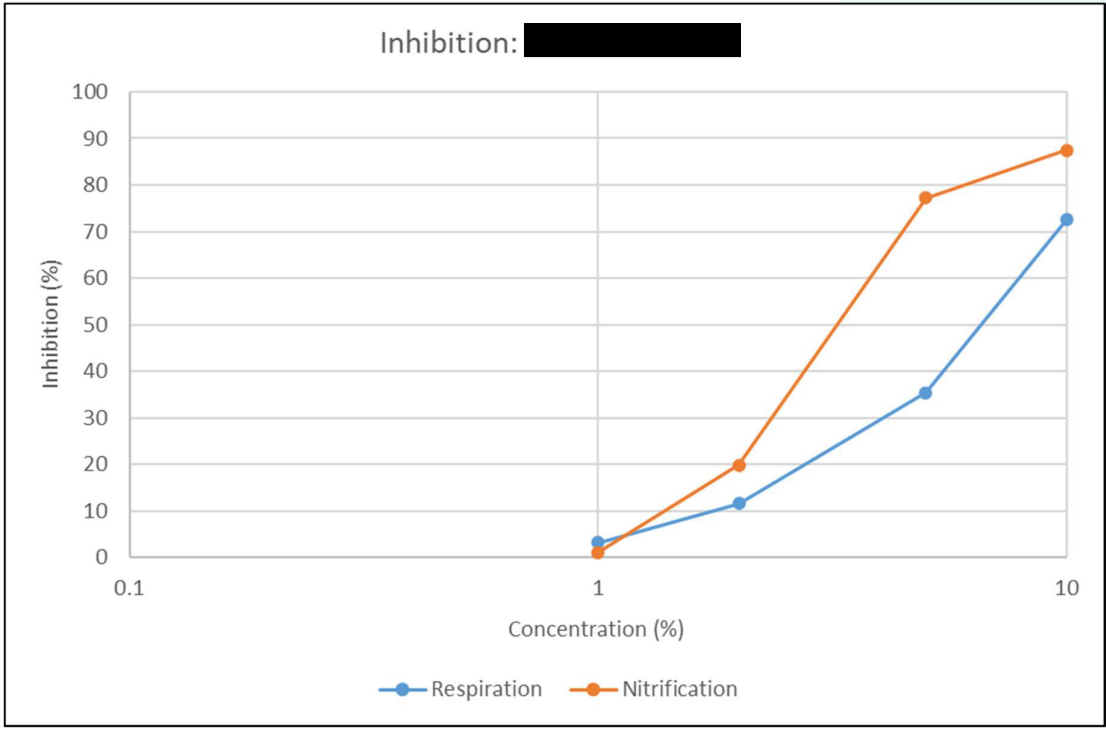


Figure 4: [REDACTED] Inhibition Curve

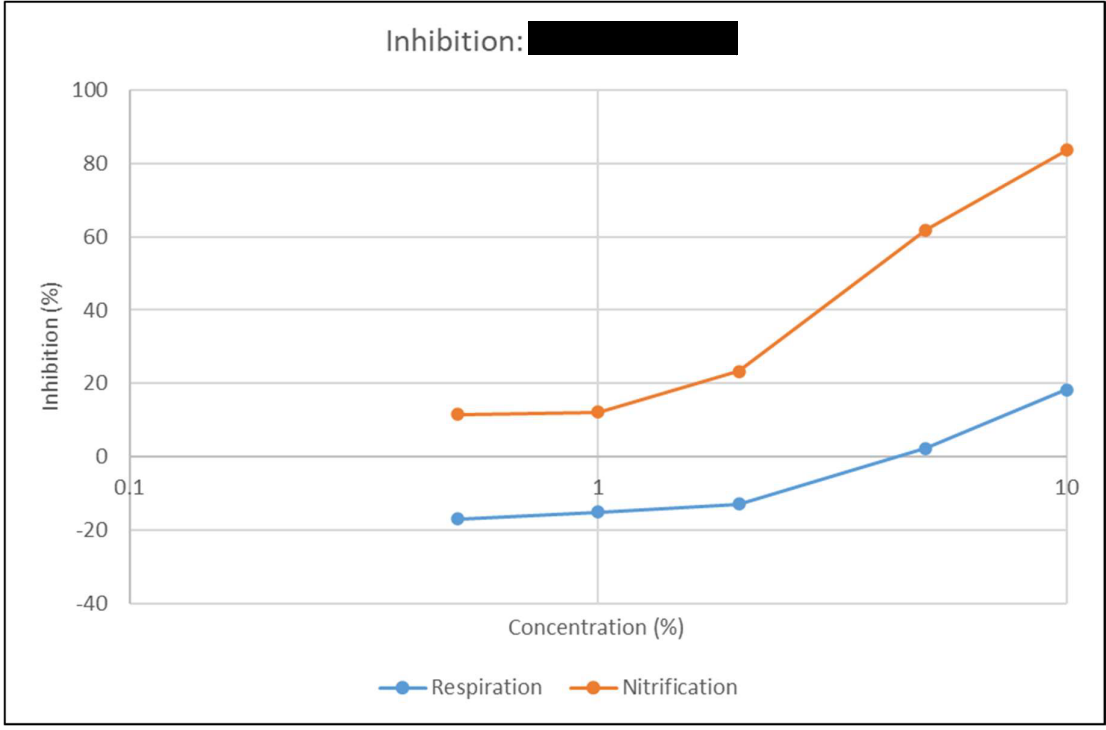


Figure 5: [REDACTED] Inhibition Curve

Discussion

This testing has identified that both [REDACTED] and [REDACTED] have the potential to adversely affect biological wastewater treatment processes, while the [REDACTED] and [REDACTED] do not appear to be of concern. The two [REDACTED] samples were inhibitory to nitrifying biomass at concentrations between 2 and 10% w/w, but were not of concern at a 1% w/w solution (1-in-100 dilution).

We understand the results of this testing will be considered when determining conditions for Trade Waste discharge agreements for [REDACTED]. A key consideration in this assessment will be how the Scrub and Mud products are used at [REDACTED], and what concentrations of these products would likely be contained in wastewater discharged from the [REDACTED] facility.

While this testing suggests the [REDACTED] would not adversely affect the Rotorua WwTP at a dilution of 1 in 100, limits in Trade Waste agreements should be conservative due to the potential for different Trade Waste discharges to have antagonistic effects on biological wastewater treatment processes.

If you would like to discuss these results, please don't hesitate to contact me.

Yours sincerely,



Hugh Ratsey
Wastewater Process Scientist