



Earth Rangers Centre
for Sustainable Technology

and

MOLOK[®]
North America Ltd.

Independent Temperature
& Odour Test Report

May 2019



EXECUTIVE SUMMARY

The Earth Rangers Centre for Sustainable Technology (ERC) was retained to complete an independent study of the Molok in-ground waste and organics storage system for its ability to buffer changes in outdoor temperature and thus reduce odours. This study also encompassed a comparison of temperatures and odours from our temperature controlled waste room.

ERC completed this study over a period of two (2) years. With the only differences being:

- in the second year of the study the measurement frequency for odours was greater than in the first year; and
- in the second year of the study we measured the energy consumption of our temperature controlled waste room in order to estimate the energy cost of operating our waste room

The following two (3) findings are discussed in more detail in the report below and represent a testing over two (2) year of measurements.

FINDING 1: Temperatures measured from 50" from the top to the bottom of both the waste and organics Moloks at all times were lower than the average temperature of our temperature controlled waste room. From the top to 25" below the top, temperatures were on average lower than that of our conditioned waste room 78.7% of the time.

FINDING 2: At no time did odours, measured by our calibrated odour meter, directly outside the Molok exceed that of our temperature controlled waste room

Overall, our findings indicate that the Molok outperformed our temperature controlled waste room in slowing decomposition by keeping waste and organics at lower temperatures and reducing odours emanating from Moloks.

FINDING 3: Based on data collected from building submeters. The total energy consumption to condition our waste room was 2,940 kWh which equates to a cost to condition our waste room of approximately \$323.42*. The Moloks did not cost any energy to condition or maintain in 2018. Therefore, the net savings if we were to only use the Moloks for waste, recycling and organics would be \$323.42* per year.

*Energy consumption and costs are based on Earth Rangers Centre specific data, which are 56.7% of the national average office consumption profile. It should also be noted that the Earth Rangers Centre conditioned waste room is 390 square feet.

METHODOLOGY

Temperature probes were installed in the interior bag of the Molok waste organics container and on the interior tube of the Molok organics container. In total, four (4) temperature probes were installed on each Molok container at the following levels:

- Top of Bin



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- 25" from Top of Bin
- 50" from Top of Bin
- Bottom of Bin

The temperature data logger on both Molok containers was set to measure temperatures every hour. This log was downloaded every 2 weeks and the data collected for one (1) years.

Odours were measured using the following equipment:

- Levitt Safety IAQ monitor set to measure CO₂, SO₂, NO, O₂, and ambient temperature
- KanoMax Handheld Odor Meter OMX-ADM, which measure hydrogen sulfide, methyl mercaptan, ammonia and other odour causing substances.

Odours and temperatures were measured bi-weekly (every 2 weeks) for the first year of the study period and daily for the second year. Odours were measured at the Molok area and also in our waste room for comparison purposes.

SUMMARY OF FINDINGS

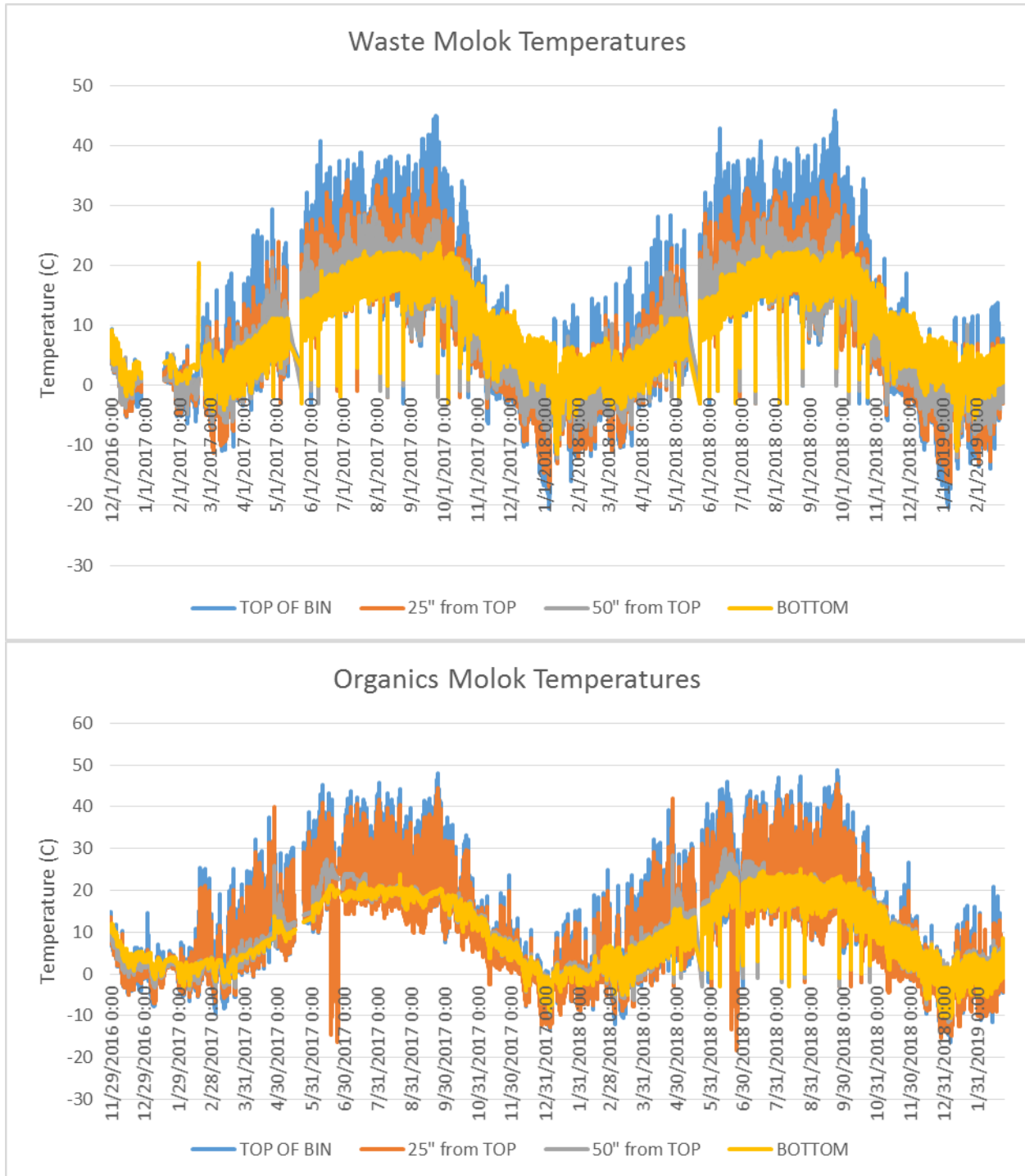
Based on the results of our two (2) year study on temperatures and odours emanating from the Waste and Organics Molok containers, we measured the temperatures at intervals of one (1) hour for at four (4) different depths for each Molok container. The below graph shows the temperatures from the waste and organics Moloks vs the temperatures from our conditioned waste room. Please note that the temperatures were much more constant 50" from the top of the bin to the bottom of the bin for both the waste and organics Moloks.



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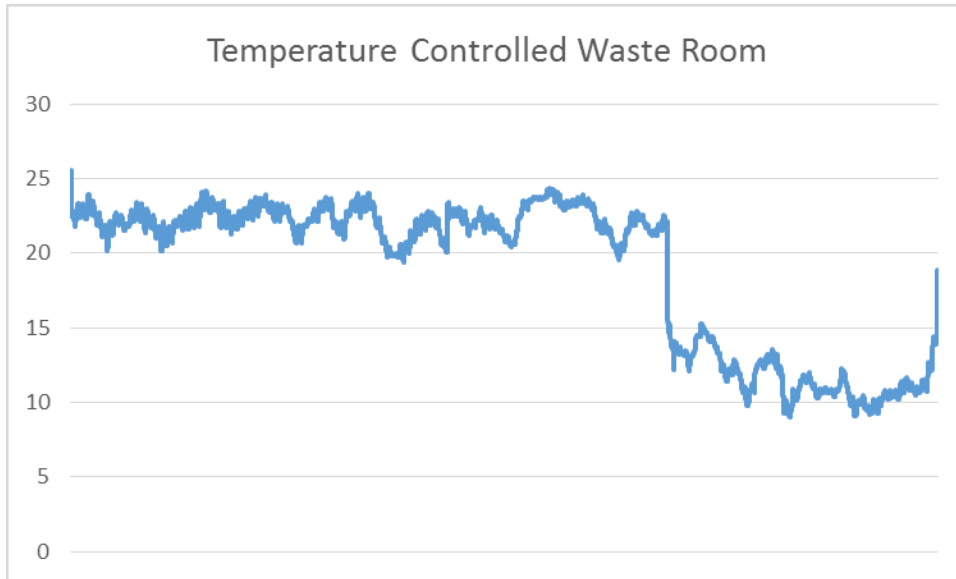




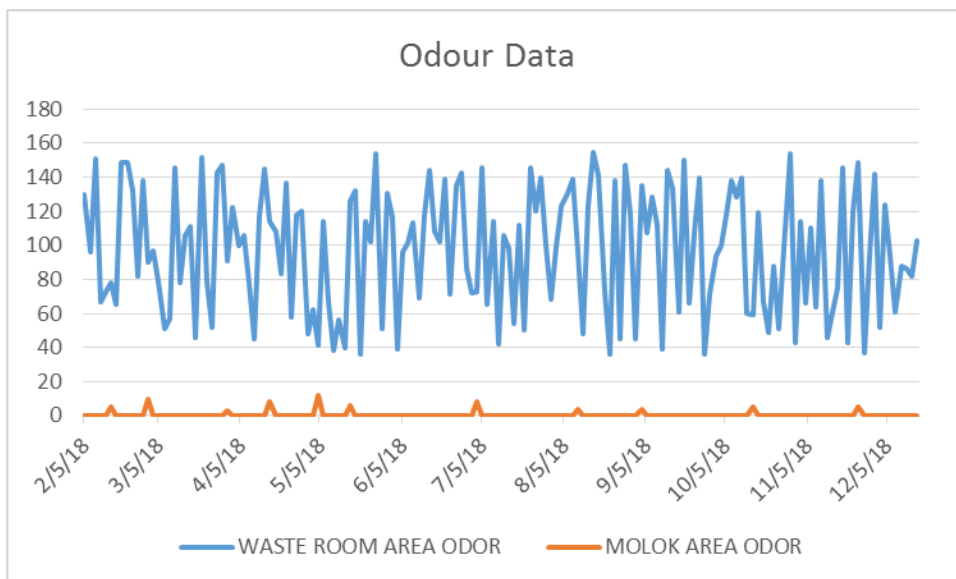
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The Kanomax odour monitor was provided the most accurate readings of odours and measured odours on a scale from 0 to 999 with 0 being no detectable presence of any odour causing molecules. Odours were detected in the waste room throughout the year while odours were only detected from Molok in May, directly following a recent Molok pick-up.

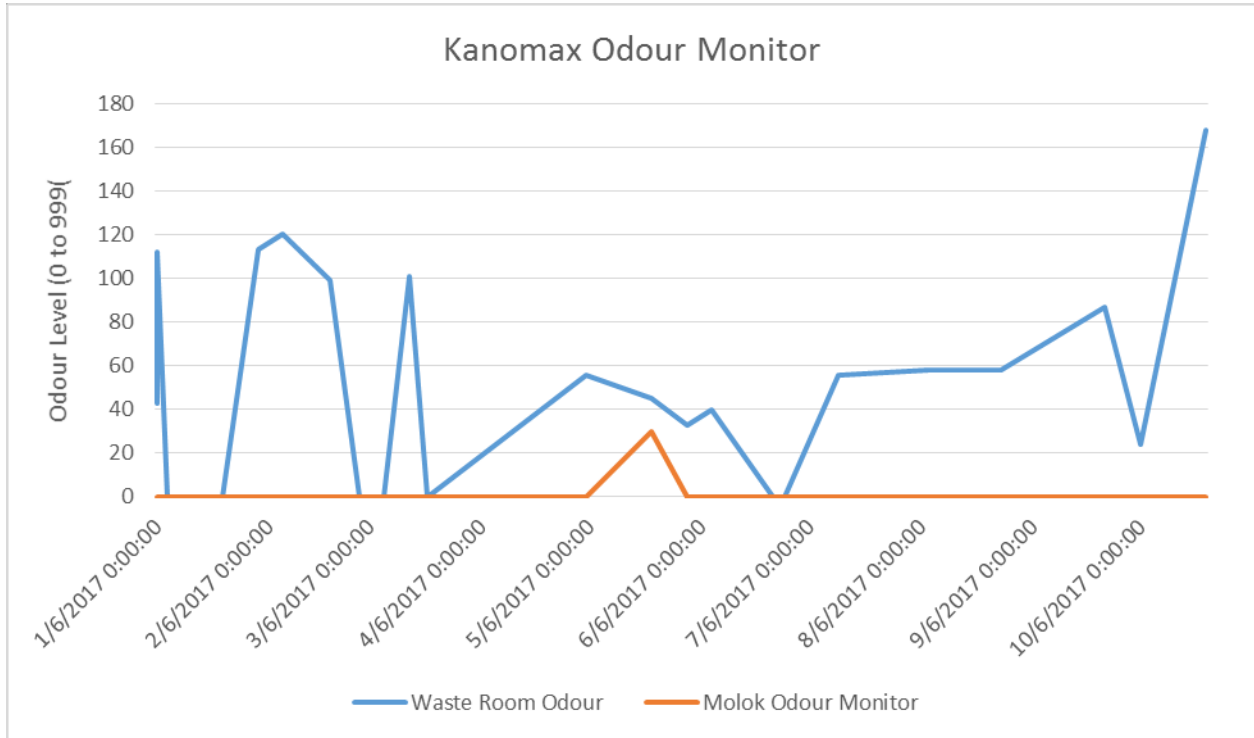




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CONTACT

This study was supervised by Gavin Yeung; contact provided below. All measurements and analysis were completed at the Earth Rangers Centre for Sustainable Technology located at 9520 Pine Valley Dr., Woodbridge, ON.

Please contact the undersigned should you have any additional questions or inquiries regarding this report.

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