



Technical Memorandum

To: Atascocita Joint Operations Board

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Subject: Second DryLet Test – Results and Economic Analysis

Introduction

The purpose of this technical memorandum is to summarize the results and the economic benefit of sludge reduction for the second round of testing using DryLet® LIFT at the Atascocita Regional Wastewater Treatment WWTP (“WWTP”). DryLet® LIFT (“DryLet”) is proprietary a wastewater sludge reduction product developed and manufactured by DryLet, LLC. For more information on the first round of testing, please refer to our memorandum titled “DryLet® LIFT Study and Evaluation at Atascocita Regional Wastewater Treatment WWTP” and dated August 18, 2015.

This test was conducted with the support of Severn Trent’s on site O&M personnel and personnel from Severn Trent’s Client Solutions Group.

Testing

The test period began in August 15, 2016 and concluded in April 28, 2017. The test period was broken down into three phases with Phase 2 split into two subphases:

- **Phase 1 - Baseline Data Collection**
 - August 15, 2016 – October 18, 2016, Weeks 1 – 10 (10 weeks)
 - Baseline data collection prior to DryLet addition for comparison to data collected during DryLet addition.
- **Phase 2 - DryLet Addition**
 - **Phase 2a - DryLet Addition: Ramp Up**
 - October 19, 2016 – December 21, 2016, Weeks 11 – 19 (9 weeks)
 - Addition of DryLet at 8 lbs/day and increase in the Mixed Liquor Suspended Solids (MLSS) to bring the WWTP to a “steady state” with the product in the system (i.e. higher solids carrying capacity).
 - **Phase 2b - DryLet Addition: Steady State**
 - December 22, 2016- March 14, 2017, Weeks 19 – 31 (12 weeks)
 - Addition of DryLet at 8 lbs/day to maintain the WWTP at a steady state.
- **Phase 3 – Post-DryLet**

- March 15, 2017 – April 28, 2017, Weeks 32 – 37 (6 weeks)
- Addition of DryLet ceased on March 15 followed by a gradual decrease in the MLSS to return WWTP to non-DryLet steady state.

It is important to note that there was a period of three weeks (weeks 10-12) when the WWTP belt press dumpsters were inaccessible to the sludge hauler due to WWTP paving and driveway culvert improvements. Furthermore, during weeks 12 to 19, the sludge wasting rate from the digester to the belt press was kept especially low to increase the MLSS at the WWTP. Per DryLet, this allows for the optimal operating conditions for the DryLet product to perform. This period of time was labeled as Phase 2a and eliminated from as it was an acclimation phase to the DryLet addition prior to achieving a new steady-state condition in the WWTP.

Starting on October 19, 2016, DryLet LIFT was added to the headworks of the WWTP at a rate of 8 lb/day. Data on various aspects of the WWTP was collected to evaluate any changes to the WWTP and ensure compliance with the Texas Commission on Environmental Quality (TCEQ) discharge permit requirements.

Throughout the study period, the WWTP maintained compliance while experiencing improvements in various performance measures outlined later in the memorandum. However, the most relevant variable in terms of economic value, and the focus of this memorandum, was sludge production. The sludge is dewatered, hauled and weighed prior to being legally disposed of at a landfill. This weight was tracked and the results are plotted on Figure 1. Wet tons of sludge hauled was reduced by 39% during the test period. In addition, the number of sludge hauls were tracked and are shown in Figure 2. The resulting reduction in sludge hauls was 36%.

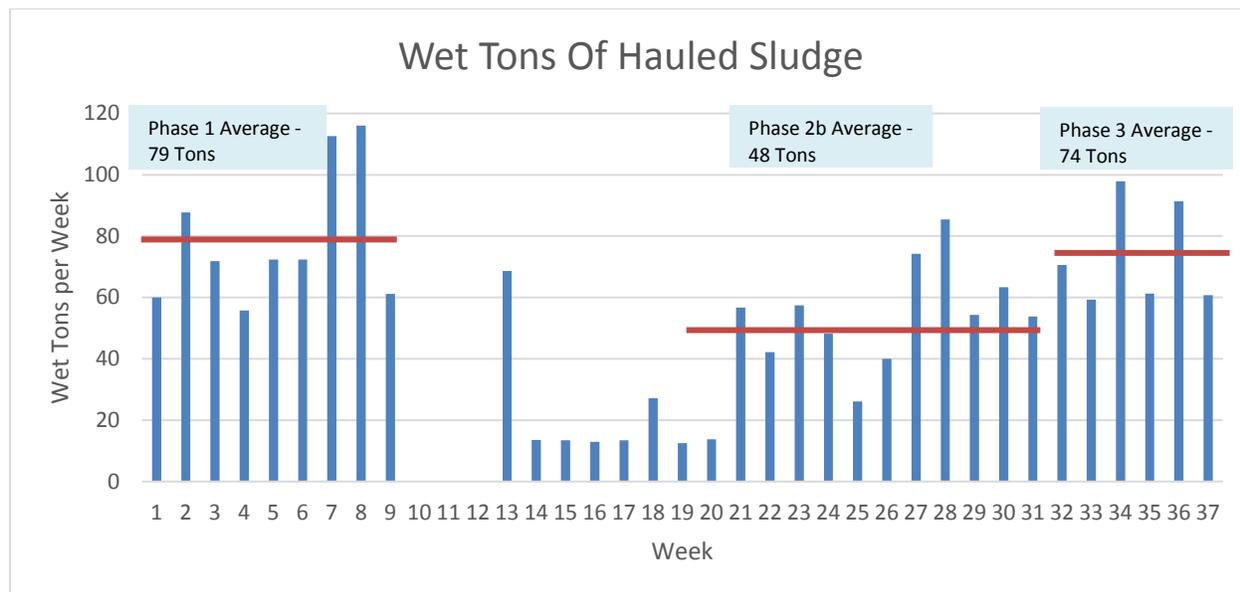


Figure 1 - Tons of Hauled Sludge

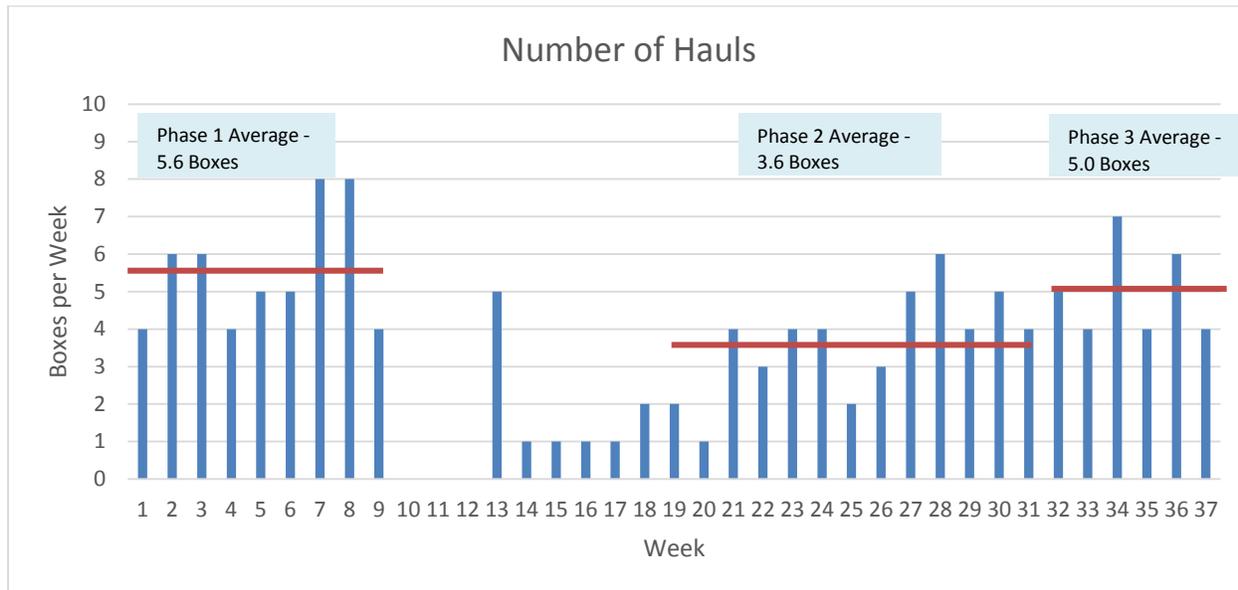


Figure 2 – Number of Hauls

Other notable observations included:

- Potential for better treatment efficiency
 - Potential for more capacity without capital expenses
 - Potential for less blower use by optimizing dissolved oxygen demand.
- Potential for more thorough nitrification/denitrification
- Potential for reduced chlorine demand and dechlorination requirements
- Potential for improved effluent quality
- Increased belt press run time
 - The press run time was recorded to be 26 hours per week for Phase 1 and 31 hours per week for Phase 2b. We have some ideas on potential reasons for this, but will continue to track this metric following the study.

Economic Analysis

The calculated sludge haul reduction of 36% translates into financial savings. The savings are estimated by annualizing the cost of sludge hauls without DryLet to the cost of sludge hauls with DryLet plus the cost of DryLet itself based on the data collected during the test period.

The cost per sludge haul is \$495/box and there was an average of 5.6 boxes per week during Phase 1 (without DryLet) and 3.6 boxes per week during Phase 2b (DryLet-Steady State). The cost of DryLet consist of the product itself at \$12/lb plus shipping charges of \$105/month. The calculations are shown below and summarized in Table 1.

Annual cost of sludge hauls without DryLet:

$$5.6 \text{ boxes/week} \times 52 \text{ weeks/yr} \times \$495/\text{box} = \$144,144$$

Annual cost of sludge hauls with DryLet:

$$3.6 \text{ boxes/week} \times 52 \text{ weeks/yr} \times \$495/\text{box} = \$92,664$$

DryLet LIFT cost:

8 lbs/day * 365 days/yr * \$12/lb + 12 months * \$105/month (shipping) = \$36,300

Table 1 - Economic Analysis Summary

	Annual Cost without DryLet	Annual Cost with DryLet
Sludge Disposal	\$144,144	\$92,664
DryLet LIFT	\$0	\$36,300
Total	\$144,144	\$128,964

The annual savings are estimated to be **\$15,180**.

Conclusion

The second round of DryLet testing further supports the conclusions of the first round of testing, i.e., obtaining a significant reduction in sludge production while adding DryLet to the system. In addition, the WWTP functions more efficiently in many quantitative and qualitative aspects and, while some of these aspects cannot be translated into financial savings, there is the potential for future optimization opportunities. These include less blower usage by optimizing Dissolved Oxygen demand and less use of Chlorine and Sodium Bisulfite.

However, the main economic driver comes from the sludge haul reduction. During the study a reduction of 36% was observed which equates to an estimated annual savings of approximately \$15,000 when the cost of DryLet LIFT was taken into account. It is our recommendation that DryLet LIFT continue to be used at the WWTP. It is also our recommendation that sludge hauls and belt press run time continue to be monitored on a regular basis to confirm that the savings are maintained for the long term.