

# **Biosolids Dryer Inspection Report**

## **For Wellington Florida**

Date: May 18, 2020

Inspection Date: May 13 – 14, 2020

Inspected By: Chad Bolton

The dryer and area are exceptionally clean and well organized compared to the many other Fenton dryer installations AIT services across the U.S. It is obvious that there has been a dedicated effort in keeping up with the general maintenance of the system since it was installed 8-9 years ago.

While the general appearance of the system is good, and the maintenance as it was outlined by Fenton has obviously been adhered to, there are a large number of items listed below that AIT feels falls outside of what a general maintenance program would encompass.

Although the system is functioning as this time, AIT recommends that the repair, or replacement of several failing, or worn components be conducted in the not-too-distant future. Failure to address the problem with several of the failing components soon would most likely result in an extended shut down of the dryer at some point given the timeframe required to obtain the proprietary parts.

Below is a list of each of the deficiencies identified during our inspection, recommendations for the corrective actions and comments:

### **Leaking and Deteriorated Scrubber/Condenser and Thermal Fluid Expansion Tank**

Problem – The scrubber lid has eroded holes in it with deterioration from corrosion on the inside of the vessel along with missing seals and bolts.

The expansion tank has a hole in it located near a pipe fitting penetration weld.

Recommendation – Either repair both systems, or replace these with new vessels.

Comment – Leaks in the scrubbing system prohibit the ability to maintain the correct draft on the dryer chamber which can greatly affect the removal of the steam vapor from the drying chamber. This can result in extended drying times per batch.

A quote for this condenser, along with a new thermal fluid expansion tank for your system was provided to James Washington with Wharton-Smith on March 12, 2020.

### **Rotor Drive Sprocket/Chain Misalignment**

Problem – The drive sprockets on the rotor drive were out of alignment. The drive sprocket on the rotor shaft is severely worn due to extended operation with the sprockets not set properly.

Recommendation – Replace rotor drive sprocket.

Comment – Due to concern over the misalignment and the high possibility of the chain breaking, AIT reset the sprockets to align during our inspection visit. There is still a possibility of the chain “jumping” teeth on the worn sprocket, which could result in the chain breaking.

#### Rotor Thermal Fluid Swivels

Problem – One of the two swivels appears to be worn internally (bushings) from the noise (grinding) observed. The other swivel is leaking fluid.

Recommendation – Replace the worn swivel and install new packing and springs in the other.

Comments – These swivels were designed by Fenton, therefore are not a stock item. Production time is an estimated 4-6 weeks for one of these swivels. Consideration should be given to having the worn swivel inspected after removal and determine if it can be rebuilt. If it can be rebuilt at a reasonable cost, the City would have a spare unit in inventory.

#### Rotor Shaft/Dryer End Wall Gland Packing

Problem – Sludge is leaking on both ends of the dryer through the packing glands. The steel compression ring on one end is worn.

Recommendation – Replace the worn steel compression ring and install new packing and seals in both ends.

Comments – Leaking seals on the dryer chamber not only create a mess but can allow ambient air to be pulled into the housing by the scrubber/condenser blower. This can create a slight inefficiency of the system but will increase the amount of particulate loading going to the scrubber/condenser.

#### Dryer Discharge Door Seal

Problem – The dry solids discharge door seal has failed.

Recommendation – Replace the seal.

Comments – Failure of this seal will allow leakage of the wet bio-solids into the dry solids discharge auger. The potential of plugging of the conveyor exists, since rewetted dried biosolids tend to become impacted in screw conveyors much more so than typical dewatered biosolids off a press, or centrifuge.

#### Dryer Chamber Access Support Bars

Problem – The heavy crossover support bars that are located across the opening in top of the drying chamber are severely corroded.

Recommendation – Replace all support bars.

Comments – These bars serve to support the structural integrity of the chamber. Extended operation of the dryer over a shorter period could cause deformation of the actual chamber due to the continuous thermal expansion and contraction of the dryer.

#### Chamber Seals

Problem – Missing, or faulty seals on the dryer chamber access lids and inspection hatches.

Recommendation – Replace all damaged or missing seals.

Comments – Leaking seals on the dryer chamber not only create a mess but can allow ambient air to be pulled into the housing by the scrubber/condenser blower. This can create a slight inefficiency of the system but will increase the amount of particulate loading going to the scrubber/condenser.

#### Dryer Rotor

Problem – The dryer rotor has shifted toward one end of the chamber.

Recommendation – Reposition the rotor to the correct location.

Comments – The rotor has minimal clearance between the end wall of the chamber and the rotor discs. Thermal expansion of approximately  $\frac{3}{4}$ " in length of the rotor is typical. The concern is that if the rotor shifts a small amount more, it will be rubbing the dryer end wall and cause damage to both the end wall, and the rotor disc. The rotor weighs approximately 58,000 lbs. but can be moved out of position by the biosolids being dried if the reversing timer is not adjusted properly.

#### Rotor Drive Chain Adjustment

Problem – Too much slack in the rotor drive chain.

Recommendation – Reposition the gear reduction box.

Comments – The large rotor drive chain cannot be adjusted to the correct tension by simply removing or adding links. Shims need to be placed under the gear box to obtain the proper adjustment on the chain.

#### Rotor Drive Chain Tensioner

Problem – Worn component.

Recommendation – Replace chain tensioner.

Comments – Reducing the amount of slack in the rotor drive chain as described above, will require less movement of the chain tensioner and extended life of the tensioner can be expected.

#### Rotor Disc End Plate Scrapers on Drive End

Problem – Worn components.

Recommendation – Replace scrapers.

Comments – The scrapers are welded to the outer disc face on either end of the rotor. These serve to prevent the biosolids from becoming dried and impacted between the chamber end

plate and the rotor. Operating the dryer over an extended period without these scrapers in place can cause greatly accelerated wear to the rotor disc and/or the dryer end plate.

#### Rotor Lifting/Conveying “Paddles”

Problem – Worn components.

Recommendation – Replace all paddles in the not-too-distant future.

Comments – These paddles are welded to the rotor and are a critical component to the efficiency of the drying process as they serve to break up the biosolids allowing moisture to more easily be released. In addition, some of these paddles serve to move the dried material to the discharge opening when the cycle is completed.

#### Swivel Cable/Brace

Problem – There is excessive over-hung load on the thermal fluid rotary swivels from the weight of thermal fluid piping. This load is apparently causing premature wear of the swivels.

Recommendation – Install a mechanism to support the weight of the piping and reduce the over-hung load on the swivel.

Comments – Fenton obviously did not take into consideration the excessive load placed on the swivel from the weight of the piping.

#### Fusible Link

Problem – The fusible link is missing.

Recommendation – Install new component.

Comments – The fusible link is a safety device in the exhaust piping that is temperature sensitive and opens and provides a vent in the unlikely event a fire occurs within the chamber.

#### Dryer End Plate Corrosion

Problem – Corrosion to the inside of the dryer end plate.

Recommendation – No action currently recommended.

Comments – An area of corrosion (oxidation) of the inside of the dryer end wall plate was noted. It appeared the depth of the corrosion was approximately 25% of original material thickness. Given the original thickness of the plate was 1”, AIT feels it will be a number of years before the corrosion is at a depth where repair is necessary.

#### Feed Hopper Bearings

Problem – Leaking seals creating problems with bearing life.

Recommendation – Install a custom seal housing behind each bearing and utilize an appropriate seal to prevent/minimize leakage.

Comments – Utilization of standard lip seals of the original Fenton design may not be acceptable due to the “runout” of the shafts. Upon request, AIT can offer some custom designed sealing methods for your consideration.

General Comments:

Apart from the deficiencies listed above, the drying system appears to be in relatively good condition. Ultrasonic measurements were taken on multiple rotor discs and where possible on the drying chamber wall. There was virtually no wear detected. The dryer chamber and rotor are by far the primary components of the drying system.

Noted in the list above is the corrosion of the support bars at the top of the drying chamber and the end plate. This is not typical in other Fenton drying systems which are similar, or older in age as the Wellington dryer. AIT suspects that there is a somewhat higher salinity given you are in a coastal area which is causing this.

While the list of deficiencies above is relatively long, it is AIT’s understanding that the drying system has seen many thousands (and perhaps tens-of-thousands) of operating hours over the last 8-9 years. Every effort was made by AIT to identify all deficiencies of the drying system. It is AIT’s opinion that the dryer has many more years of useful life remaining. With this said, due to the dryer age and specifically related to the operating hours of the components, we recommend a higher level of inspection be provided going forward to ensure that potentially failing components be identified, and corrective actions are taken prior to any potential total failure from occurring. This is recommended to try and prevent any unexpected and/or extended shutdown of the system as various components were proprietary to Fenton.

If you have any questions related to the issues listed above, or have any questions, please do not hesitate to contact me.

Thanks,

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