# Mechanical Dewatering Technologies for Wet Biomass Feedstocks

***Summary Report***

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## ***Purpose***

Many wet biomass feedstocks generally have low value due to the high cost of thermally removing water to make use of the lignocellulosic material contained therein. Mechanical technologies (as opposed to thermal dehydration) that can remove water cost-effectively offer promise in raising the value of these materials. Dryer feedstocks would open markets for combustion or gasification of the feedstocks, pelleting material for feed, slow release fertilizer or serving as ground covers. At a minimum, producers or processors using a dryer feedstock for feed or land application would be trucking more material and less water.

The Agricultural Utilization Research Institute (AURI) along with the Northwest Minnesota Foundation collaborated with PulverDryer USA, Inc., www.pulverdryerusa.com, located in Springfield, Michigan, to evaluate the performance of their HydroPress technology for dewatering agricultural coproducts.

Dewatering research obtained continues to support the work completed by the *AURI Drying Initiative* started in 2009. The goal of this research is to continue to identify potential thermal and mechanical drying technologies that may represent an efficiency improvement over current methods of drying currently being utilized by industry.

## ***Goal***

The goal of this initiative was to identify technology transfer opportunities to improve the economics of drying high moisture feedstocks. Efficiently and economically removing moisture from various coproducts can expand market opportunities through improved storage, transportation and product stability. These improvements assist with developing new uses for agricultural products and coproducts.

## ***Test Material***

American Crystal Sugar located in Moorhead, Minnesota, provided approximately 200 pounds of sugar beet tailings and 200 pounds of sugar beet pulp to PulverDryer USA to conduct dewatering trials. Product samples were frozen prior to testing. Freezing may improve dewatering results slightly due to the rupturing effect that occurs within the cell wall.

## ***Testing/ Results***

*Sugar beet tailings*

Sugar beet tailing (Photo 1) were evaluated using the HydroPress technology. Initial product moistures for the raw sugar beet tailings averaged 20.2% total solids and 79.78% moisture. Two trials were conducted; the first using a small quantity of material identified as T1 and the

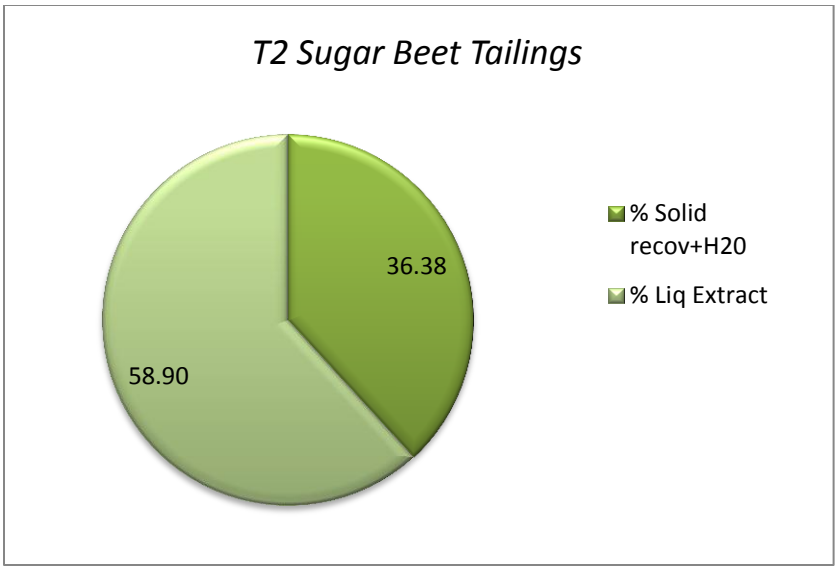
second utilizing 103.9 pounds of material identified as T2. It should be noted that there was a loss of material during the dewatering process.

**Photo 1 – Wet Sugar Beet Tailings**

Table 1 shows performance results. Focusing on trial two (T2), 103.9 pounds of material were exposed to the HydroPress that resulted in 36.38% product being recovered along with 58.9% liquid extracted or 61.2 pounds of liquid extracted. This does not account for the material loss during testing.

**Table 1 – Sugar Beet Tailing Dewatering Results**

| Trial | Initial Tailing Wt. (lbs.) | Post HydroCell™ Tailing Wt. (lbs.) | Extracted Liquid Wt. (lbs.) | Tailing Loss (lbs.) | (%) Product Recovered | (%) Liquid Extracted |
|---|---|---|---|---|---|---|
| T1 | 27.6 | 9.8 | 13.2 | -4.6 | 35.51 | 47.83 |
| T2 | 103.9 | 37.8 | 61.2 | -4.9 | 36.38 | 58.90 |




The recovered sugar beet tailings post HydroPress (Photo 2) averaged 29.55% solids and 70.45% moisture. The extracted liquid fraction contained 17.4% solids and 82.6% moisture.

Density of the raw sugar beet tailings prior to dewatering was 29.89 pounds per cubic foot. Dewatered sugar beet tailing were 21.38 pounds per cubic foot.

**Photo 2 – Sugar Beet Tailing post HydroPress**

*Sugar beet pulp*

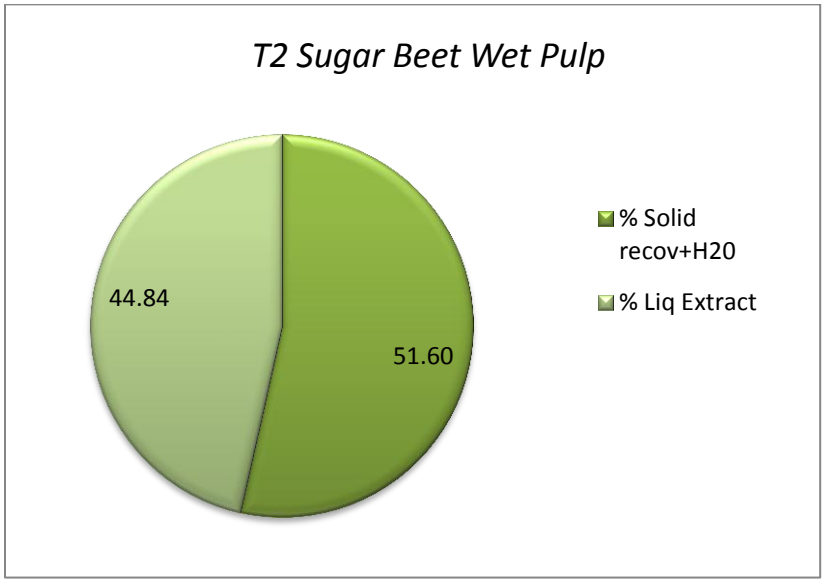
The second material evaluated was sugar beet pulp (Photo 3). Initial product moistures for the raw sugar beet pulp averaged 14.4% total solids and 85.6% moisture. One trial was conducted utilizing 81.4 pounds of material; this trial is identified as T1. This trial also had a loss of material during the dewatering process.

**Photo 3 – Wet Sugar Beet pulp**

Table 2 shows performance results for sugar beet pulp. Trial one utilized 81.4 pounds of pulp exposed to the HydroPress, this resulted in 51.6% product being recovered along with 44.8% liquid extracted or 36.5 pounds of liquid extracted. This does not account for the material loss during testing.

**Table 2 – Sugar Beet Pulp Dewatering Results**

| Trial | Initial Pulp Wt. (lbs.) | Post HydroCell™ Pulp Wt. (lbs.) | Extracted Liquid Wt. (lbs.) | Pulp Loss (lbs.) | (%) Product Recovered | (%) Liquid Extracted |
|---|---|---|---|---|---|---|
| T1 | 81.4 | 42 | 36.5 | -2.9 | 51.60 | 44.84 |



The recovered beet pulp post HydroPress averaged 20.77% solids and 79.2% moisture (Photo 4). The extracted liquid fraction contained 19.3% solids and 80.7% moisture (Photo 5). This liquid fraction was further evaluated for sugars. The liquid extract recovered contained 1.2% fructose, 0.74% glucose, and less than 0.10% sucrose.

**Photo 4 – Sugar Beet Pulp post HydroPress**

**Photo 5 – Sugar Beet Pulp HydroPress Liquid Fraction**

Density of the raw sugar beet pulp prior to dewatering was 28.41 pounds per cubic foot. Dewatered sugar beet pulp was 22.3 pounds per cubic foot.

## ***Conclusion***

The goal of this initiative was to identify technology transfer opportunities to improve the economics of drying high moisture feedstocks. Initial trails conducted using the HydroPress technology provided by PulverDryer USA, Inc. appears to be an efficient method of feasibly dewatering sugar beet tailings and sugar beet pulp. This assumption is due to the 58.9% liquid extraction observed in the wet sugar beet tailings and the 44.8% liquid extraction observed in

the wet sugar beet pulp.  Although the remaining products still contained 29.6% and 20.8% solids respectively; the majority of the moisture was removed utilizing mechanical methods.

PulverDryer USA, Inc. claims an operational cost of $6 per wet ton; this is comprised of a $1.50 to $2.25 per wet ton processing cost.

Dewatering technologies may offer an efficient companion technology to thermal drying thus increasing the market opportunities for wet biomass feedstocks.