

Department of Ecology / Organix Inc / C2200108 / Grant Update

Date of report: 10/7/2022

When: Summer/Early Fall 2022

What: Chipping project update - discovery of challenges and new opportunities

Where: Royal City / Othello, WA

Who: Orchard owners, Organix staff, Vermeer, BioFiltro

Summary. We now know that if we can make usable chips on a small scale, the next logical step is scaling up. When presented with the chips for the BioFiltro BIDA™ unit, the BioFiltro management was pleased with the results. So much that instead of running trials on a small scale, they ran in-house trials to confirm media viability. They suggested skipping the field trial and proceed with a larger test in truckload quantities. Collectively, we now believe that with the right commercial scale equipment, it is now feasible to make two products – coarse chips and fine chips/shavings.

Observations. Working with chipping equipment manufactures – in this case Vermeer - has its advantages and disadvantages. They are a large company that has a broad array of equipment that can do the work. On July 20th, we arranged for a chipping demo at the smaller unit tested, the BC 1500 (shown below), which came out of the Spokane Vermeer dealership, performed almost flawlessly in making a product that could be used. Finding a larger chipper has not been as easy.

Process of chipping. In late July, Keith Johnson from Vermeer along with Organix staff met at an orchard in Othello for the trials. The chipping went as we hoped, so we discussed what it would take to have a larger scale demonstration. That demonstration is being prepared now. The chipper has not been located as of the writing of this report, but the screen required has been found and being prepared for work.

Smaller scale, Vermeer BC1500 tree chipper; capacity for up to 15" trees



Tree trimming piles to be chipped: This size is most common today due to trimming, grafting and trellis growing styles. Large, full-size trees will be chipped on the large-scale demo.



Chipping of trees directly into totes (instead of fruit boxes) in trailer for delivery to Royal Dairy for processing/screening.

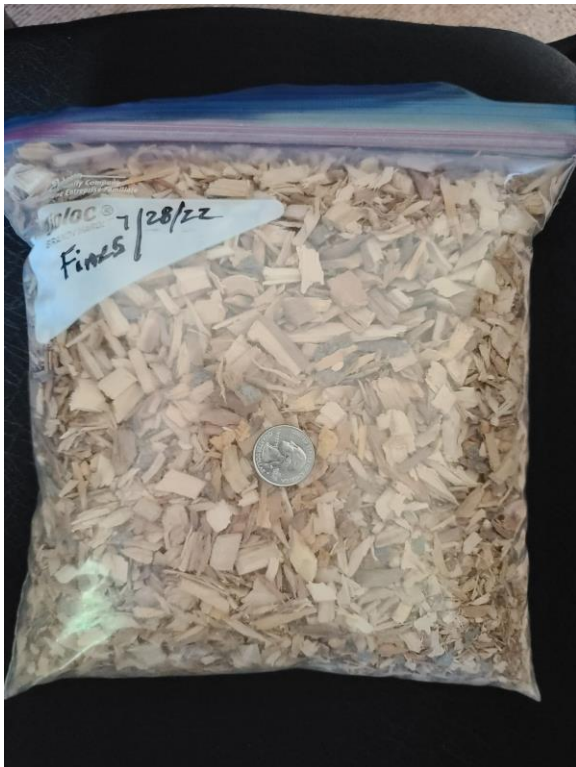


Totes of chipped trees arrive at Royal Dairy for manual screening.



Final results.

Products resulting from this chipper (front, back) –



The purpose of the front and back pictures is to show the number of fines and dirt/sand after the bag is shaken. Some of this is a function of the machine, but some of it is a result of good presorting of trees. The BioFiltro filtration unit does not process sand and it accelerates the decreases in capacity of the filter and is therefore undesirable. These samples contained an acceptable amount.

Screening. Once success at a trial level is proven, scaling up is the next logical step. After the wood was chipped, the material was hand screened with a ½" sieve to see if an acceptable chip could be made. According to BioFiltro, not only is there a place for the large chips, but there is also a market for the ½" minus product in non-dairy applications like wineries and juice plants.

Dirt/soil removal. There is virtually no application for chips contaminated with soil, so removing dirt when present will be necessary.

Change in strategy. Our original intent was to run trials with the chips in a downscaled version of the BioFiltro system. BioFiltro has assured us that the chips we are producing can be used in the system based on the samples they have received to date. So, we are moving toward a large-scale trial to see if the small-scale operation can be commercial.

Chipping stumps. It is common knowledge in the grinding /chipping world that stumps cannot be chipped, only ground with a large tub or possibly with a horizontal grinder. This will need to be addressed as a future challenge: can stumps be made into chips? We are researching this currently.

Screening plant for large scale demonstration.



How the chips are used in a BioFiltro BIDA.

The BioFiltro BIDA™ is a biological, trickling filter. It irrigates wastewater onto the bed at a rate that the worms and biology inside can digest. The Royal Dairy system processes around 500,000 gallons per day on seven acres of bed and uses wood chips as the primary media. Other processors like wineries or fruit processors use wood shavings, which are smaller and break down quicker than chips. It is for this market that we believe the undersized material could be used.

Royal Dairy BIDA; beds in foreground.



Non-dairy BIDA.



Filtration results.

Over 90% removal of nitrogen is primary. The filtration results surpass all required tests from BioFiltro to perform as filter media. (Provided by BioFiltro)

	LAGOON			AFTER BIDA			EFFICIENCY		
	TSS (mg/L)	TN (mg/L)	TP (mg/L)	TSS (mg/L)	TN (mg/L)	TP (mg/L)	% removal TSS	% removal TN	% removal TP
1	14,560	2,317		144	391		99%	83%	
2	19,940	2,582		1,620	116		92%	96%	
3		2,446			114			95%	
4	29,180	2,282		2,600	123		91%	95%	
5	35,320	2,428	412	290	90	77	99%	96%	81%
6	14,680	2,265	272	514	260	36	96%	89%	87%
7	23,860	2,302	303	332	175	15	99%	92%	95%
8	21,890	2,454	282	490	144	18	98%	94%	94%
9	25,200	2,036	327	278	126	21	99%	94%	94%
10	22,420	2,012	267	252	101	18	99%	95%	93%
							97%	93%	91%

Legend: TSS: Total Suspended Solids; TN: Total Nitrogen; TP: Total Phosphorus; mg/L: milligrams per liter

Next steps.

Another demo is being planned for late fall, early winter of 2022. There are a lot of parties that want this project to succeed including the Dept of Ecology, Organix, BioFiltro, Royal Dairy, Apple orchardists and marketing firms.

Financial proformas and industrial symbiosis reports are being worked on as well.

Prepared by Russ Davis, Organix, Inc.