

Side stream Management

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What Side streams?

- Glycerin
- Wash water
- Excess Methanol
- Absorbents (e.g. Magnesol)
- Glop and/or bad batches
- WVO Sludge



Glycerin

Important to have a plan

- Product of the process
- Can shut a co-op down
- Environmental consciousness





Glycerin

How much glycerin do we get?

About 18% of the finished product is crude glycerin before methanol recovery.

Must remove methanol before doing anything with glycerin.



Glycerin

- Soap making
- Vermiculture composting
- Aerobic Composting
- Anaerobic biodigesters
- Burning glycerin for process heat



Glycerin Soap

- NOT a real solution - Glycerin soap with a lot of glycerin tends to sweat and get slimy
- We used about 1/4 gallon of glycerin in our soap batch along with virgin oils.
- We followed a recipe from The Transparent Soap book.
- It has taken us about 2 months to sell off that batch.
- A liquid pumice for washing your hands in the lab can be made from 100% glycerin.

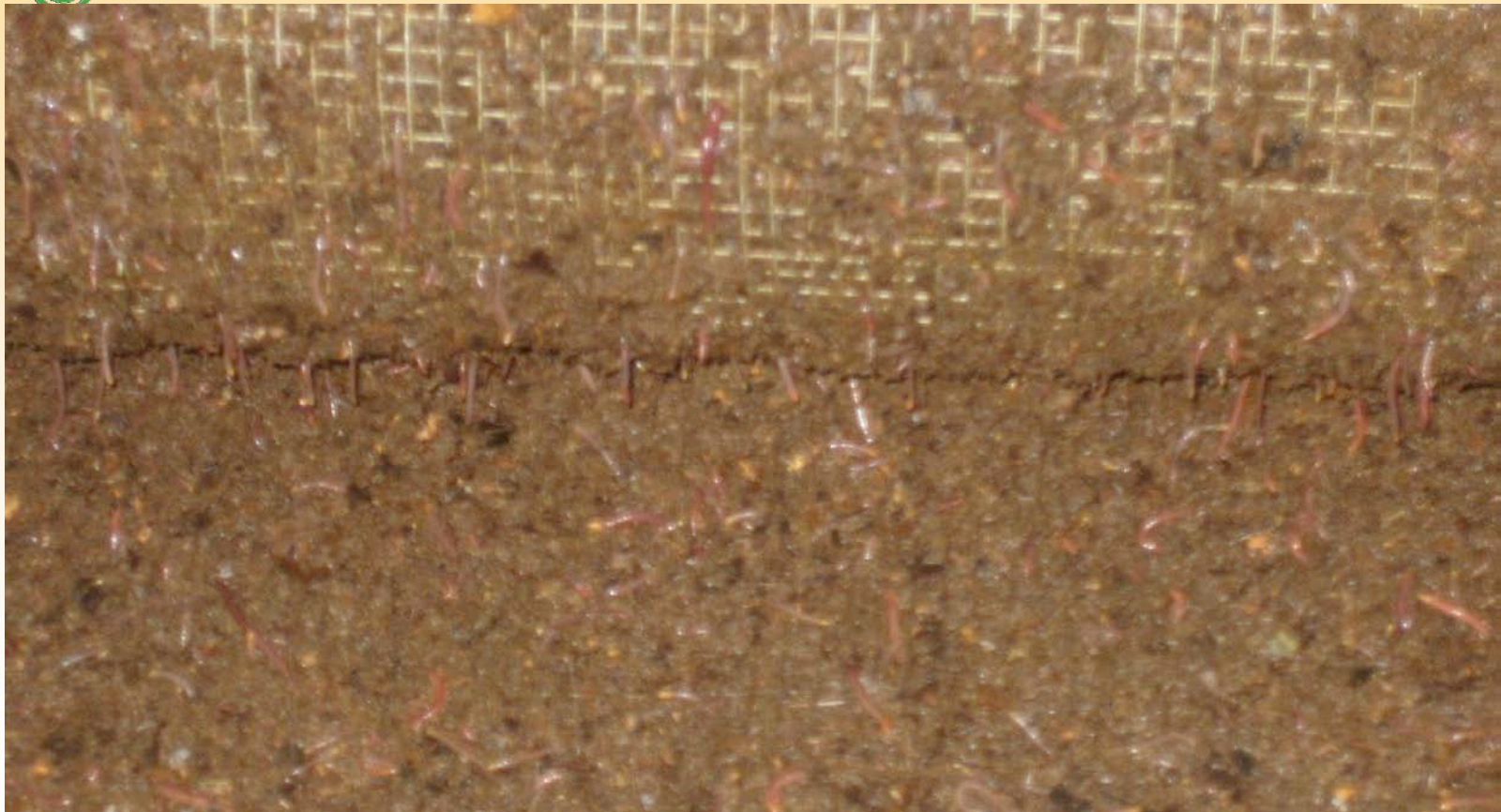


Glycerin Soap





Vermiculture Composting



Plant Vermiculture Composting

Ideal Conditions: Moist, 72-74°F, 6-8pH, no aerobic activity (turn if smells).

- Food - Waste vegetable produce (no meat, dairy, citrus or oil).
- Bedding - Shredded paper
- Glycerin diluted in H₂O, applied to bedding, then added to pile.



Co-op Vermiculture Composting

- 4 bins, all approximately 4 cu ft.
- Weekly they receive 1/2 qt. - 2 qts glycerin each.
- Bedding is leaves.
- Food and garden produce waste added weekly.
- We track amount of glycerin added and worm castings produced
- Nothing to report yet





Vermiculture Composting

- Relatively slow (5-6 months) compared to aerobic decomposition (6-8 weeks)
- Need bedding material and nitrogen input (coffee grinds, leaves, shredded paper, farm produce waste)
- Worm castings = high value product
- Future worm tractor experiment



Aerobic Decomposition (Composting)

- NOT just throwing all your organic waste into one place
- Using bacteria and microorganisms to break down wastes to reach a C:N ratio of 15:1 (finished compost)
- Need to add both carbon and nitrogen inputs to start feeding the compost.



Aerobic Decomposition Small Scale Composting





Aerobic Decomposition

Small Scale Composting

- We add about 20 gallons of glycerin to each pile (3 cu yds).
- Too carbon rich to add much more as it lowers our compost temperature.
- We need to maintain the compost temperature over 130°F for 90 days(?) to obtain organic certification.
- Not a sustainable solution: 1 pile roughly equals 1 batch biodiesel. We only need about 4-5 piles per season for our 0.85 acre farm.



Medium Scale Composting Burlington Biodiesel Co-op





Medium Scale Composting

- Pile composed of 40 tons of wood chips, started with a load of chicken manure.
- Tree service drops truck loads of wood chips for free.
- 160°F and still burning after 5 1/2 months
- Co-op disposes of all glycerin (after methanol evaporation) and magnesol in compost
- Magnesol does not break down



Large scale/Industrial Composting

- Piedmont disposes its unusable oil and glop batches at an industrial compost site.
- “The Pit”
- Industrial compost operations may allow free dump of waste grease and/or glycerin for small scale producers.

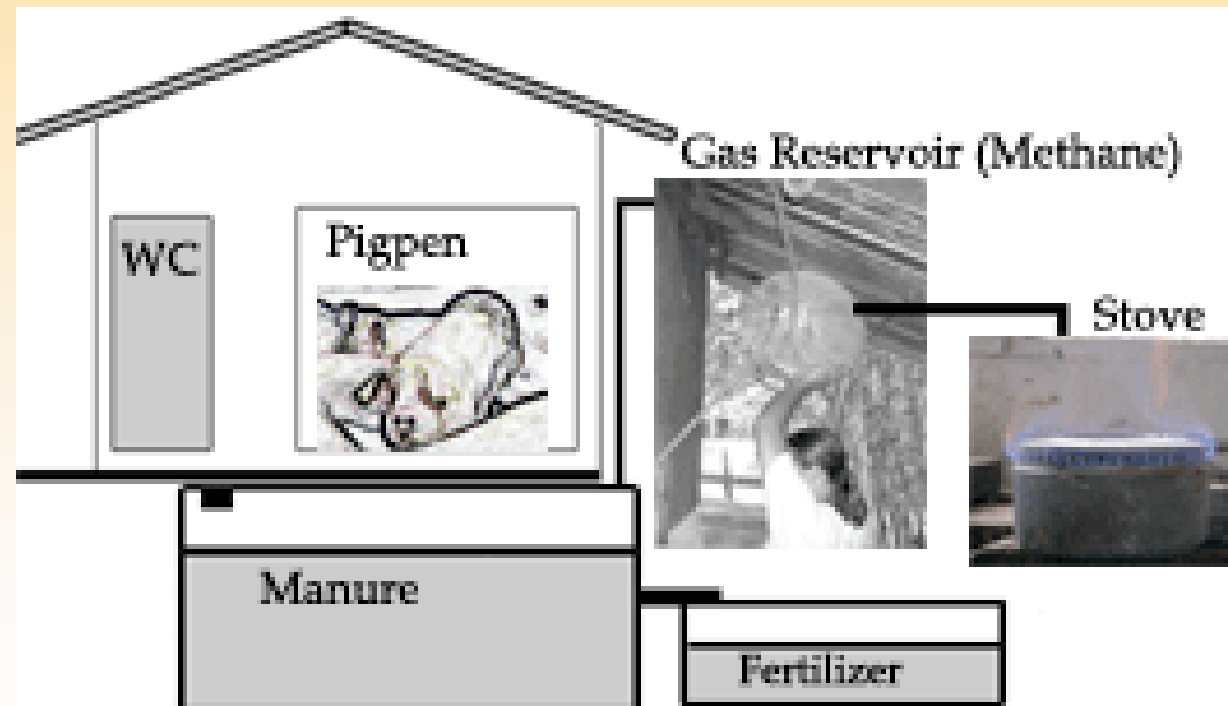


Biodigesters - Anaerobic Decomposition

- Biodigesters can be used to turn animal and food waste into methane gas
- Biodigesters might be able to break down glycerin
- Methane gas can be reused as process heat
- Normally you add 25% animal waste, 25% vegetable waste, 50% water.
- Very difficult to store the gas in cylinders
- Extreme caution to not breath Hydrogen Sulfide (H_2S), which is HIGHLY toxic and also produced in anaerobic digestion



Biodigester





Burning Glycerin

Guatebiodiesel is packing a PVC tube with:
1 part shredded newspaper, 1 part sawdust, 1
part glycerin

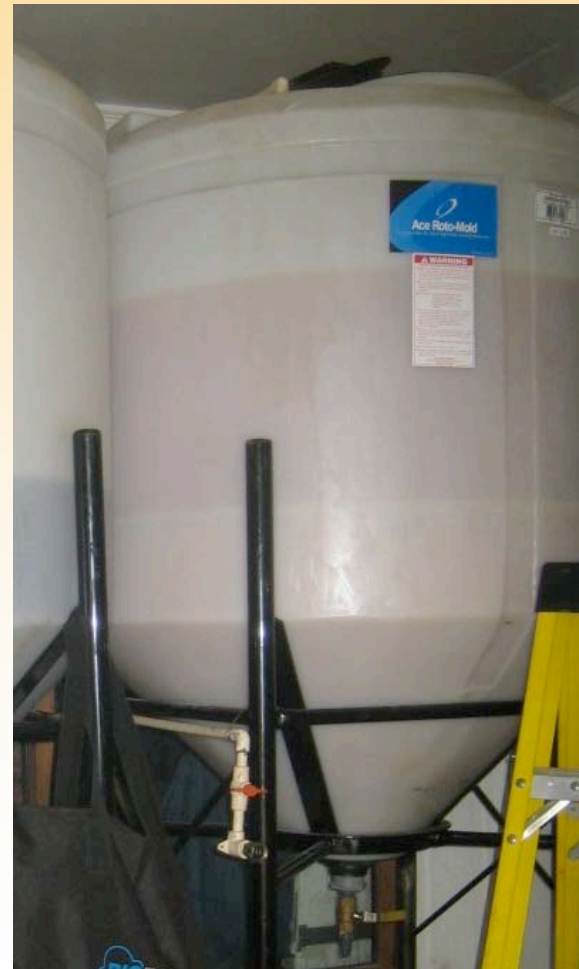
Fire is started in a wood burning stove with
wood, and glycerin logs are added when
hot. Burns very hot with a clear blue flame.

If you start to see a smoldering black flame
you are producing acrolein (carcinogen
found in cigarette smoke). **Add oxygen
and heat. (<300°F)**



Wash water

- A biodiesel wash will typically be 30-50% water by volume.
- 3-4 washes -> water used is 2-4x the amount of biodiesel batch
- Very high biological oxygen demand (BOD)
- High pH (must soften water)





Wash Water

- BOD is an indicator of organic water pollution
- BOD in wash water is around 12,000 mg/L - OFF THE CHARTS HIGH
- For reference, a pristine river has a BOD of about 1 mg/L, treated sewage is about 20, influent coming into most waste water treatment facilities is about 200, untreated sewage is about 600
- To lower BOD: Dilute and Oxygenate
- High BOD leads to slime

Wash water constructed wetlands





Excess Methanol

- Probably less environmentally harmful to evaporate methanol than to spill it.
- Atmospheric methanol is oxidized into CO_2 and H_2O .
- Methanol recovery systems through distillation (boils at 148.5°F at 1 atm)
- Watch out for **VERY DANGEROUS** methanol vapor that is toxic and can flash (requires 4x the density of gasoline vapors)



Excess Methanol Recovery





Absorbents (e.g. Amberlite and Magnesol)





Magnesol

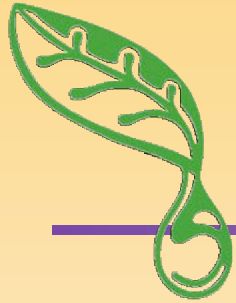
Does not break down





Bad Batches / Glop / WVO Sludge

- Waste Oil Burner-
Bad Batches can either be re-reacted, or used in a waste oil burner for process heat, along with some amount of WVO.
- Pilot light issue with oil burners and biodiesel
- We ship out serious glop/sludge to industrial compost site



Thank You For Your Time!

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