

**STANDARD OPERATING PROCEDURE
STAN MAYFIELD PILOT PLANT****TITLE:** Sample Cyclone Operation

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APPROVALS:	Process Change Committee	DATE:

A. Scope

Biomass feedstock will be processed using steam and acid to soften and prepare the fibers for subsequent hydrolysis by enzymes in the Liquefaction step. This SOP pertains to the proper methods of obtaining samples of biomass during hydrolysis using the Sample Cyclone (VS-2107).

B. Safety and Training Requirements

The pretreatment process operates at high temperature (~190 °C/374 °F), high pressure (~ 200 PSI), and low pH (~2.0).

CAUTION: High temperatures (~190 °C/374 °F)

CAUTION: High pressure (~200 PSI)

CAUTION: Acid (phosphoric acid, 2.5 – 5.0% w/w)

Proper PPE is required for operations in this area.

- face shield
- chemical resistant rubber gloves
- chemical resistant apron
- Hard Hat

C. Related Documents and SOPs

1. Metso Operation and Controls Manual P-280029
2. Experimental Plan
3. Phosphate determination SOP-0501
4. Moisture by moisture balance SOP-0503
5. Sugars, organic acids, and inhibitors concentration SOP-0505
6. Biomass composition SOP-0512
7. pH measurement SOP-0514
8. Conductivity SOP-0515
9. Biomass Pretreatment SOP-2110
10. CO₂ Scrubber SOP-7210
11. Bleach Scrubber SOP-7211

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- 12. Process Water SOP-9505
- 13. Air System Operation SOP-9405

D. Preparation/Materials/Equipment

- 1. Sample Valve Handle Extension tool
- 2. Biomass Sampling Containers
- 3. C6 Waste Bin

E. Detailed Procedure

a. Biomass Hydrolysis

- i. Assure that the biomass hydrolysis process is operating normally and reached steady state for at least 30 min according to Biomass Pretreatment SOP-2110.

b. Sampling

- i. Assure that the Sample Cyclone (VS-2107) is clean and ready by visual inspection.
- ii. Determine which of the two sample points will be used:
 - 1. valve at midpoint of the C5 Hydrolyzer (ME-2101), or
 - 2. valve at the Hydrolyzer Discharger (CV-2101)
- iii. Place a clean sample container into the Sample Chamber of the Sample Cyclone by lifting the lid and placing container directly under the top cyclone chamber.
- iv. Assure that the bottom drain valve 2103-V-22 is closed.
- v. Using the Sample Valve Handle Extension Tool, open the sample valve for 1 to 2 seconds.
- vi. Close the sample valve.

CAUTION: Wait 5 minutes for chamber to clear of steam.

- vii. Remove the sample container from the Sample Chamber.
- viii. Seal the sample container and label it with a sharpie indicating the date, time, vessel, and batch number.
- ix. Make the appropriate measurements (dry weight, water insoluble solids, phosphate content, pH, conductivity, etc.) according to the experimental plan.
- x. In between measurements, place the sample in the refrigerator at 40 °F (4 °C).
- xi. Wait for the sample to reach room temperature before making any measurements.
- xii. Place the sample in the freezer at -4 °F (-20 °C) for long-term storage.

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c. Flushing and Rinsing

- i. Assure that C6 Waste Bin is in place.
- ii. Flush the Sample line used with air by opening either valve 1202-V-10 or 1202-V-11 for 5 - 10 seconds depending on which valve was used for the sample.
- iii. Open valve 2103-V-22 for the Sample Cyclone drain line.
- iv. Rinse out the sample chamber using process water into the Sample Cyclone by:
 1. opening the process water supply valve 2103-V-01,
 2. opening the top water rinse valve 2103-V-21 and rinsing the top section of the cyclone for 5 – 10 seconds, and
 3. opening the bottom water rinse valve 2103-V-20 and rinsing the sample chamber for 5 – 10 seconds.
- v. Visually inspect the Sample Chamber to assure complete rinsing.