STANDARD OPERATING PROCEDURE
FOLEY PILOT PLANT

TITLE: Biomass Pretreatment

AUTHOR: **Ismael U. Nieves** **DATE: March 30th, 2011**
APPROVALS: **Process Change Committee** **DATE:**
HHSM **DATE:**

CONTENTS

A. Scope

This procedure describes the methods for biomass pretreatment once it has been soaked in acid solution and dewatered.

.

B. Safety and Training Requirements

Eye protection is required when operating the steam gun.

C. Related Documents and SOPs

1. Biomass acid soak and press SOP
2. OHAUS 5000 Series Xtreme W balance manual
3. KERN moisture balance manual
4. Shop Vacuum manual
5. Kobalt impact wrench manual

D. Preparation/Materials/Equipment

1. High pressure boiler
2. 2% hydrogen peroxide solution
3. OHAUS 5000 Series Xtreme W balance
4. Plastic autoclavable bags
5. Sharpie
6. 1-gal ziplock bags
7. Autoclaved blow tank scraper
8. Kobalt impact wrench
9. 48” wooden stick
10. KERN moisture balance

E. Detailed Procedure

1. Make sure the boiler is up to the pressure needed for the desired pretreatment temperature (see attached table).
2. Spray the inside of the blow tank with the 2% hydrogen peroxide solution, specially under the lip inside the blow tank.
3. Close the XXXXX of the blow tank using a Kobalt impact wrench.
4. Make sure the collection drum is pushed all the way up against the blow tank and its discharge valve is close.
5. Warm up the steam gun
    a. Push the “Control” tab.
    b. Enter the pretreatment temperature in “process temperature”.
    c. Enter the same temperature in “main steam cutoff temperature”.
    d. Enter the “main steam open” time according to value in table.
    e. Enter 900 s in the “process time”.
    f. Push the “Process” tab in the control panel.
    g. Close the top valve of the steam gun.
    h. Open the bottom valve of the steam gun.
    i. Open the main steam valve and allow steam to flow through the steam gun and the blow tank for ~20 s.
    j. Close the main steam valve.

k. Close the bottom valve of the steam gun.
l. Open the main steam valve.
m. Once the temperature reaches ~5°C below the set temperature, close the main steam valve and hit "Start".
n. After the cycle is complete, close the top valve and hit "Start" once again. It is important to run the process at least two consecutive times for 900 s to ensure that the steam gun is warmed up to the desired temperature.
o. Keep running the warm up cycle until ready to start pretreatment.

6. Between two people, load the biomass (already divided into buckets for each shot) into the steam gun through the top using a wooden stick to make sure that the biomass enters the reactor.
7. Push "Start" in the control panel.
8. Push the "Control" tab in the control panel and set the "Process Time" to the desired value.
9. Quickly, put two autoclave bags (one inside the other) in the collection drum. Open the discharge valve and, using the shop vacuum, get the excess air out of the collection drum so that the bags are against the wall of the collection drum.
10. Close the discharge valve, place the collection drum under the blow tank and make sure it is pushed all the way up against the blow tank.
11. Turn on the cooling jacket of the blow tank.
12. After the first pretreatment, load the next biomass bucket into the steam gun, close the top valve and push "Start".
13. Repeat this step as many times as necessary. If more than ten shots are planned for the day, the bags in the collection drum must be replaced after the tenth shot.
    a. To replace the bags, before starting the next shot, open the XXXX of the blow tank using a Kobalt impact wrench and scrape the remaining biomass into the collection drum using the autoclaved blow tank scraper.
    b. Take the bags out and replace them with new ones the same way it was done in steps 9 and 10.
    c. Close the XXXX of the blow tank using a Kobalt impact wrench.
    d. Continue pretreatment.
14. Weight the bag using the OHAUS 5000 Series Xtreme W balance and label the bag using a Sharpie with the date of pretreatment, the weight of the pretreated biomass, the duration of pretreatment, and the acid concentration of the soak solution used.
15. Allow for the biomass to cool at room temperature overnight.
16. Fill about half of a 1-gal ziplock bag and label it the same as the autoclave bag.
17. Measure dry weights using the KERN moisture balance.
18. Store the sample in refrigerator for further analysis.

F. Data Archival and Analysis

Record the data in the Biomass Pretreatment Log and store in the Batch Log Book.

G. Tickets

Biomass Pretreatment Log

Date	_____
Boiler set pressure (psi)	_____
Pretreatment temperature (°C)	_____
Pretreatment time (min)	_____
Main steam open (s)	_____
Weight of pretreated biomass (kg)	_____

	% Dry Weight
1	_____
2	_____
3	_____
4	_____
5	_____
6	_____
	_____ Average