Campaign 13

Operations Summary

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Cellulosic Research and Demonstration Plant

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07/07/2015

Operations - Campaign 13
04/20/2015 – 04/24/2015

Operation problems & resolutions:

1. Propagator 3 Temperature Probe
    a. <u>Problem:</u>
        i. It was realized that the propagator 3 temperature probe's high position in the tank could give false temperature readings prior to inoculation. The temperature probe is significantly higher than the agitator and slightly higher than the pH probe (see picture below). This means that care must be taken when inoculating a propagator 3 tank with a small volume because the temperature of the slurry may be higher than what is read at the HMI.
        ii. 
    b. <u>Resolution:</u>
        i. A procedure was set in place to ensure the slurry is above the temperature probe prior to inoculation.
    c. <u>Status:</u>
        i. Resolved.
2. Continuous liquefaction
    a. <u>Problem:</u>
        i. Due to the unreliability of the pretreatment system, we decided to start liquefaction much earlier than needed in anticipation of break downs and the resulting down-time. Over past campaigns it became evident that timing the seed train was critical for success, and if liquefaction was not ready to go at the time the seed was ready then the fermentation would not perform well. The downside to starting liquefaction early is that there is potential for a much

longer retention time than 6 hours, leading to unrealistic sugar yields and contamination. However, it was decided that the pros outweighed the cons.

b. Resolution:
    i. We decided to start pretreatment 12 hours earlier than we typically do. This gave us a 12 hour buffer for any mechanical delays with the pretreatment system. The sugar yields were very high, but contamination was not a problem in the liquefaction tank.

c. Status:
    i. Resolved for now.

3. Scale back in fermentation size
    a. Problem:
        i. Due to the wear on the plug-screw (see Camp. 12 Op. Summary), the pretreatment system had a limited number of hours before it was completely dysfunctional.
    b. Resolution:
        i. We decided to scale-back the size of the slurry fermentation to 400 gallons to reduce the amount of time on the plug-screw. We had tested this method before with little success, but we figured it was worth revisiting.
    c. Status:
        i. Resolved, but not ideal. Waiting for the new plug screw to come in before we try running at a high through-put.
4. Biomass flow rate
    a. Problem:
        i. Due to the wear on the plug-screw (see Camp. 12 Op. Summary), we had to run the pre-steam live-bottoms at a lower speed to prevent the chute from clogging
    b. Resolution:
        i. If we ran at any speed higher than 60%, the plug-screw would not keep up with the feed and the chute would clog. The lower speed on the live-bottoms meant a lower biomass flow-rate through the system, which we anticipated. We averaged 135 lb DW/hr at 60% speed.
    c. Status:
        i. Resolved, but not ideal. Waiting for the new plug screw to come in before we try running at a high through-put.
5. Cablevey
    a. Problem:
        i. The cablevey 2 cable fell off its track several times during the campaign due to too much slack in the line.
    b. Resolution:
        i. A disc was taken out of the cable to tighten up the tension.
    c. Status:
        i. Resolved.
6. Vibrator

a. Problem:
    i. The pretreatment vibrator stopped working entirely.
b. Resolution:
    i. We decided to retire it from the system because it was not helping much to begin with. The bigger issue was that the plug-screw was so worn.
c. Status:
    i. Resolved.

7. pH Adjustment Rupture Disc
    a. Problem:
        i. The rupture disc popped, but we did not find out about it until after the campaign. It was likely due to an accidental overfill of the tank, which was likely due to an inaccurate level reading.
    b. Resolution:
        i. The control room operator must keep a closer eye on any unexpected changes in level reading, and if one occurs, they must ask an operator or engineer to spray down the level sensor with the UV water port.
    c. Status:
        i. Resolved.