Campaign 10

Operations Summary

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Cellulosic Research and Demonstration Plant

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Operations - Campaign 10
02/23/2015 – 03/01/2015

Experimental plan notes:

1. Propagation hydrolysate: 50% 190C
2. Pretreatment temperature: 185C
3. Liquefaction: 15% solids with 5% enzyme.
4. Third campaign trying the new experimental plan of conducting smaller scale fermentations in the propagator 3s, but at a different pretreatment temperature than the previous campaign.

Operation problems & resolutions:

1. No growth in flasks
    a. Problem:
        i. The flasks showed very little growth at 24 hours.
    b. Resolution:
        i. There was enough extra hydrolysate from preparation (36 hours prior) to start another round of flasks. The reason for no growth was believed to be incorrect nutrient concentrations. The hydrolysate in propagator 2A and 2B was ready for inoculation for the first round of flasks, so it ended up sitting an additional period of time, but this was approved by Dr. Ismael Nieves.
        ii. The second round of flasks grew better, but not by much.
    c. Status:
        i. Resolved, but the flasks were not as healthy as they usually are.
2. Unreliable seed train scale up
    a. Problem:
        i. The propagator 2s grew very slowly, which was unexpected since lab tests the week prior were successful. This was the first instance where parameters for the seed train in the lab did not scale up as expected in the field. We had to wait 36 hours for propagator 2A to reach an acceptable ethanol value before inoculating propagator 3A. We did not use propagator 2B since we were so far behind schedule.
    b. Resolution:
        i. We still are not sure why the scale-up didn't work. It seemed like maybe the hydrolysate was too old and too toxic to trust in general.
    c. Status:
        i. We shifted to 185C hydrolysate in subsequent campaigns.
3. Pretreatment hydrolyzer discharger
    a. Problem:
        i. As we were filling liquefaction, the hydrolyzer discharge screw stopped working. The shear pin connecting the motor to the gear drive broke, which allowed the motor to free spin. The screw was not moving at all, but there was initially no

indication of this. The amps looked fine – maybe a little flatter than usual. The first sign of something weird happening was a decrease in system temperature and an increase in pressure at the end of the hydrolyzer, which was due to a clog of biomass starting to form at the end of the hydrolyzer. We thought an air pocket had formed, so we tried venting the hydrolyzer, but the problem was not going away. It was then noticed that the screw was not actually moving, and the system was shutdown. The hydrolyzer amps were starting to go up right before we shut down. The hydrolyzer discharge was off for a total of 20 minutes, which means we were compacting the end of the hydrolyzer for that long.

ii. This was the first time we had a screw completely stop running without any indication in the control room.

iii. We had to use a pipe wrench and a come-along to get the screw to dislodge itself.

b. Resolution:

i. A procedure has been established to routinely verify the screws on the pretreatment screw are actually turning, and the control room now keeps a close eye for abnormally flat amperage trends.

ii. We never figure out what actually caused the hydrolyzer discharger to clog like it did.

c. Status:

i. Resolved for now.

4. Propagator 2A agitator
    a. Problem:
        i. The motor randomly quit working. It was burnt up and needed to be replaced. Luckily, it happened as we were inoculating into propagator 3A.
    b. Resolution:
        i. It was replaced with a spare we had.
    c. Status:
        i. Resolved.
5. UV lamp quartz sleeves
    a. Problem:
        i. Two quartz sleeves broke while they were being removed for cleaning.
    b. Resolution:
        i. More care.
    c. Status:
        i. Resolved.
6. Sump pump impeller wear
    a. Problem:
        i. The wastewater sump pump impeller was found to have significant pitting. It's still functional, but care needs to be taken to ensure it's not overworked or presented with harsh chemicals. The wear most likely came from when we

would add concentrated caustic directly to the sump to adjust the pH of wastewater.

b. Resolution:
    i. Use the CIP caustic tank to adjust the pH in the wastewater tank.
c. Status:
    i. Resolved.