Zero Discharge Corn Processing II

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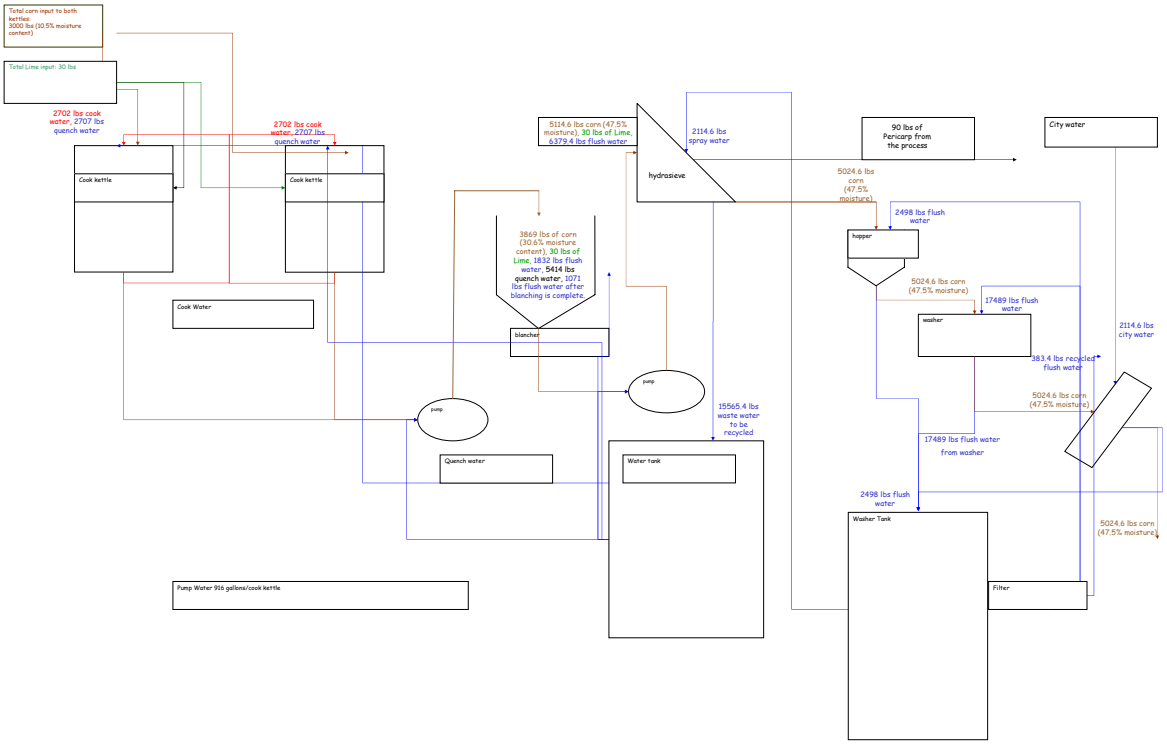
Problem:

A corn processing plant currently produces 60,000 pounds of corn masa per day. The total wastewater generated from this process is 105,822 gallons per day. All of this wastewater must be treated before it is discharged into the environment. The current usage of water is limiting the plant from increasing corn masa output. Converting this plant to zero discharge would allow expansion.

Objective:

The objective of this project is to find a zero discharge process for a corn processing plant.

- Water within the plant is to be recycled
- Pericarp and soluble solids can be filtered out and used to process animal feed

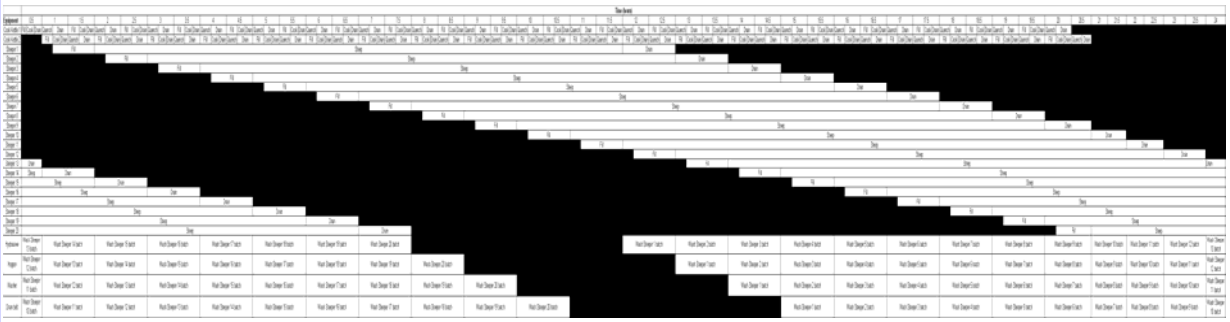


Possible Alternatives for water recycling:

1. **Decrease quench water**
   a. Add ice
   b. Insert Heat Exchanger between the cook kettle and blancher
   c. Add quench water in the steep tank to prevent the water from cooling the cooking tanks
2. **Collect overflow of quench**
   a. Recycle and use for cook water
   b. Use for initial washing steps, i.e. hydrasieve and hopper
3. **Limit wash water**
   a. Use less water
   b. Turn off the water in between washes if there is downtime

Possible Alternatives for reprocessing solid wastes:

1. **Recover lime from wastewater**
   a. Reuse lime in cook water
   b. Reuse lime in steep water
2. **Collect pericarp from hydrosieve step**
   a. Process and use for animal feed
   b. Make food additive hemicelluloses b and fiber oil
3. **Filter soluble solids from recycled water**
   a. Process solids once per day to be used for animal feed
   b. Reduce risk of microbial growth

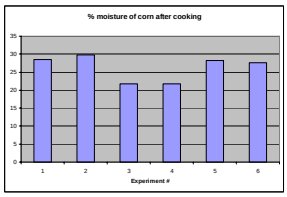


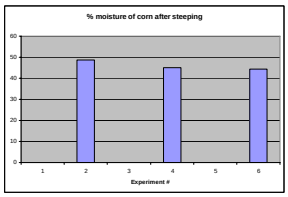
Proposed Alternative:

Recycle! Recycle! Recycle!

- Recycle cook water
- Replace lost cook water due to absorption with recycled hydrasieve water
- Quench hot corn with recycled hydrasieve water
- Recycle hopper, washer, and drain belt water
    - use 2114 lbs in hydrasieve wash
    - use reverse osmosis on remaining water and reuse for hopper, washer, and drain belt
- Input fresh water at the drain belt (2114 lbs) to replace the amount that is absorbed by the corn
- Filter out pericarp from each batch
- Filter out soluble solids from recycledwater once per day
    - process for animal feed
    - value-added product

Experimental Data:





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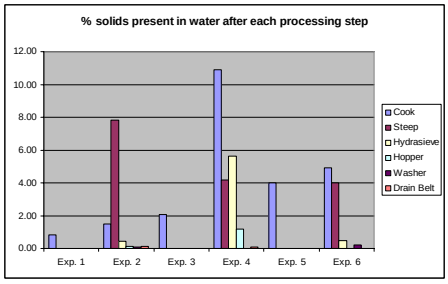

Future Work:

- Continue laboratory experiments
    - determine effect of recycling on corn quality
    - determine method for measuring lime content
- Determine if 40 recycled cook water batches is economically and microbiologically feasible
- Size and determine costs of new equipment
    - holding tanks
    - filters
    - pipes
    - evaporators pericarp and soluble solids processing
- Determine Return on Investment
    - energy/utility savings
    - water cost savings
    - cost of new equipment
    - costs of new processing steps

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