

Zero Discharge Corn Processing I

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Problem:

- ☐ Due to significant water demands, corporations are being denied expansion privileges due city water limitations. Drought and exhaustion of natural water resources are keeping companies from achieving maximum production and revenue potential. Implementing a zero discharge water process will allow companies to overcome these restrictions and conserve water in the process.

Objective:

- ☐ To design a zero discharge process for producing masa
- ☐ To optimize the current process by reducing water consumption and output

Introduction:

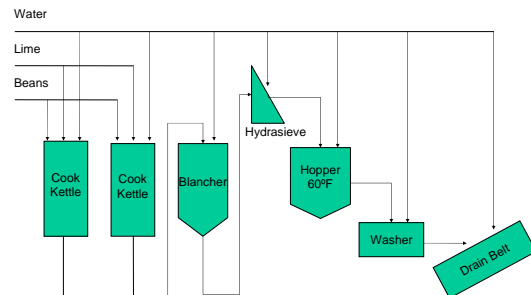
- ☐ The demand for water all over the world, forces corporations to investigate new methods to reduce water usage
- ☐ It is important to treat wastewater from the food industry to reduce environmental pollution and curb utility expenses
- ☐ This project will explore converting wastewater streams into process recycle streams to limit the amount of water that is discharged from the plant

Current Process Design

- ❑ 3,000 lbs of corn processed per batch
- ❑ 50,000 lbs of water used per batch
- ❑ 30 lbs of lime used per batch
- ❑ Twenty batches processed per day
- ❑ Equates to more than 1,000,000 lbs of wastewater generated per day

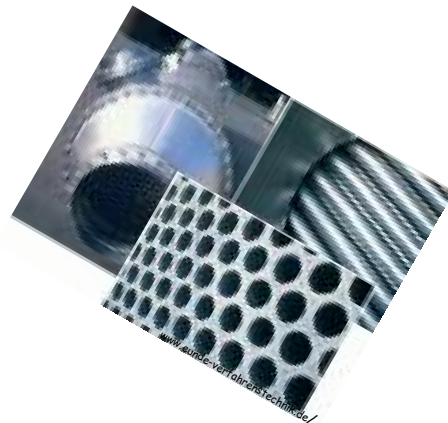


Flow Chart



Current process modifications

- ❑ Remove blancher overflow by introducing a heat exchanger
- ❑ Reuse water from blancher and hydrasieve for the cook, blancher and hydrasieve
- ❑ Recycle water leaving the hopper, washer and drain belt, and purify for reuse
- ❑ Replace rotary pump with lobe pump to eliminate flush water



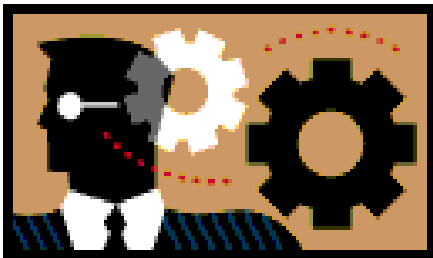


Lab Procedure and Results

- ❑ Cook water was reused for 6 experiments
- ❑ The solid content in the water increased from 1.43% to 2.10% by the 6th experiment
- ❑ The blancher cook water solids increased from 1.61% to 2.79%
- ❑ Solid content stays relatively stable; therefore, water recycling is a feasible option

Optimization

- ❑ Filtration to remove the suspended solids in the water
- ❑ Use MVR to reduce steam costs and water usage (save 767,142 lb of water per day)
- ❑ A heat exchanger is used to cool down the product when transferring from the cooker to blancher, reducing the use of quench water (save 45,700 lbs of water per batch)



Conclusion

- ❑ Future work is needed for corn quality analysis when using recycled water
- ❑ Our proposed work is to develop a more efficient process:
 - Use of corn pericarp as alternative bio-fuel
 - Reuse water from washing stream to quench corn
 - Reuse cook water for multiple cooking processes