# Twin Rivers Paper Company

## Reduction of COD Loading at Twin Rivers Paper Through the Production of By- Product(s)

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TWIN RIVERS PAPER COMPANY

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# PROJECT SUMMARY

### Project Objectives

- Reduce COD loading to existing lagoon at TRP through the treatment of acid condensate.
- Produce a sellable by-product(s) from the acid condensate.

### Twin Rivers Paper Company

- Pulp mill located in Edmundston, NB on the Madawaska river. It was founded in 1917, with a sister paper mill located in Madawaska, Maine constructed in 1925.

### Pulp and Paper Effluent Regulations

- In 2021 new Pulp and Paper Effluent Regulations (PPER) from the Government of Canada will come into effect.
  - These new regulations have increased limitations on the amount of chemical oxygen demand (COD) which can be discharged from the mill.
- Twin Rivers must decrease amount of COD being sent to lagoon in order to comply with 2021 PPER regulations

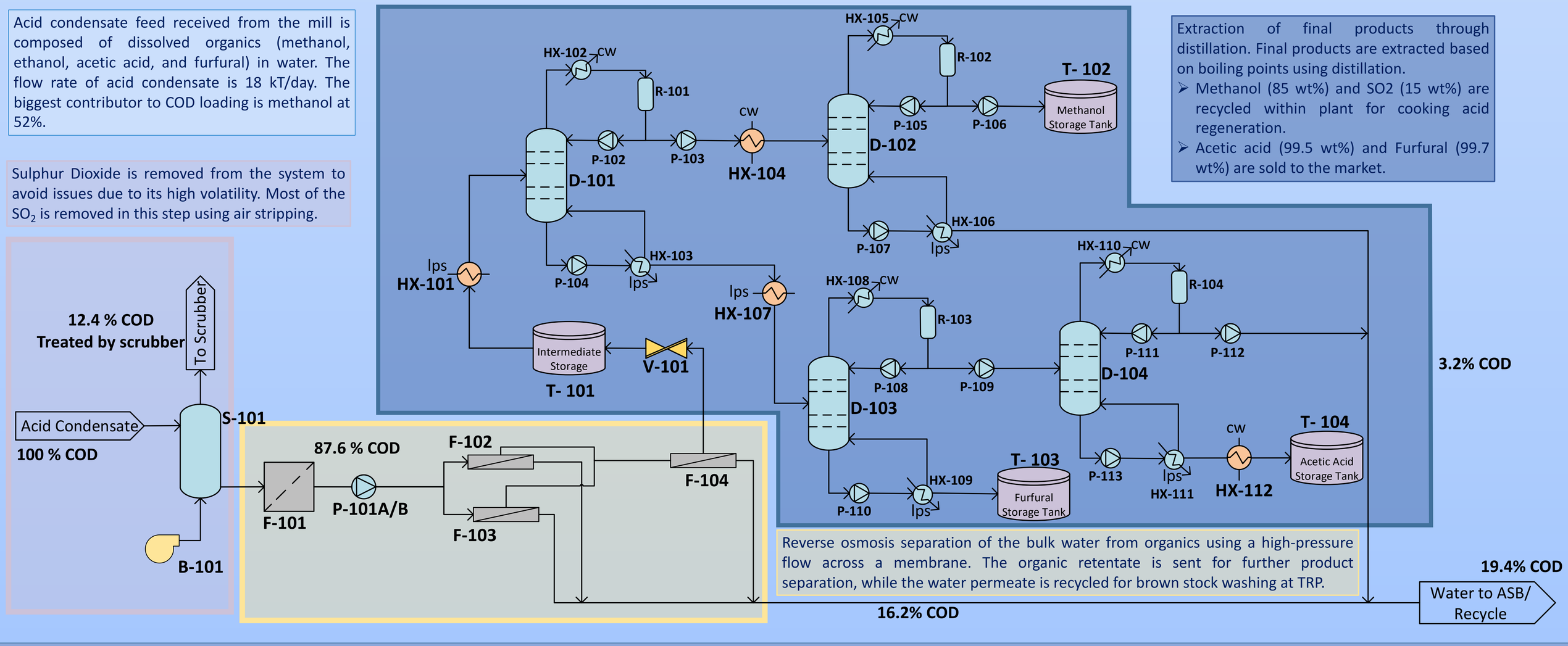
### Project Outcome

- The use of air stripping, reverse osmosis treatment, and a series of separation by distillation has been selected as the best design to reach the project objectives
- Chosen as best option in order to reduce COD and produce products.
  - Total COD reduction of 80.6%
  - Total capital investment of $9.3 M

# PROPOSED DESIGN: COD Reduction through the Extraction of By-Products from Acid Condensate

Acid condensate feed received from the mill is composed of dissolved organics (methanol, ethanol, acetic acid, and furfural) in water. The flow rate of acid condensate is 18 kT/day. The biggest contributor to COD loading is methanol at 52%.

Sulphur Dioxide is removed from the system to avoid issues due to its high volatility. Most of the $SO_2$ is removed in this step using air stripping.



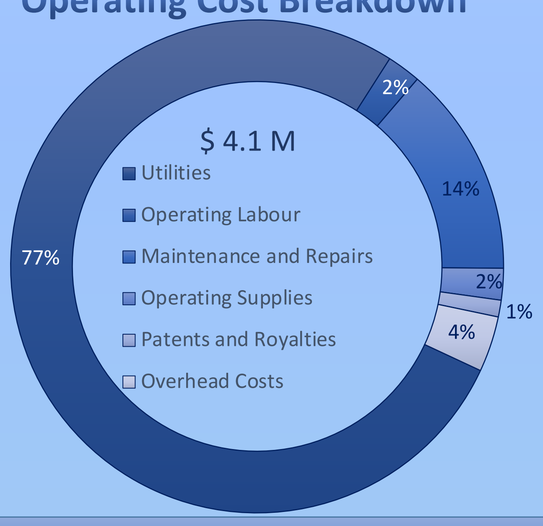

Extraction of final products through distillation. Final products are extracted based on boiling points using distillation.

- Methanol (85 wt%) and SO2 (15 wt%) are recycled within plant for cooking acid regeneration.
- Acetic acid (99.5 wt%) and Furfural (99.7 wt%) are sold to the market.

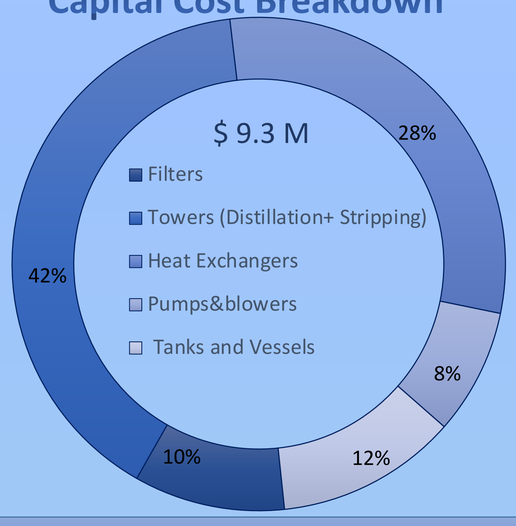
Reverse osmosis separation of the bulk water from organics using a high-pressure flow across a membrane. The organic retentate is sent for further product separation, while the water permeate is recycled for brown stock washing at TRP.

# ECONOMIC ANALYSIS

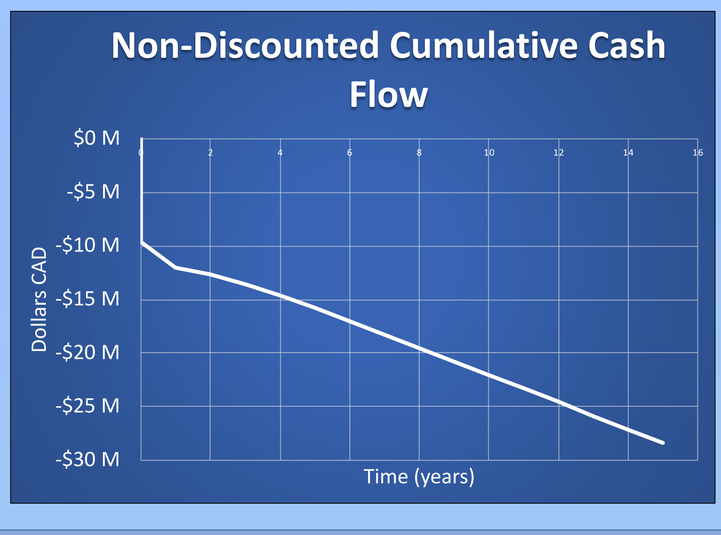
### Operating Cost Breakdown



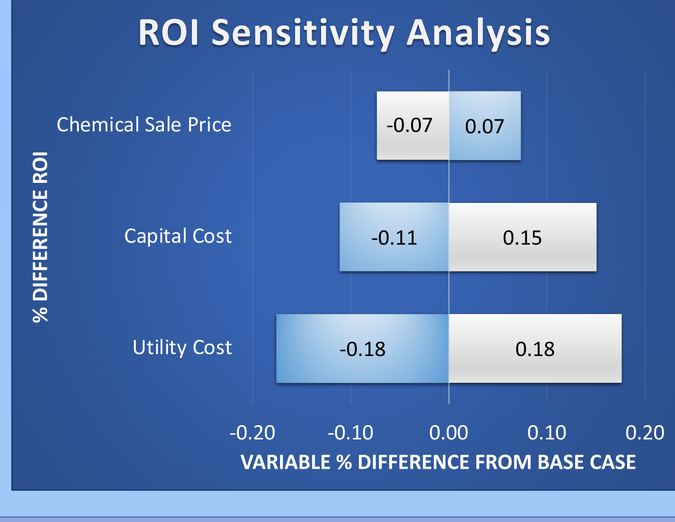

### Capital Cost Breakdown




### Non-Discounted Cumulative Cash Flow




### ROI Sensitivity Analysis




# CONCLUSIONS AND RECOMMENDATIONS

### COD Removal Level

- An 80.6% reduction of COD loading from acid condensate is achieved through process, which leads to an overall COD loading reduction of 17% at TRP.

### Production of By-Product(s)

- The production of methanol at 85 wt%, acetic acid at 99.5 wt%, and furfural at 99.7 wt% is achieved through separation by distillation.
- By products lead to a yearly revenue of $2.4 M

### Recommendations

- It is recommended that Twin Rivers Paper evaluate the following opportunities:
  - Producing steam on site to mitigate the purchased cost of steam
  - Sending RO retentate to existing boiler
  - Utilizing anaerobic digestion

## ACKNOWLEDGEMENTS

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