



Black Liquor and Biomass Steam Reforming at Norampac's Trenton Mill

TAPPI 2007 International
Conference on Renewable Energy

May 11, 2007

www.tri-inc.net

Topics

- Introduction to Norampac
- Review of Steam Reformer Technology
- Overview of Norampac Black Liquor System
- Highlights of the Reformer Operation
- View of the Future
- Conclusion
- Questions

Norampac - Trenton, Ontario

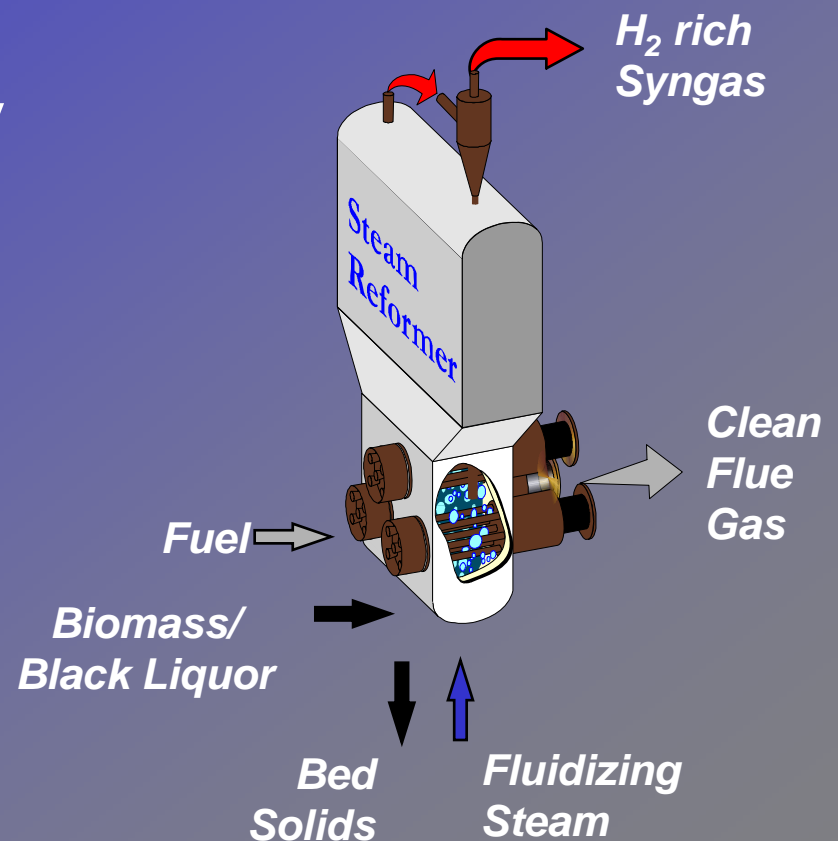
- Division of Cascades Canada Inc.
- Located in Trenton, Ontario, Canada
- Semi-chem pulp mill and 500 tpd corrugating medium paper machine
- World's first commercial low temperature black liquor steam reformer
- Started up September 03
- Over 18,000 hrs of operation



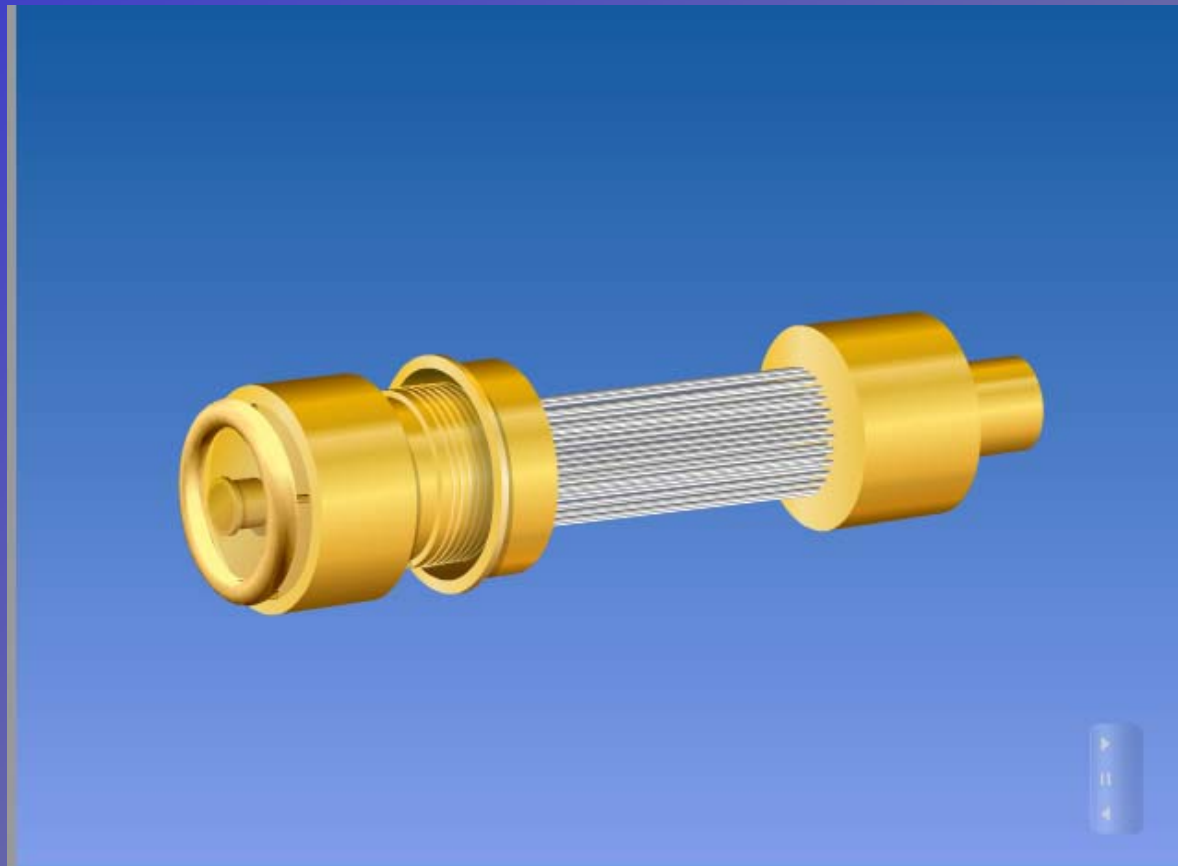
TRI's Technology

TRI's PulseEnhanced™ steam reformer is a patented technology that:

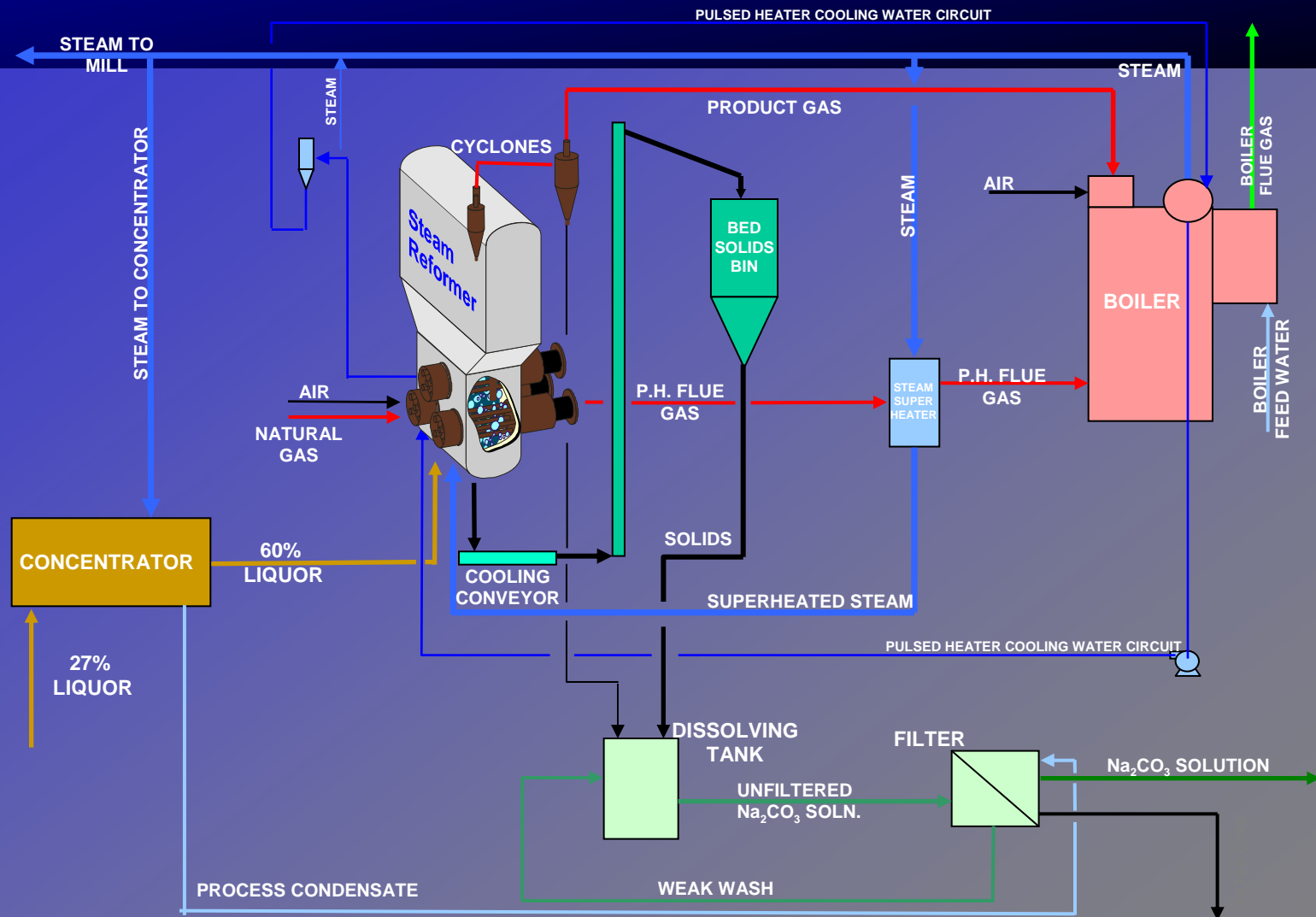
- Produces medium Btu Syngas
- Customize Syngas to meet downstream process needs
- Process wide spectrum of Biomass
- Energy self sufficient
- Is inherently stable and safe



PC Heater Animation



Norampac Steam Reformer Flow Sheet



Norampac Steam Reformer



Advanced Biomass Conversion Technologies for the Pulp and Paper Industry

Highlights Of Reformer Operation



- Reformer operation extremely stable
 - Single operator per shift
 - Bed temperature, bed level, liquor flow straight trend lines
- Syngas combustion has proven to be very stable
- Overall system net steam positive
 - Above 45% capacity and through combustion optimization
- Turn-down ratio phenomenal – can operate at 10% to 100% design capacity for extended durations
- High chemical recovery (94-97%)
- Meets all environmental emissions targets
- No contaminant build-up during the mill liquor loop closure

Highlights Of Reformer Operation

Mechanical Issues

- PC Heater –to date largest contributor to downtime and needed design improvements
 - Baffle redesigned to reduce forces and improve section modulus
 - Decoupler seal being redesigned to better allow for thermal expansion
 - Aerovalve redesigned and successfully tested at GP
- Expansion joints redesigned to accommodate reformer vessel movement

Process Issue

- Carbon conversion is less than design and represents an economic opportunity
 - Injector optimization in progress
 - Steam Grid design modification
 - Air Addition to fluidizing medium being considered



View of the Future

- PC Heaters reliability issues are understood and solutions have been implemented or are in design
- Operational run time expected to continue to improve
- Concept and testing program in place to improve carbon conversion:
 - Optimized steam grid
 - Air addition

Conclusion

- Steam reformer remains a viable and integral part of the mill's operation
- Norampac is solidly behind this technology and continues in its diligence to work with TRI to resolve remaining issues
- Confident that modifications can be made to improve carbon conversion

“We would like to thank Norampac for their leadership, support and dedication in working closely with TRI to make this world’s first low temperature steam reforming installation a commercial success, and an integral part of the mills operation.”

Norampac Steam Reformer



***Renewable
Energy***