

Environmental Assessment of Wet Oxidation and Mild Bisulfite Pretreatments for Converting Forest Slash Residues to Sugar

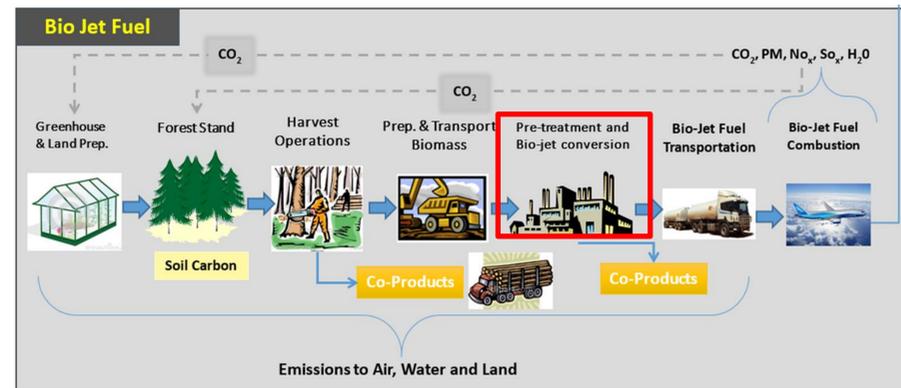
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Abstract

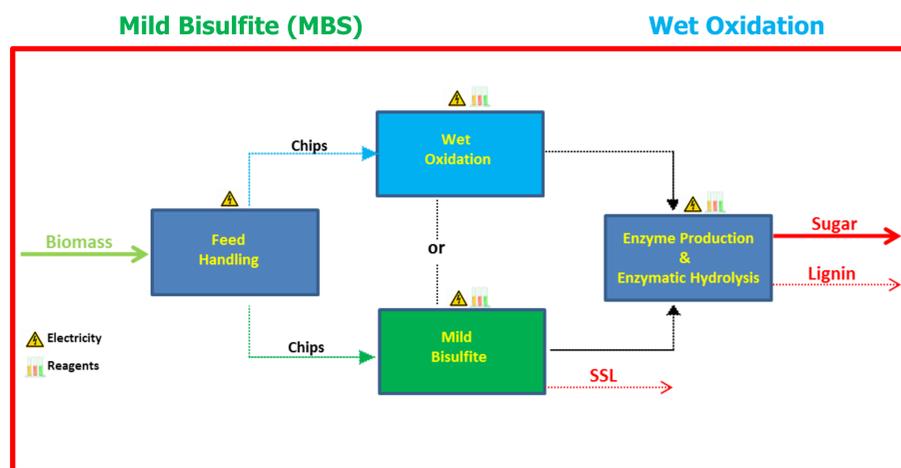
Processes such as Wet Oxidation and Mild bisulfite (MBS) are emerging as options for pretreating biomass for downstream sugar production. A comparative assessment of both processes is done to discern their various environmental impacts. The assessment will be built from full-scale models of both processes using the Aspen Plus Software package. A techno-economic assessment is used to augment the data set developed in the process model. Goals are to 1) elucidate which of these two pretreatment options would better fit a conceptual depot scale facility based in the Pacific Northwest, 2) investigate which units of the pretreatment processes are major contributors to impact categories like global warming, eutrophication, and smog formation.

Background

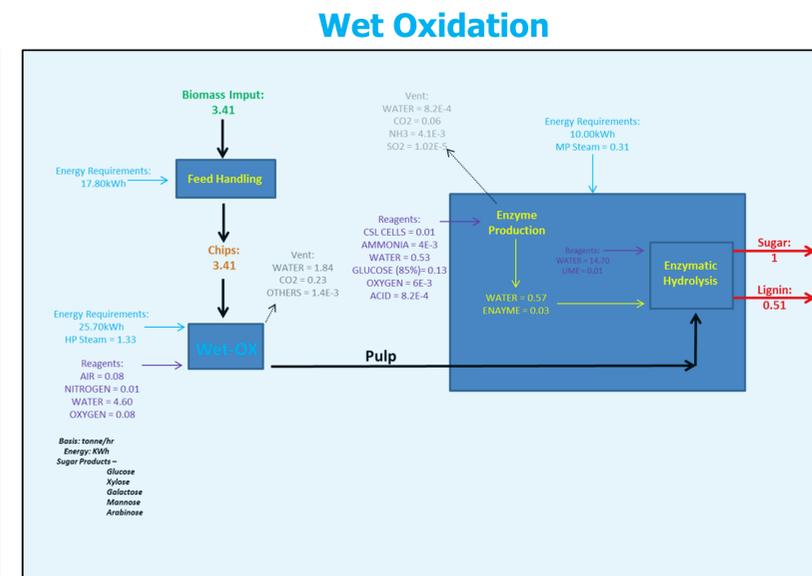
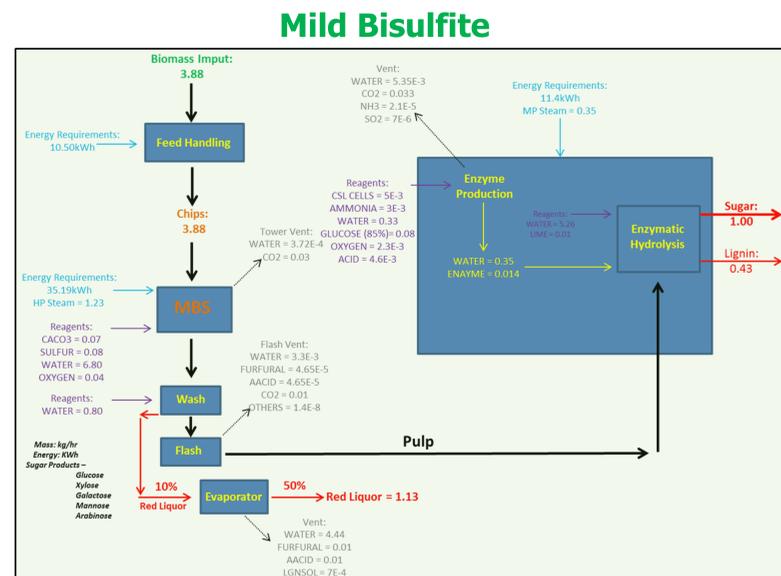
The Northwest Advanced Renewables Alliance (NARA) looks to create fuels from forest residues. The pretreatment and enzymatic hydrolysis of the slash wood are crucial step within the process. We analyze two of these pretreatment techniques: Wet oxidation (WO) and MBS for their environmental impacts.



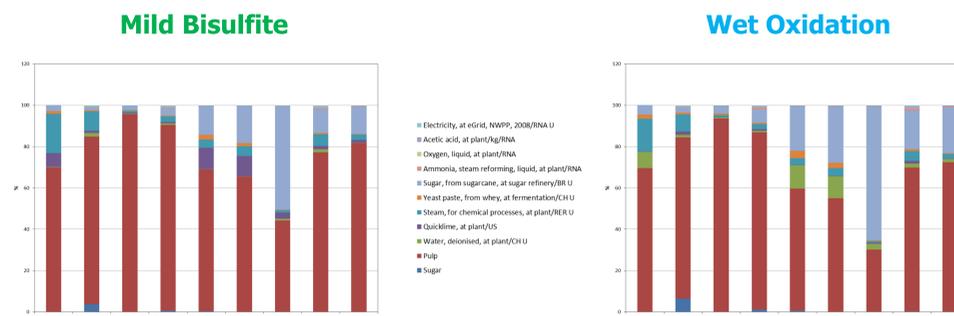
Introduction – Pretreatment Methods



Flow Diagrams



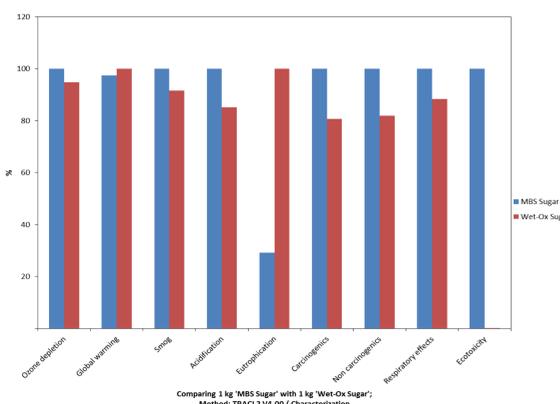
Results – Assessment of Sugar Production



Conclusions

- 1) The two methods Wet Oxidation and MBS are relatively similar with only minor differences in each impact category. This assessment was based on assumptions that will change as more data is gathered.
- 2) Comparing the two processes, the biggest difference in impact assessment is in the eutrophication category.

Comparative Data



Future Work

- 1) More work will be done towards gathering data for a more comprehensive assessment; including recycle streams, waste water treatment, and vent scrubbing.
- 2) Secondly, work will also be done towards refining the assumptions made in the model as well as integrating data from other downstream processes (i.e. fermentation).

References

1. Gate Review (ASPEN Model, 2014)
2. USLCI Database
3. Llyod *et al*, *Bioresource Technology*, 96, 2005
4. NREL & Harris Group. *Technical Report*, May 2011
5. NREL & Harris Group. *Aspen Model*, May 2011