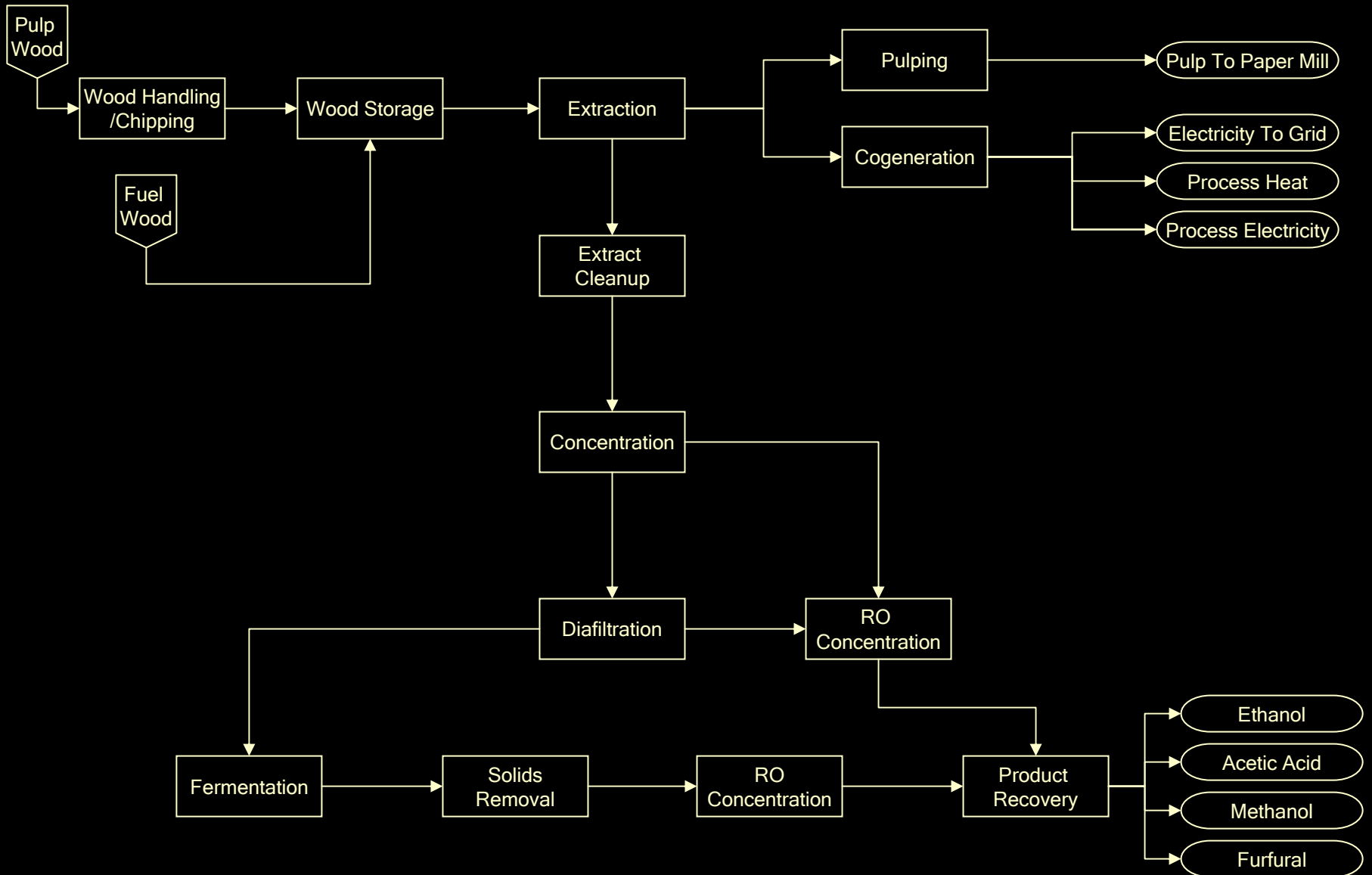


Economic Analysis of a Forest Biorefinery At A 1000 T/Day Pulp & Paper Mill

Christopher D. Wood

Basic Facility Overview



Major Assumptions

- 350 Operating Days / Year
- Sufficient Recovery Capacity for Incremental Pulp
- Sufficient Water Treatment Capacity For Excess Water
- Extraction Conditions for Fuel and Pulp Wood
- Facility In New York

Major Equipment

- Wood Handling Equipment
- Extraction Equipment
- 35 MW Cogeneration Facility
- Membrane Plants
- Fermentation Capacity
- Product Recovery
- Rail Modifications

Total Capital Investment

Total Equipment	\$ 64,223,245.12
Buildings, Instrumentation, Piping, Electrical Costs	\$ 67,755,523.60
Engineering, Construction, Legal, Contractors Expenses	\$ 57,158,688.16
Contingency	\$ 23,762,600.69
Cogeneration Facility	\$ 66,606,000.00
Total FCI	\$ 279,506,057.57
WCI	\$ 49,324,598.40
TCI	\$ 328,830,655.97

Production \ Operating Costs

Fuel Wood Costs	\$ 6,125,000.00
Pulp Wood Costs	\$ 10,980,900.00
Electrical Costs	\$ 641,244.48
Membrane Replacement Costs	\$ 5,066,666.67
Labor Costs	\$ 4,164,818.86
Royalties	\$ 43,139.60
Operating and Maintenance Costs	\$ 11,569,402.65
Fermentation Nutrients	\$ 834,560.99
Contingency	\$ 5,788,675.84
Total Production / Operating Costs	\$ 45,214,409.08

Revenue

Product	Price	Unit	Production	Unit	Value/Year
Ethanol	2.43	\$/Gal	42813.505	gal/day	\$36,412,886.27
Acetic Acid	65	Cents/Lb	127321.00	Lb/day	\$28,965,527.50
Electricity	76.27	\$/MWH	35	MW	\$22,423,380.00
Methanol	1.57	\$/Gal	24579.00	Lb/day	\$2,044,752.15
Furfural	0.84	\$/lb	16890.10	Lb/day	\$4,965,689.40
Incremental Pulp	550	\$/Ton	188.33	T/day	\$36,253,525.00
Animal Feed	4	Cents/Lb	17.55	T/day	\$491,400.00
				Sum	\$131,557,160.32

Taxes

- Federal Tax Rate: 34%

Section 45	1.5	Cents/ KWH
Section 40.b.2	60	Cents/Gallon
Section 40.b.3	10	Cents/Gallon
NY "Renewable Fuel Production Tax Credit"	15	Cents/Gallon

Base Case

- Includes Tax Benefits
- All Equity Financing
- Discounted Cash Flow Rate Of Return: 23.5%

Loan Case

- 35% Equity Financing
- 65% Debt Financing
 - 16 Years
 - 8% Interest
- Includes Tax Benefits
- Discounted Cash Flow Rate Of Return: 48.7 %

DOE Grant Supported Case

- Includes Tax Benefits
- \$80 Million DOE Grant
 - \$40 Million to TCI
 - \$20 Million Off From Operating Costs, 2 Years
- 65% Debt Financing
- Discounted Cash Flow Rate Of Return: 71.4 %

Factors Not Included in Analysis

- Heat / Electrical Saving By Mill
- Lignin Discharge As A Product
- RO Water As Boiler Feed Water
- Flue Gas Drying
- Offset Costs Of Incremental Pulp

Conclusions

- Value To Mill Is High
- Return on Investment is Acceptable to Excellent
- Product Value Increasing
- Good High Risk Investment

Questions ?

Base Case

DCFROR	23.49%
TCI	\$ 328,830,65
WCI	\$ 49,324,598

	Year 1	Year 2	Year 3	Year 4	Year 5
Revenue	\$ 131,557,160	\$131,557,160	\$131,557,160	\$131,557,16	\$131,557,160
Expenses	\$ 45,339,593	\$ 45,339,593	\$ 45,339,593	\$ 45,339,593	\$ 45,339,593
Depreciation (MACRS)	\$ 13,975,302	\$ 26,553,075	\$ 23,897,767	\$ 21,521,966	\$ 19,369,769
Gross Profit	\$ 72,242,264	\$ 59,664,491	\$ 62,319,799	\$ 64,695,600	\$ 66,847,797

Taxes	\$ 7,421,352	\$ 3,144,909	\$ 4,047,713	\$ 4,855,486	\$ 7,828,942
NP	\$ 64,820,912	\$ 56,519,582	\$ 58,272,085	\$ 59,840,114	\$ 59,018,855
A	\$ 78,796,215	\$ 83,072,657	\$ 82,169,853	\$ 81,362,080	\$ 78,388,624

PWF	0.8098	0.6557	0.5310	0.4300	0.3482
PW	\$ 63,809,469	\$ 54,477,562	\$ 43,636,695	\$ 34,989,776	\$ 27,299,327

Sum PW	\$ 328,830,655
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Equipment Breakdown

Extraction	\$27,349,565.12
Course Filtration	\$ 6,000,807.97
Separation	\$ 6,151,659.21
Fermentation	\$ 9,961,203.02
Product Recovery	\$ 6,303,678.78
Utilities / Recovery	\$ 6,001,125.06
Other Equipment	\$ 2,455,205.96
Total Equipment	\$64,223,245.12