

TechnoBusiness Forum -- 2005

Open Innovation

-- Enterprise Transformation --



Opportunities in the Power Sector

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Leaving \$100 Bills on the Floor

- The Paper Industry Has Had *Depressed Earnings* For Many Years
- The Industry Has Gone From A Position Of World Leadership (Southern Pine, Specialty Papers) To *Struggling To Survive*
- Present *Use Of Trees Is Inefficient* -- Leaving \$100 Bills On The Floor
- New Focus On Sustainability & Renewable Resources Gives This Industry Advantage

Current Profitability

- Recovery Boilers Were A Major Step Toward *Eliminating Purchased Energy For Mills*
- They Transformed A Water Pollution Problem Into A Large Savings – *Cannot Use Lignin In Paper; Burn It Rather Than Flush It*
- Recovery Boilers Are Inefficient – *Produces High Temperature Steam For Use In Low Temperature Processes*

Replace Recovery Boilers!

- Put High Temperature Steam Through A Turbine To Produce Electricity – Use Low Temperature Steam For Process Heat
- “Free” Electricity, Except Capital Cost
- Economies Of Scale In Electricity Generation
=> At Least 2.4 Million Lbs/Day Of Lignin
(1,200 Tons/Day) – Better At 3,600
- Electricity Worth \$72,000 To \$168,000/Day – A Lot Of \$100 Bills On The Floor

Alternative: Gasify Lignin

- Gasify Black Liquor To Produce More Electricity & *Still Have Process Steam*
- *Gasify* To Produce Diesel, Gasoline, & Other Chemicals Via Fischer-Tropsch
- Most Profitable Alternative Depends On Various Markets – *Flexibility To Go To Most Profitable Market Is Important* - & More Expensive

Today's Opportunities

- MA, PA, TX, CA, Etc. Have “*Renewable Portfolio*” Standards For Electricity
- Utility Must Buy X% Of Its Electricity *From Renewable Sources*
- Cheapest Renewables – Wind, *Biomass Cofiring* (Photovoltaic, Etc. Expensive)
- Why Burn Valuable Cellulose? *Cellulosic Ethanol, Paper, & Other Products*

The Saudi Arabia of Renewables

- **Forest Products Industry Controls The Major Source Of US Renewables**
- **Industry Will Have A Leading Role In Sustainability & Renewable Portfolio Standards**
- **Key Will Be Intelligent Use Of The Whole Tree – Cellulose & Lignin – Biorefinery**
- **Wide Range Of Opportunities – Business Risks – Where Do We Start?**

Current Opportunities

- *Oil At \$60/Bbl To 2011 In Futures Market*
- *Biorefinery For Lignin & “Surplus” Cellulose
Very Profitable At These Prices...but...*
- *Electricity At 3-7 ¢ / Kwh Profitable For
Lignin With Low Temp. Steam For Processes*
- *Renewable Portfolio Standards Give
Premium Price For This Electricity*
- *Electricity Prices Likely To Keep Rising*

More Opportunities

- **When Carbon Dioxide Restrictions Bind, Electricity Prices Will Rise, *But No Problem For Wood Generated Electricity***
- **If US Gets Serious About Limiting Oil & LNG Imports, *Fischer-Tropsch Liquids Will Be More Valuable (Profitable)***

Conclusion

- Forest Products Has *Large Opportunity*
- Immediate Opportunities – *Electricity, Gasification – Fischer-Tropsch Liquids*
- Renewable Electricity Prices *Likely To Rise*
- But Economies Of Scale *Imply Larger Plants*
- Need For Expertise From *Outside The Industry* – Electricity, Chemicals
- Need For New Investment