Total Fuel + Non-Fuel Costs are Lower, and Pollutants Less, for Natural Gas than Biomass Fuels for Rock-Tenn

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Note: The following article is a condensed version of two essays posted by the author on the Rock-Tenn Community Advisory Panel listserv on January 28 & 29. The article reviews evidence about the availability, costs, and questions associated with six types of biomass fuel, and evidence about the non-fuel costs (operation, maintenance, capital, and financing) of incinerating each type of biomass. The article concludes by presenting evidence that the total fuel + nonfuel costs are lower to power Rock-Tenn with natural gas than any combination of biomass fuels, and the reliability is higher. Extensive evidence, not reviewed in the article but available elsewhere, also indicates that burning natural gas will create far fewer health impairing pollutants than burning biomass, especially biomass comprised of composite and treated wood waste and/or refuse derived fuel (RDF). The article envisions a win-win scenario for workers and residents, and for the company, city, county and state, by burning natural gas to create both steam and electricity, instituting energy efficiency upgrades, and embracing carbon offsets.
(1) http://rtadvisory.org/main.php

The Saint Paul Port Authority wants to build a biomass incinerator at the Rock-Tenn site that is large enough to meet the steam needs of the paper recycling plant and the heating needs of the Central Corridor. The Port Authority and its "Energy Independent" newsletters and "Green Energy Development" webpage (2) are deceptively leading the public to believe that if the biomass incinerator is built, the incinerator and the Central Corridor energy district it is proposing will be fueled in much the same way as the "green" downtown St. Paul district energy system it operates -- a system it claims is fueled "about 80%... by waste wood from trees cleared from local parks or damaged by storms."
(2) http://www.sppa.com/green.asp

If a biomass incinerator is ever built at Rock-Tenn, very little clean urban tree waste will actually be burned in the incinerator. Extensive evidence indicates that despite the Port Authority's "green" spin, there is no way that the Rock-Tenn/Central Corridor energy district biomass incinerator it proposes can be fueled in the same way as the downtown St. Paul energy district incinerator it operates.

More specifically, the Green Institute's March, 2007 "Renewing Rock-Tenn: A Biomass Fuels Assessment for Rock-Tenn's St. Paul Recycled Paper Mill" study (3) indicates that only enough clean urban tree waste is available to supply 3% of Rock-Tenn's

current fuel needs on a reliable annual basis, and a maximum of 15% in "good" years. Similarly, the Green Institute's December, 2007 "Comments to the MN Pollution Control Agency on the Midtown Eco-Energy Project" (4) indicate that even less clean urban tree waste would be available -- and perhaps none at all -- if the Midtown "Eco-Energy" Project incinerator is approved.
(3) http://www.greeninstitute.org/energy
(4) http://www.greeninstitute.org/energy

I've included more specifics from both studies about the available quantities of clean urban tree waste in the Appendix at the end of this article. It's clear, however, that the amounts are totally inadequate to meet even a small percentage of Rock-Tenn's fuel needs, let alone a larger incinerator that would meet the needs of both Rock-Tenn and the Port Authority's proposed Central Corridor energy district.
[Note: In the remainder of this article, all statements about the percentage of fuel needs that could be supplied by various types of biomass refer only to the percentages that could fuel a biomass incinerator large enough to meet Rock-Tenn's current needs. These percentages would be considerably lower if enough of any type of biomass had to be provided to fuel an incinerator large enough to meet both Rock-Tenn's and the proposed Central Corridor energy district's needs.]

So if little to none of Rock-Tenn's fuel needs can be met by clean urban tree waste, what other types of biomass are available to fuel an incinerator?
Table 14 (p. 4) of the Executive Summary of the March, 2007 study indicates that 56% of the fuel demand at Rock-Tenn could be supplied by "agricultural residues: corn stover" and "dedicated energy crops: grasses." While at first glance this looks good, each of these forms of biomass are associated with MAJOR UNCERTAINTIES -- as reflected in the following summary statements and quotes from the study:

-- Corn stover agricultural residues might be able to make a significant contribution, but questions remain about difficulties storing and burning high-alkali corn stover, and "over the next 20 years, significant quantities of corn stover will likely be diverted to liquid biofuel production such as cellulosic ethanol." (p. 2)
-- Perennial grasses might also be able to make a significant contribution, but questions remain about storage and competing conversion to biofuels. (p. 2)
-- "Agricultural sources [corn stover and perennial grasses] could provide at least one-third of Rock-Tenn's fuel needs (potentially more if longterm contracts were in place to offset the risk of increasing demand for biofuel production)." (p. 6)

Echoing the above uncertainties, John Curry noted on 1/28 that all of the above are commodities, with costs and availability (in the absence of long term contracts) subject to supply and demand, transportation costs, etc.

Regardless of whether one agrees with all the projects and approaches reflected on the "Land of Biofuels?: Minnesota DNR" website (5) posted by Steve Haselmann on 1/24, there is clearly going to be intense competition for perennial plants and agricultural wastes in the future to produce cellulosic ethanol (if the technology can be developed),

and to create electricity and heat. While I think there are much better, cleaner, and more job producing, community enhancing and sustainable ways to create electricity, heat, and cooling, the point here is that if a biomass incinerator is built at Rock-Tenn it will be in competition with many other facilities for the same agricultural wastes and perennial plants. If Rock-Tenn is unsuccessful in this competition; if the cost of the agricultural wastes and plants increases too much or their availability becomes too unpredictable; if storage and transportation costs get too high; and/or if the operational and maintenance costs to incinerate these forms of biomass increases too much, Rock-Tenn will turn to other sources of "biomass."
(5) http://www.dnr.state.mn.us/volunteer/janfeb08/biofuels.html

So what's left?

The Executive Summary notes that "there is sufficient wood from logging residues and other forest sources within 100 miles to provide a significant portion of Rock-Tenn's fuel needs; but because of the distance, only a portion of this resource should be used" (p. 6). Table 14 (p. 4) of the report projects that if a mixture of biomass fuels were used to power an incinerator for Rock-Tenn, 20% of this fuel might be provided by forest residues. But what if the Midtown "Eco-Energy" incinerator is approved? It will also draw upon these residues. And as John has noted, logging and forest wastes are commodities too, subject to supply and demand, changing transportation costs, etc.

Table 14 (p. 4) of the Executive Summary indicates that the "proportion of plant demand" at Rock-Tenn that could be supplied by "C&D Other Wood" (contaminated composites/painted/treated wood) is 45%. "C&D other wood" was also found to have the lowest estimated fuel cost of the six types of urban wood waste, agricultural fuels and forest residues evaluated in the study (Figure 20, p. 5).

Incinerating contaminated C&D wood (composite, painted, and treated wood) creates all sorts of highly toxic emissions, even when advanced combustion and pollution equipment is in use. It is for this reason that the Executive Summary notes that "the use of some C&D wood will trigger a higher threshold of environmental review and the possible need for additional pollution control equipment."

At least two states view the risks posed by the incineration of contaminated C&D waste as even more severe than implied by the above statement, and have banned such incineration. More specifically, on June 12, 2007, the Governor of New Hampshire signed a law permanently banning the burning of contaminated C&D waste. Vermont has a similar ban. For more on the health and environmental consequences of burning C&D wastes, see the website (6) of the Residents Environmental Action Committee for Health (REACH).
(6) http://www.leadfreeordie.com/

The Green Institute (7) in its December 7, 2007 "Comments to the MN Pollution Control Agency on the Midtown Eco-Energy Project" (and in reacting to a specific draft permit proposal), reached a somewhat different conclusion than it did in the Rock-Tenn report

about the acceptability of incinerating C&D waste. More specifically, the Green Institute specifically recommended that "composite woods should be specifically excluded from the permit" for the proposed Midtown incinerator (p. 1). "Plywood, oriented strand board (OSB), medium-density fibreboard (MDF), wood with plastic laminates and other composite woods contain contaminants that can pose environmental hazards that are not addressed in the permit documents" (p. 5).
(7) http://www.greeninstitute.org/energy/

Quick summary of all of the above:

-- virtually no clean local unallocated tree waste is available;
-- agricultural wastes, perennial crops, and forest and logging wastes may be available but there are major uncertainties associated with a number of variables (technology, diversion to other uses, commodity supply and demand issues, storage, transportation, etc.);
-- contaminated C&D waste is plentiful, locally available, and cheap. If the "Eco-Energy" incinerator is approved and the recommendation of the Green Institute followed, the quantity of available C&D waste won't be diminished by diversion to the Midtown incinerator. As a commodity, its costs are likely to be stable or even decrease. [Note: refuse derived fuel -- RDF, excluded from the Green Institute Study -- has these same characteristics, and is even cheaper. The incinerator operator may even be paid to accept the fuel. Guess which two fuels will be burned in a biomass incinerator if it is constructed.]

So what about the "Non-Fuel Costs" of incinerating the various types of biomass that might potentially be used to fuel an incinerator at Rock-Tenn?

The Executive Summary of the Green Institute's March, 2007 report notes that while Rock-Tenn asserts that "plant operation based solely on natural gas fuel is not economically viable... the economics of a natural gas plant provide a reference point for considering the economic viability of a biomass-fueled plant." The report also notes that "in comparing biomass with natural gas, it is necessary to consider the cost of non-fuel expenses (such as operation, maintenance, capital, and financing) as well as the fuel costs."

The report notes that "non-fuel costs for a biomass plant are heavily dependant on financing assumptions, as well as assumptions regarding required pollution control equipment, involving both capital and operating costs. The report also notes that "appropriate combustion and pollution control equipment would be required to destroy the compounds and reduce emissions from types of C&D wood" ... [and that] "the use of some C&D wood will trigger a higher threshold of environmental review and the possible need for additional pollution control equipment."

Factoring in all of the above, Figure 11 (p. 5) indicates that the non-fuel costs (fixed and variable operating and maintenance costs + financing costs) for three different biomass fuel mixtures are much higher than the non-fuel costs for natural gas. The non-

fuel costs of the natural gas scenario are only a small fraction of the three different biomass scenarios.

Figure 20 (p. 5) makes a different economic point, namely that if Rock-Tenn was fueled 100 percent by six types of urban wood waste,
agricultural fuels and forest residues, the type of biomass with the lowest estimated fuel cost is contaminated C&D wood.

My summary: While the fuel costs of various forms of biomass are less than natural gas (with contaminated C&D wood being the cheapest), the non-fuel costs of burning natural gas are only a small fraction of the non-fuel costs (pollution control equipment, operation, maintenance, capital, and financing) of all scenarios involving the incineration of various mixtures of biomass. Burning various forms of biomass also creates various forms of extensively documented health and environmental problems, and creates major financial risks to the backers and guarantors of the project due to uncertainities about the availability, cost and content of the fuel, and the costs and reliability of the incineration and pollution control technology.

The Green Institute offered this conclusion in their March, 2007 Executive Summary: "Our modeling of fuel costs suggests that a 100 percent biomass option using a blend of the fuel sources considered in this study might cost approximately $4/MMBtu. Based on our screening analysis of nonfuel costs of biomass, this may be too expensive for the project to bear, even in our low-cost scenario of biomass non-fuel costs." The [low-cost scenario] of "biomass non-fuel costs assumes a project with secure fuel access and other factors reducing project risk and allowing access to low-cost financing, as well as limited pollution control equipment. The [higher-cost, upper-range scenario -- even more expensive for the project to bear] assumes the use of advanced pollution control equipment, such as would be required for combusting RDF, contaminated C&D, and possibly other biomass fuels depending upon natural or human-caused contamination. Financing and other variables, such as grants or lower interest rates, may have potential for reducing costs (or increasing costs) from those presented here."

Final conclusion: When both fuel and non-fuel (pollution control equipment, operation, maintenance, capital, and financing) costs are combined, natural gas is the clear winner. When one factors in all the health problems created by the various forms of biomass (problems that are "externalized" in business models), natural gas becomes an even bigger winner. It's certainly true that some of the forms of biomass are much more "carbon neutral" in terms of a long-term carbon cycle than fossil fuels such as natural gas. I want to say more about that in a later post, but for now, all things considered, natural gas is still overall the least expensive (fuel + non fuel costs), least health impairing, and most desirable commodity for meeting Rock-Tenn's fuel needs.

Rock-Tenn's jobs, services, products, and financial contributions to the community, county and state are clearly important. Steve Haselmann (12/3) assures us that "Rock-Tenn Company does not want to close this plant. It is strategically located and has a number of other aspects that makes it a very good operation for Rock-Tenn."

The win-win solution for everyone is for the company, city, county and state to create a shared financing and incentives arrangement that supports maximal energy efficiency improvements at the plant and to the boilers, and the installation of a waste heat recovery boiler (8, 9) to the stack to create electricity that could be used onsite, sold for use offsite, and used as savings or income, respectively, to offset natural gas costs. A shared commitment by all parties to plant trees and support other carbon offsets should also be considered.

(8) Worldwatch Institute: Clean Energy's Best-Kept Secret: Waste Heat Recovery 11/19/07
http://www.worldwatch.org/node/5499

(9) Bill McKibben: Making Low Carbon Energy a Precious Resource Nov./Dec. 07
http://www.orionmagazine.org/index.php/articles/article/467

A biomass incinerator is the wrong way to go to meet Rock-Tenn's steam needs. It's also not the best, greenest, or most sustainable solution to meeting the heating needs of the Central Corridor. Some of the elements for such a solution will be suggested in a later article.

Appendix: Specifics on the Green Institute's Findings on the Available Quantities of Clean Urban Tree Waste
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The Executive Summary of the Green Institute's "Renewing Rock-Tenn: A Biomass Fuels Assessment for Rock-Tenn's St. Paul Recycled Paper Mill" study (March, 2007) indicates that the "proportion of plant demand" that could be reliably supplied by "urban tree residue" is only 3% (Table 14, p. 4). The study also reported that "in some years [urban tree residue] may be able to provide about 15 percent of Rock-Tenn's fuel needs, but annual availability fluctuates considerably and supplies cannot be relied upon" (p. 6).
http://www.greeninstitute.org/energy/

The above study was based upon Rock-Tenn's exact fuel needs at the time (an "average steam load of 226,000 lbs/hour"). It EXCLUDED possible decreases in need due to "efficiency improvements ... that may reduce future energy demand" ... and dramatic increases in need due to "steam loads other than Rock-Tenn that could factor into plant development, such as a district heating system." (pp. 58-59 of the larger study)

The Green Institute's December 7, 2007 "Comments to the MN Pollution Control Agency on the Midtown Eco-Energy Project", reaffirm the scarcity of urban tree waste, in this case as a potential fuel for the Midtown "Eco-Energy" Project. The next two paragraphs contain their comments:
http://www.greeninstitute.org/energy/

[The] "Green Institute's own research, conducted for the Rock-Tenn paper recycling facility, shows that there are 300,000 wet tons/year of tree trimmings, and 150,000 wet tons/year of land clearing trees available in the Twin Cities metropolitan area, for a total of 450,000 tons/year. However, annual fluctuations in availability can be significant, particularly for tree waste from land clearing activities. Additionally, our research shows the current fate of those quantities is as follows:
-- 260,000 tons: District Energy St. Paul
-- 125,000 tons: landscape mulch
-- 15,000 tons: Lynn Busch Roses (biomass boiler in Plymouth)
-- 10,000 tons: other biomass boilers

Thus, the available, non-utilized quantities are estimated to average 40,000 tons/year. This research is based on extensive survey work done over multiple years. It was verified against national studies conducted in other urban areas. It appears to be further validated by District Energy's experience this past winter, where it was necessary for them to extend their procurement operations hundreds of miles beyond the Twin Cities to secure sufficient wood quantities during a period of downturn in the housing industry (new homes construction is responsible for a majority of tree removal from land-clearing activities)." (p.4)

The Green Institute concluded that, at most, only 40,000 tons/year of non-utilized urban tree residue was available to meet the proposed Midtown "Eco-Energy" incinerators' needs of 299,000 tons/year. Thus, not only is there virtually no "clean" urban tree waste to fuel the "Eco-Energy" Project, but if this unnecessary and ill-conceived project was approved and became the destination for the remaining non-utilized tree waste, there would be absolutely zero "clean" tree waste to fuel a Rock-Tenn incinerator.

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