

ENVIRONMENTAL FOOTPRINT COMPARISON TOOL

A tool for understanding environmental decisions related to the pulp and paper industry



EFFECTS OF DECREASED GREENHOUSE GAS EMISSIONS ON ENERGY USE

Emissions from Energy Use in Manufacturing

Reducing energy-related greenhouse gas emissions by fuel switching can affect energy consumption. The amounts of usable energy obtained from fuels are more or less inversely related to the fuel's greenhouse gas emissions, as shown in Table G2. Therefore, a change, for instance, from coal to bark will accomplish a very large reduction in greenhouse gas emissions but will require more total energy consumption because more bark is required to produce the same amount of usable energy.

Table G2. Representative Greenhouse Gas Emissions for Fuel Sources
(Source: IPCC 2006)

Fuel	Greenhouse Gas Emission Factor for Combustion, kg CO ₂ eq./GJ (HHV)
Bark and wood waste (biomass)	1.84
Pulping liquors (biomass)	0.64
Coal (bituminous)	90.32
Residual oil	73.77
Natural gas	50.54

Table G3. Boiler Thermal Efficiencies

Fuel	Efficiency	Reference
Spent Liquor Solids	61 ^a	Adams et al. 1997
Spent Liquor Solids	68-69	AGRA Simons Ltd.
Hogged Fuel	67	AGRA Simons Ltd.
Natural Gas	83	AGRA Simons Ltd.
Oil	87	AGRA Simons Ltd.
Sludge	65	AGRA Simons Ltd.
Spent Liquor Solids and Biomass	64 ^b	Francis et al. 2006
Coal	85, 75 ^c	Council of Industrial Boilers 2003
Oil	80, 72 ^c	Council of Industrial Boilers 2003
Gas	75, 70 ^c	Council of Industrial Boilers 2003
Biomass	70, 60 ^c	Council of Industrial Boilers 2003

^a Includes sootblowing 3.4% and boiler blowdown 0.85%.

^b Canadian average.

^c Second number is low load efficiency, numbers are for relatively new unit.

Effects of Recycled Fiber Use on Energy Use

Energy Use in Manufacturing

Switching to less GHG-intensive fuels seldom reduces total energy consumption, although it can significantly reduce non-renewable energy consumption if the change involves switching from a fossil fuel to biomass.

It is also important to consider whether fuel switching is accompanied by a change in combustion technology because this can have major impacts on total energy consumption. For instance, although coal-fired boilers are generally more efficient than gas-fired boilers, this difference is small compared to the increase in efficiency associated with replacing a coal-fired condensing turbine power plant with a natural gas-fired combined cycle co-generation facility. In addition to fuel switching, it is possible to reduce energy-related greenhouse gas emissions by reducing energy consumption. There are, of course, always strong co-benefits to energy use when greenhouse gases are reduced by reducing energy consumption.

References

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- AGRA Simons Limited. 2001. *A guide to energy savings opportunities in the kraft pulp industry*. Report prepared for The Pulp and Paper Technical Association of Canada (PAPTAC) by AGRA Simons Limited, Vancouver, BC.
- Council of Industrial Boiler Owners (CIBO). 2003. *Energy efficiency & industrial boiler efficiency: An industry perspective*. <http://www.docstoc.com/docs/36692511/ENERGY-EFFICIENCY-and-INDUSTRIAL-BOILER-EFFICIENCY-An-Industry>
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