ENVIRONMENTAL FOOTPRINT COMPARISON TOOL

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

GREENHOUSE GASES

EFFECTS OF DECREASED ENERGY CONSUMPTION ON GREENHOUSE GAS EMISSIONS

Energy Savings by Reducing Steam Demand

Much of the energy required by mills is supplied by steam generated by burning fuels in boilers. A 2006 report to the U.S. Department of Energy indicates that steam supplies 67% of the energy used in pulp and paper mills. (See Table 4.5 in the 2006 *Pulp and Paper Industry Energy Bandwidth Study*, available at http://www1.eere.energy.gov/manufacturing/resources/forest/pdfs/doe_bandwidth.pdf). It is not surprising, therefore, that reducing steam demand is a major focus of mill efforts to reduce energy use.

In many mills, most of the steam is generated in combined heat and power (CHP) systems. In these systems, the steam is generated in a boiler at high pressure, passed through a turbine where electricity is generated as the steam pressure is reduced, and then the lower pressure steam is used in the mill. These CHP systems are usually sized to meet the mill's steam demand (see link in this section of the Tool to CHP systems).

Mills do not want to generate more steam than they need because this is expensive. Generating less steam, however, means that the mill can generate less electricity so more electricity must be purchased from the grid. This means that the overall effect of reduced steam consumption depends on a) how much fuel is saved at the mill, b) what type of fuel it is, c) how much more electricity has to be purchased from the grid, and d) the emissions released in generating this additional purchased electricity.

In most cases, reductions in steam demand are accompanied by reductions in greenhouse gas emissions. The relationship is not direct, however, and in some cases, it is possible for reductions in steam demand to increase greenhouse gas emissions, as explained below.

If the fuel used to produce steam at the mill is biomass, the overall emissions may increase when steam demand is reduced because reducing the consumption of biomass fuels has little effect on greenhouse gas emissions whereas increasing the purchases of electricity will usually be associated with increased indirect emissions (from the power plant producing the electricity). This effect can be reduced by either producing excess steam (not always economical) or by reducing electricity demand (not always possible).

This trade-off may exist even if steam is being generated from fossil fuels. This is because a mill's CHP system produces electricity far more efficiently than the systems used by most electric power companies. In addition, the fossil fuel used at the mill may be less greenhouse gas-intensive than the fuel used by the power company.

Where energy is saved by reduced steam demand, therefore, one needs to examine the effects on greenhouse gas emissions based on the specific situation involved.

Steam usage varies substantially by mill type in the wood products industry. Further, although most mills do use some form of indirect heat, some do not use steam, but rather thermal oil. In general, oriented strand board (OSB) and particleboard mills use steam or thermal oil only to heat presses. Their primary use of heat is direct heat applied to the dryers. Plywood mills commonly use steam to heat both their dryers and presses. Medium density fiberboard (MDF) mills use steam or thermal oil to heat their presses, but may use either direct or indirect heat for their tube dryers.

Since most of the heat energy at wood products plants is from renewable biomass, a 10% reduction in steam demand may only result in a 0 to 2% reduction in greenhouse gas emissions.

CHP systems are rare at wood products mills as the boilers are much smaller than pulp and paper boilers.