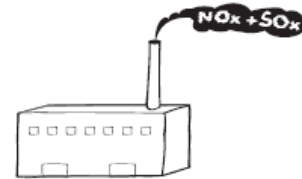


ENVIRONMENTAL FOOTPRINT COMPARISON TOOL

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



EMISSIONS TO AIR

EFFECTS OF RECYCLED FIBER USE ON EMISSIONS TO AIR

Fuel Combustion-Related Emissions

Sulfur dioxide (SO₂)

Emissions of sulfur dioxide (SO₂) from fossil fuel combustion at a pulp and paper mill depend primarily on the sulfur content of the fuel and whether control devices are used to scrub combustion gases. Natural gas normally has very little sulfur, while the sulfur levels in oil and coal are highly variable and can be quite high (USEPA 1995). Because of the importance of fuel sulfur content, the differences between recycling and virgin fiber mills are difficult to discern.

For several biomass fuels important to virgin pulp mills, wood waste and black liquor in particular, the sulfur in the fuel is largely captured during combustion so that the SO₂ emissions from black liquor combustion and burning bark and wood waste are very small compared to those from burning fossil fuels (NCASI 2004).

The Paper Task Force examined life cycle emissions of SO₂ from virgin and recycled manufacturing (Paper Task Force 2002). The results reveal no large or consistent differences between virgin and recycled production, with the possible exception of newsprint. We assume that the higher emissions for virgin newsprint in the Paper Task Force study are not due to mill emissions but rather reflect the SO₂ associated with the large amounts of purchased power required for virgin newsprint production. (In the U.S., about one-half of the electrical power is from coal, although this varies significantly from one region of the U.S. to another. Note that in areas where electrical power is largely hydro power, this would significantly reduce estimated purchased power emissions.) This assumption is confirmed by statistical analysis of NCASI data on mill emissions (i.e., not including effects of purchased power), which failed to demonstrate a significant difference in mill SO₂ emissions between virgin and recycled newsprint mills.

The Paper Task Force results are generally consistent with a conclusion that mill-level and life cycle SO₂ emissions largely depend on factors other than whether a mill is virgin or recycled. Nonetheless, statistical analysis of NCASI site-specific data, which do not address purchased power, suggests that in the paperboard sectors, virgin mills tend have higher emissions of SO₂ than comparable recycling mills, presumably due to the selection of fuels.

Nitrogen Oxides (NO_x)

Nitrogen oxides are produced during combustion from nitrogen in fuel and from atmospheric nitrogen. The amounts formed from atmospheric nitrogen vary by fuel type and can be controlled by combustion conditions, a phenomenon that is put to work in a variety of NO_x control technologies. NO_x emissions, therefore, depend on fuel nitrogen content, fuel type, combustion conditions, and the use of NO_x controls. In addition, they depend on the amounts of fuel burned. These mill-specific factors, in particular fuel type, combustion conditions, and NO_x controls, greatly complicate comparisons between industry sub-sectors.

The Paper Task Force report (2002) does not reveal large lifecycle differences in NO_x emissions between virgin and recycled production, except perhaps for newsprint. In the case of newsprint, again, it can be assumed that the differences may not be due to on-site mill emissions but rather due to NO_x associated with purchased power at virgin newsprint mills. These emissions will vary according to the source of the purchased electrical power.

Effects of Recycled Fiber Use on Emissions to Air

Fuel Combustion-Related Emissions

Statistical analysis of NCASI site-specific data suggests that NO_x emissions from virgin mills are higher than those from recycling mills producing board, tissue, and fine papers. These findings probably reflect the types and amounts of fuels being used. No significant difference is evident in NCASI site-specific data, between mill-site NO_x emissions from virgin and recycled newsprint mills.

References

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