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Steel and the Green Movement

Canadian steel industry – Leading the shift to Green

Global warming and climate change are two terms found increasingly in headlines around the world. Initiatives such as the Kyoto Protocol have brought these issues to the forefront and provide a framework and objectives for reducing greenhouse gases (GHG). GHG are heat trapping gases, such as water vapour, carbon dioxide, or methane that absorb the earth's heat and hinder it from being released into space. As levels of GHG build up in the atmosphere, a greenhouse effect takes place that warms the earth's atmosphere and makes global climate change inevitable.

Attitudes on environmental issues are changing worldwide. Developed nations are committing to reducing GHG emissions to 5.2% below the 1990 baseline by 2012. Notably, Canada has committed to reducing its GHG emissions to 6% below 1990 levels, which corresponds to a gap of 29.1% of where the nation is and where it wants to be. An ambitious undertaking, considering that Canada's GHG emissions have been steadily on the rise over the years and in 2004 was actually 26.6% higher than 1990 levels. On a positive note, in the last two years emissions have started to decline, but there remains a long way still to go.

The quest for a greener Canada continues and helping to lead the way to a greener Canada is the nation's steel industry, which is making great strides in reducing GHG emissions, conserving energy, and lessening impacts on our air, water, and land.



Figure 1: Canada's GHG Emissions Since 1990-2006

Canadian Sheet Steel Building Institute
652 Bishop St. N.
Unit 2A
Cambridge, ON
N3H 4V6
Tel: (519) 650-1285
Fax (519) 650-8081
www.cssbi.ca



Doing our part

While all Canadian industries re-examine their impact on the environment, the Canadian steel industry is making significant progress in manufacturing greener products for its end users, as well as cleaning up its own manufacturing processes. The North American steel industry dedicates nearly 15% of its capital spending towards improving the environmental and sustainable development of its facilities.

The Canadian steel industry's environmental commitment includes working with all levels of government to develop new processes and technologies that help reduce Canada's GHG emissions and air pollutants, conserve fresh water, and reduce the impact on land by generating less waste. Between 1990 and 2006 the Canadian steel industry has achieved remarkable results with more than a 24% reduction in direct process-related GHG emissions per ton of steel produced, while managing to increase productivity by over 18%.

A closer look at making steel in Canada

Canada's steel sector is one of the nation's largest industries with annual sales greater than \$11 billion, including \$3 billion in exports. Canada has 13 steel mills spread between Alberta, Saskatchewan, Manitoba, Quebec, and Ontario. Canadian steel makers use two different steel making processes:



Basic Oxygen Furnaces (BOF) account for 59% of Canada's steel production. This process combines smelted iron ore with 25 to 35% melted scrap steel to produce products such as bars, rods, structural shapes, plates, sheets, pipes and tubes, and flat-rolled products.



Electric Arc Furnaces (EAF) account for the remaining 41% of Canada's steel production. This process uses as much as 100% scrap steel to produce products including structural beams, steel plates, and reinforcing bars.

GHG and Canadian steel

Carbon is an essential raw material fuel for making steel, which is a very complex, energy intensive process that produces carbon dioxide (CO₂) emissions. Energy efficiency and high operating temperatures are directly linked to the amount of emissions steel mills produce. Higher temperatures create more GHG emissions of CO₂, CH₄ and N₂O of which over 90% is CO₂.

Canada's steel industry is part of the Iron & Steel sub-sector, which is part of a much larger Energy sector called Stationary Sources. With all GHG sources combined, the Stationary Energy sector accounts for 45% of Canada's GHG emissions, and specifically, the Iron & Steel sub-sector produces only 0.9% of Canada's total GHG emissions. As noted earlier, since 1990 Canada's GHG has increased by 21.7% (see previous page, Fig.1) with the largest increases coming from the Energy sectors. The Iron & Steel sub-sector was one of the areas that actually experienced a 1.9% **reduction** in emissions during this period.

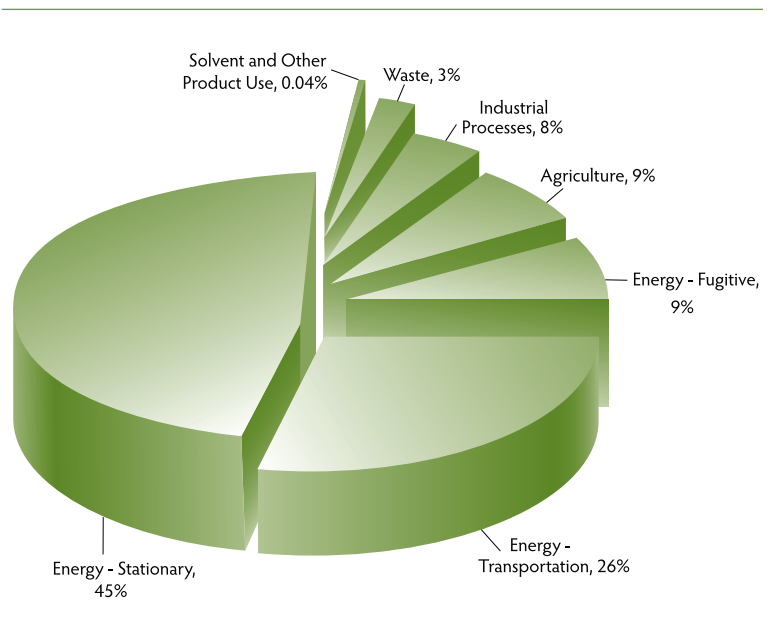


Figure 2: Canada's 2006 GHG Emissions by Sector

Energy and energy intensity

The energy used by the Canadian steel sector represents just 2.8% of the nation's primary energy consumption, or 7.4% of Canada's industrial energy demand. At the plant level, the energy used for operations is the second largest expense for steel mills, second only to labour. Since 2000, many Canadian steel makers have participated in a **voluntary** agreement with our federal government to reduce Specific Energy Consumption (gigajoules per tonne of product) by 1% (per year). With these improvements, and since the initiation of Kyoto, the Canadian steel industry has successfully reduced energy intensity (per shipped tonne) by 14%.

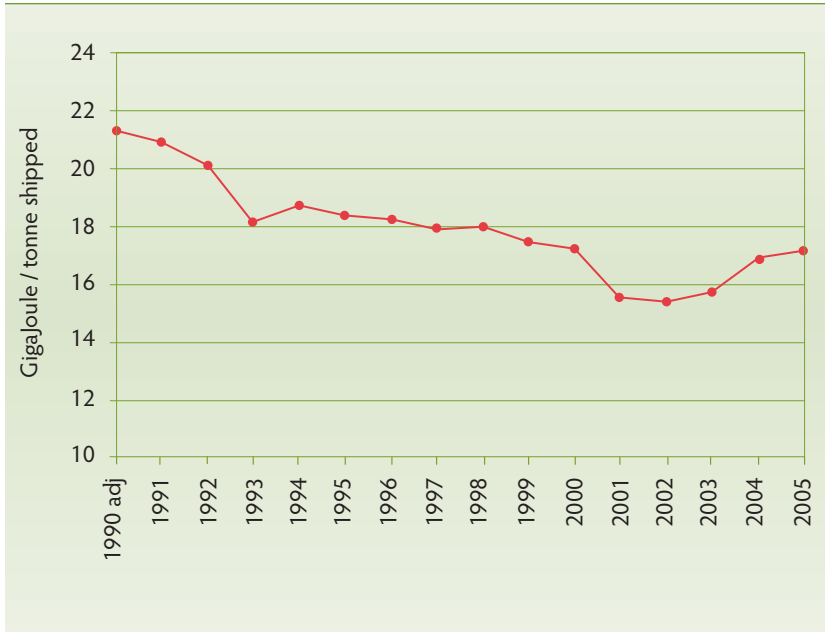


Figure 3: Canadian Steel Industry Specific Energy Consumption

How is progress being made?

Canadian steel makers work with steel makers around the world through the International Iron and Steel Institute (IISI) to share resources, best practices, and expertise. Global research and development initiatives, such as the IISI’s CO₂ Breakthrough Program, help identify advanced technologies and processes for making steel with reduced CO₂ emissions. Today’s steel plants are improving processes with investments in energy-reducing automated technologies that monitor energy performance and CO₂ emissions for operating units. Mills are tracking energy inputs and outputs at primary manufacturing operations and providing detailed analyses on the energy consumption of electricity, steam, natural gas, and by-product fuels. The industry’s efforts since the initiation of Kyoto have resulted in a reduction of CO₂ emissions per shipped tonne by over 26%, as well as a reduction on a wide range of other airborne pollutants.

Succeeding in making air easier to breathe

The air we breathe is as important to Canadian steel mills as it is to people in the community. Since the early 2000’s, Canadian steelmakers have worked with federal and provincial governments to develop environmental performance standards for chemicals released into the air. Our steel mills are required to provide full reports called a National Pollutant Release Inventory (NPRI), to Environment Canada.

Over the last decade, steel mills have made significant improvements in their environmental performance by upgrading air monitoring equipment and instruments with emission controls and processes. These changes have reduced the amount of harmful emissions in both water and air by 90% compared to the statistics of 1990.

Since the early 1990’s, the Canadian steel industry has achieved significant pollutant reductions per tonne of steel shipped, such as:

Air Pollutants	Canadian Steel Industry
Benzene	75%
NO _x	31%
SO ₂	76%
PAHs (polycyclic aromatic hydrocarbons)	74%

Our progress flows in water treatment

Water is essential in the steel making process. When steel mills tap into a water source, between 10 to 15% is used for material conditioning to control dust. Another 10 to 15% of the water is used in the mills primary operations including wet scrubbers for pollution control, coating operations, and for acid control in pickling operations. The remaining 60 to 80% is used in heat transfer applications, where water is used to cool and protect equipment in this heat intensive environment.

After use, the water is cooled and treated for reuse or release. In North America, new technologies and water management efforts have allowed plants to reduce their freshwater intake and recycle more than 95% of the water they need. The quality of water released has always been an issue for the industry; however, North American steel mills are cleaning the water they use so well, that it returns to natural sources cleaner than when it entered the mill. Canadian steel mills are dedicated to meeting and exceeding water standards set by government, with some facilities outperforming municipal water requirements by completing as many as 6,000 daily and



weekly analytical and toxicity water tests. Recent studies found that top performing steel mills have reduced their effluent discharging into surrounding waterways by 97% compared to 1990 statistics.

Changing the landscape for the better

Steel production creates a variety of by-products, including steel skulls, slag, waste refractories, wastewater treatment sludge and dust. Many of these by-products are now recycled or sold to new and profitable markets where they are used instead of being deposited into a landfill.

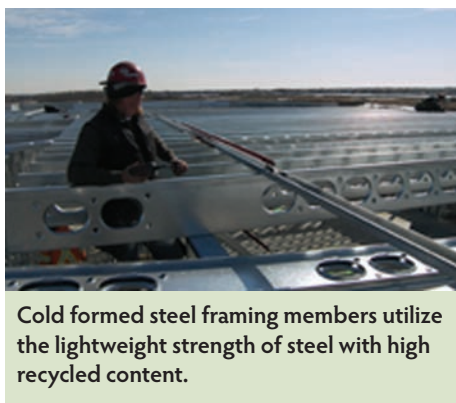
Slag from a mill's blast furnace is recovered and sold to cement manufacturers for use in cinder blocks, road aggregate, and asphalt. **Oxide dust** is also diverted from landfill and used in the sintering market, while **acid regeneration oxide iron filings** are recycled and sold for use in magnets, ceramic heating tiles, and brake pads.

Between 1994 and 2002, Canadian steel mills reduced waste sent to landfill by over 52%. One secondary material that will never be found in landfill is scrap steel itself. As the most recycled material in the world, scrap steel is too valuable to enter landfill and is recycled worldwide more than all other recyclables combined. The world's recycling of steel averages about 69%, which amounted to 73 million tonnes in North America in 2006.

Steel recycling is important for the environment and affects the sector's energy performance. It is estimated that for every ton of recycled steel, about 2,500 pounds of virgin iron ore is saved, along with 1,400 pounds of coal, and 120 pounds of limestone. In the U.S., recycled steel saves the nation enough energy to power about 18 million homes for one year. The EAF and BOF process together recycle huge amounts of scrap steel in making new steel every year, thus conserving significant energy and other natural resources, while reducing emissions.



One-hundred tonnes of steel are used for affordability and strength in a 60 metre wind turbine tower.



Cold formed steel framing members utilize the lightweight strength of steel with high recycled content.

Steelmaking Getting greener every day through new technology

The Canadian steel industry has come a long way and is only getting better. Through initiatives like the Kyoto Protocol the steel industry is examining and refining its manufacturing processes. Today's steel, steel products, and production facilities are leaving a smaller environmental footprint on the world.

Steel is also an integral component in several breakthrough "green" technologies: wind turbines for clean and renewable energy, lightweight cars that use 50% less energy, photovoltaic solar panel systems, and stronger material efficient construction products are a few examples.

For more information on steel's involvement in advanced, environmentally conscious products, contact the Canadian Sheet Steel Building Institute or visit www.cssbi.ca.

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