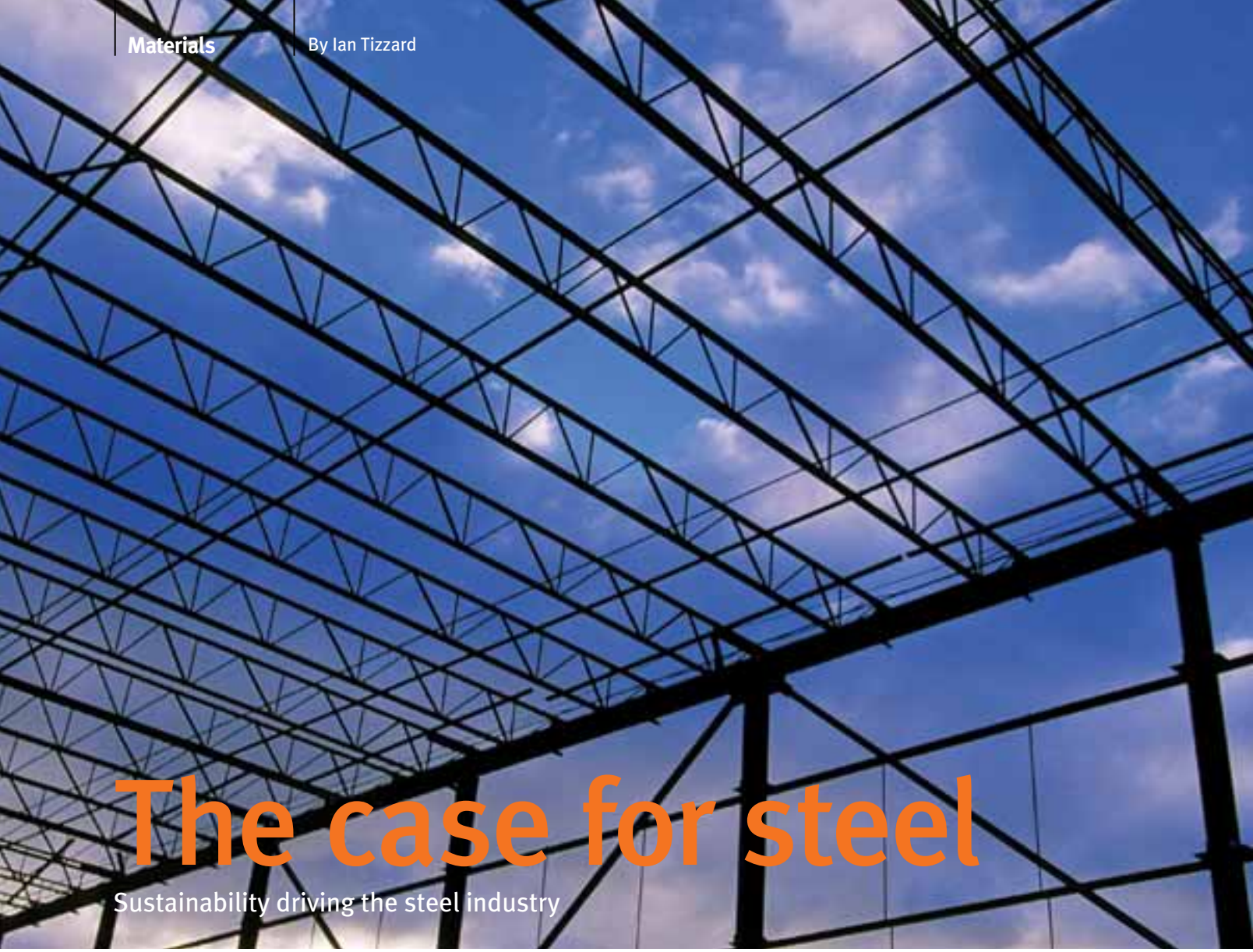
By Ian Tizzard



The case for steel

Sustainability driving the steel industry

Nothing escapes the need to clean up these days – not even one of the most recycled materials in the world. And while the material in question has been recycled since before it was mass produced, steel has gone through other changes lately in response to calls for it to be even greener and cleaner.

Already in 1995, when sustainability was still news to many people, Natural Resources Canada called metal recycling "the most mature of all recycling industries." Indeed, decades before we counted environmental costs, steel producers recycled for a different kind of green, making car bodies out of washing machines or old cans instead of expensive new steel. Now steel recycling counts towards reducing steel's overall greenhouse gas (GHG) emissions while it dilutes the initial environmental costs of mining for iron ore. According to the Canadian Steel Producers Association (CSPA), Canadians recycle steel at a rate better than 50 per cent, sending 8.1 million tonnes of it back to mills in 2006.

Recycling steel also helps builders gain points within the six categories that make up LEED® designations. Recycled steel factors strongest in the Materials and Resources category, but a Canadian Sheet Steel Building Institute publication entitled LEEDing with Steel explains how steel in general may help gain points in other categories. For example, under the Sustainable Sites category, light steel framing may allow for less ground disruption with a smaller foundation; steel framing may also allow points within the Daylight and Views subsection of the Indoor Environmental Quality category.

Beyond recycling, though, the steel industry is faced with the potential for reusing

steel products. A 2006 report by the Ryerson University's Department of Architectural Science and the Canadian Institute for Steel Construction urges greater reuse of steel in construction, but a website detailing the findings, reuse-steel.org, explains the basic challenge: "With a traditional approach to design, steel components are specified and sized to suit the spanning requirements of the architect's proposals... However, reused components do not generally come 'off the shelf,' rather they are identified on demolition sites by salvage contractors. Thus, when proceeding to construction the required size of salvaged steel may not be readily available." The website suggests that, in future, the design process may start with an inventory of salvageable steel; or that designers may (more often) start the design process with eventual disassembly in mind.

The long life span of steel products and our increasing demand for them also frustrate recycling and reuse efforts, which will never supplant new production. As a result, we can expect a future of continued recycling and reuse efforts combined with technical changes that improve processing methods.

"Everything gets better with time," says Canadian Steel Producers Association (CSPA) president Ron Watkins. He touts CSPA numbers that say Canadian steel producers have lowered their GHG emission intensity by 24 per cent since 1990. In the same time, they have improved energy efficiency by 26 per cent. He says a growing number of electric arc furnaces, running on electricity and using up to 95 per cent recycled steel as raw material, have helped reach those numbers. Nevertheless, the need for varying grades of steel requires the continued use of basic oxygen furnaces, which produce a more carbon intensive product.

Yet, steel has to meet demands to be greener still. Regulators insist on further improvement; meanwhile, companies such as ArcelorMittal Dofasco insist they need more time to meet the demands.

CONSIDERING CHINA

A steel producer's call for lenience regarding environmental restrictions has obvious short-term economic benefits for industry, but it may also have potential environmental benefits on a global, if not local, scale.

In a Reuters story from spring, 2008, the secretary-general of the International Iron and Steel Institute, Ian Christmas, warned governments against the "short-term fix" of fines against companies breaking emissions criteria. He argued that liberalized trade policies have increased the number of accessible steel production markets, while mills in new big and growing markets have fewer environmental restrictions.

For example, a June 2008 newsletter from the Toronto-based risk management firm Environmental Health Strategies compared GHG emissions from Canadian and Chinese steel mills. It cited a Chatham House document that showed China produces steel with an emission intensity level 46 per cent higher than Canada does. Consider, too, that China now produces nearly 40 per cent of the world's steel (a market share gain of 250 percent since the country joined the WTO in 2001).

"You can't talk about steel without talking about China," says CSPA president Ron Watkins, blaming that country's high emissions rates on older, less efficient mills, fewer environmental restrictions, and too much electrical power produced by coal-fired generators.

Last fall, the company applied for an alternative site-specific air standard for its Hamilton plant, in response to a 2005 Ontario Ministry of the Environment regulation imposing new industrial air quality standards beginning in 2010. The company's own tests showed levels of benzo(a)pyrene, benzene and total suspended particulate that it said were too high to reduce by next year.

"Dramatic improvements in the short-term are not available," says Watkins, saying that the steel industry needs a "transformative technology – a fundamentally different way to make steel."

So far, the most potential for cutting carbon dioxide in the steel industry seems to be through carbon capture and storage (CCS), that carbon will be captured and stored at the source, later to be buried deep in the ground or deposited deep in the ocean.

But a company called Mantra Venture Group promotes a solution that could forgo the storage part of CCS, with their Electroreduction of Carbon Dioxide (ERC) process, acquired from the University of British Columbia's Clean Energy Research Center in 2007. The company says ERC can convert carbon dioxide from a steel mill into formic acid. The reusable formic acid can then be used in the steel pickling process as a replacement for the more caustic and essentially one-time-use hydrochloric acid we now use for cleaning impurities from steel.

So ERC may allow for a cleaner inter-material substitution in the smelting process, but what of the potential of inter-material replacement on bigger scale, such as when steel replaced wood beams in construction?

At Bayer MaterialScience, researchers suggest aluminum reinforced with carbon nanotubes as a steel alternative. A press release claims that "Baytube" impregnated aluminum has a tensile strength comparable to steel, and one-third the density. It might make good screws or nails if the cost is right, but the low melting point of aluminum will frustrate any attempts to replace steel on a large scale.

In the long-term, we will likely never do without steel. Yet we need big changes. Before the recent economic crisis, the World Steel Association predicted a doubling of the world's steel output by 2050. With countries such as Brazil, Russia, India and China (the so-called economic BRIC) increasing their steel production, we must look for green improvements, worldwide, for steel to continue being essential to life as we know it. *GBC*