Making steel more green: challenges and opportunities

Workshop on green growth in shipbuilding
Paris, 7-8 July 2011
1. The importance of steel in economic development
2. The past and current efforts to make steel more green
3. Challenges and opportunities for the steel industry to meet environmental targets
Why is steel so important for society?

- Steel is one of the most important materials for raising economic welfare.
- Steel is needed for:
  - Housing and other buildings
  - Infrastructure
  - Industrialization of developing economies
  - Manufacturing the capital goods which are needed to facilitate this industrialization and boost economic growth (including ships)
Steel’s role in economic development

<table>
<thead>
<tr>
<th>Country</th>
<th>Date of peak</th>
<th>Level of GDP (USD/cap)</th>
<th>Steel intensity (kg/’000USD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United States</td>
<td>1920</td>
<td>4,594</td>
<td>87</td>
</tr>
<tr>
<td>OECD Europe</td>
<td>1960</td>
<td>4,616</td>
<td>76</td>
</tr>
<tr>
<td>Canada</td>
<td>1965</td>
<td>7,966</td>
<td>57</td>
</tr>
<tr>
<td>Japan</td>
<td>1970</td>
<td>5,623</td>
<td>159</td>
</tr>
<tr>
<td>Korea</td>
<td>1990</td>
<td>5,398</td>
<td>100</td>
</tr>
</tbody>
</table>
Steel production will continue to grow

- **Further industrialization** in developing economies
- **Expanding the capital stock** for further output and employment growth
- **Rising household incomes** strengthen the demand for consumer goods
- Population growth and **urbanization** to boost the demand for housing

Source: World Steel Association for historical data
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Why is a green approach so important for steel?

- Steel production is very **carbon intensive**
  - In the main way of making steel, the majority of CO2 emissions are originated from coal
  - Secondary steel is made from recycled scrap, less CO2 intensive but scrap supplies are too low

- Steel production accounts for 5% (8% including power, mining and ferro-alloys) of global CO2 emissions. The steel industry is the **largest industrial CO2 emitter** (30%)
Improvement in energy efficiency in steel production

- **Less steps** in the steelmaking process.
- **Recycling many of the gases and wastes** released from steelmaking furnaces, and using them for sources of energy in the steel mills (saving fossil fuel resources).
- Scope for improving the energy efficiency of smaller, less efficient steel facilities.

Recycling of steel (scrap) saves raw materials and energy

- **Steel can always be recycled** without reducing its quality.
- Scrap recycling rates likely to rise further.
- This will lead to significant savings of raw materials and energy, implying reductions in CO2 emissions.

### Scrap recycling rates

<table>
<thead>
<tr>
<th>Sector</th>
<th>Recovery rate 2007 (%)</th>
<th>Recovery rate 2050 (%)</th>
<th>Life cycle in years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction</td>
<td>85</td>
<td>90</td>
<td>40-70</td>
</tr>
<tr>
<td>Automotive</td>
<td>85</td>
<td>90</td>
<td>7-15</td>
</tr>
<tr>
<td>Machinery</td>
<td>90</td>
<td>95</td>
<td>10-20</td>
</tr>
<tr>
<td>Electrical and domestic appliances</td>
<td>50</td>
<td>65</td>
<td>4-10</td>
</tr>
<tr>
<td>Weighted global average</td>
<td>83</td>
<td>90</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Source: World Steel Association
Better steels for reducing environmental impact of the consumer

• Light high-strength steels for the automotive industry
  – Reduce mass of the vehicles by 17%-25%, while maintaining safety
  – Less mass means lowers emissions from using the vehicle (maybe by more, over its lifecycle, than the emissions from manufacturing the steel for the vehicle)

• Electrical steels for motors

• New steels in shipbuilding
Contribution of steel products to energy savings and CO2 emissions reduction in shipbuilding and shipping

High-strength steel products
  => Lighter weight
    => Saving of energy consumed in transportation

Improved corrosion resistance
  => Longer service life
    => Less steel used by the shipbuilding industry

Cost reduction, CO2 emissions reduction

The use by the shipbuilding industry of finished products made in Japan of high-performance steel cut FY2009 CO2 emissions by 1.8 mn tonnes of CO2

Source: Steel Industry Measures to Combat Global Warming, Voluntary Action Plan Progress Report; Dec.10 The Japan Iron and Steel Federation
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Global steel production outlook likely to double by 2050

Steel emissions reduction challenge

• Global GHG emissions need to decline by 50% in 2050 and in adv. eco. by 80% (G8 Summit, July 2009 in L'Aquila, Italy)

• Steel sector (IEA estimates) :
  – Carbon emission from 1.7 tonne per tonne of steel produced in 2006 to 0.5t in 2050 (-70 %)
  – New investments : USD 3 trillion by 2050 for new capacities and USD 300 to 400 billion for carbon emission reduction
Need for revolutionizing the way steel is made; research initiatives

- the EU (ultra-low CO\textsubscript{2} steelmaking, ULCOS 1)
- the US (American Iron and Steel Institute) and Industrial Carbon Capture Project (ICCP)
- Canada (Canadian Steel Producers Association)
- South America (ArcelorMittal Brazil)
- Japan (JISF, COURSE50)
- Korea (POSCO, CO\textsubscript{2} Breakthrough Framework)
- Worldsteel (CO\textsubscript{2} Breakthrough Programme)
- Global Superior Energy Performance Partnership (GSEP) Steel Working Group (APP Steel Task Force)
Steel production x 2
CO2 emissions / 2

Life cycle approach

- Energy-Intensive industries, like steel industries, are calling for a life-cycle approach (LCA).
- According to the Steel’s Contribution to a Low Carbon Future (2010), “governments need to use a LCA if they create regulations and standards for energy efficiencies…”
- Inclusion of shipbuilding in the steel industry’s LCA?