China’s Iron and Steel Industry

Ankara
Aug 8, 2006
Outlines

I  Developments
II Changes in the last five years
III problems
IV Opportunities and challenges
V Actions to be taken
1.1. overview
2001-2005 (The Tenth National Plan Period)

- 2001: 128.5  2005: 352 ml
  Increased by over 200 ml tons within 5 years
  Annual growth rate of over 20%

- 1.16 billion tons of steel was produced in last 5 years,
  Accounting for 37% of the 3.1 bl tons of steel
  Produced since new China was founded in 1949

- 2001 account for 15% of the world production
  2005 account for 30.93%
Crude Steel growth rate in the last five years
I.2 Propelling factors for the development

1.2.1 high GDP growth rate

Unit: billion yuan

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP</th>
<th>Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>10,965.5</td>
<td>8.3%</td>
</tr>
<tr>
<td>2002</td>
<td>12,033.3</td>
<td>9.1%</td>
</tr>
<tr>
<td>2003</td>
<td>18,532.3</td>
<td>10%</td>
</tr>
<tr>
<td>2004</td>
<td>15,987.8</td>
<td>10.1%</td>
</tr>
<tr>
<td>2005</td>
<td>18,232.1</td>
<td>9.9%</td>
</tr>
</tbody>
</table>
1.2.2 Strong Fixed Asset investment in last five years

Growth Rate of Fixed Assets Investment

Unit: billion yuan
### Fixed Asset investment in urban areas

<table>
<thead>
<tr>
<th></th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>volume of investment</strong></td>
<td>B. Yuan</td>
<td>3000.12</td>
<td>3548.8</td>
<td>4581.17</td>
<td>5902.819</td>
</tr>
<tr>
<td><strong>Growth Rate in name</strong></td>
<td>%</td>
<td>16.9</td>
<td>26.7</td>
<td>27.6</td>
<td>27.2</td>
</tr>
<tr>
<td><strong>Price Index of FAI</strong></td>
<td>100.4</td>
<td>100.2</td>
<td>102.2</td>
<td>105.6</td>
<td>101.6</td>
</tr>
<tr>
<td><strong>Growth Rate in Reality</strong></td>
<td>%</td>
<td>16.7</td>
<td>24</td>
<td>20.8</td>
<td>23.7</td>
</tr>
</tbody>
</table>
### 1.2.4 Newly added Capacity increased via FAI

<table>
<thead>
<tr>
<th>Service</th>
<th>Unit</th>
<th>2001–2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Generation</td>
<td>Mega W</td>
<td>176.55</td>
</tr>
<tr>
<td>Power transformers over 110,000 VA</td>
<td>Mega VA</td>
<td>406.66</td>
</tr>
<tr>
<td>Railway</td>
<td>KM</td>
<td>7,063</td>
</tr>
<tr>
<td>Multi-Track Railway</td>
<td>KM</td>
<td>3,556</td>
</tr>
<tr>
<td>Electrical Railway in Operation</td>
<td>KM</td>
<td>5,494</td>
</tr>
<tr>
<td>Highway</td>
<td>KM</td>
<td>351,173</td>
</tr>
<tr>
<td>in which express Highway</td>
<td>KM</td>
<td>23,965</td>
</tr>
<tr>
<td>Handling Capacity of Ports over 10,000t</td>
<td>Million tons</td>
<td>452.32</td>
</tr>
<tr>
<td>Switch board</td>
<td>million lines</td>
<td>232.4</td>
</tr>
<tr>
<td>Optical fiber Cable Length</td>
<td>Million KM</td>
<td>214</td>
</tr>
<tr>
<td>Digital Mobile Phone Switch Board</td>
<td>Million Users</td>
<td>351.48</td>
</tr>
</tbody>
</table>
I.2.5 Growth of energy production volume

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>2000</th>
<th>2005</th>
<th>Increment</th>
<th>Growth Rate %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Production Value</td>
<td>Million ton Standard coal</td>
<td>981.38</td>
<td>1786.35</td>
<td>80.497</td>
<td>82.02</td>
</tr>
<tr>
<td></td>
<td>Million ton</td>
<td>869.41</td>
<td>2190.00</td>
<td>1320.59</td>
<td>151.89</td>
</tr>
<tr>
<td>Raw coal</td>
<td>Million ton</td>
<td>162.81</td>
<td>181.00</td>
<td>18.19</td>
<td>11.17</td>
</tr>
<tr>
<td>Crude oil</td>
<td>Million ton</td>
<td>162.81</td>
<td>181.00</td>
<td>18.19</td>
<td>11.17</td>
</tr>
<tr>
<td>Natural gas</td>
<td>Billion M^3</td>
<td>27.21</td>
<td>50.00</td>
<td>22.789</td>
<td>83.75</td>
</tr>
<tr>
<td>Power</td>
<td>Billion Megawatt</td>
<td>1.320</td>
<td>2.4747</td>
<td>2.1538</td>
<td>87.34</td>
</tr>
</tbody>
</table>
## I.2.6 Growth of Major Industrial Products

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>2000</th>
<th>2005</th>
<th>Increment</th>
<th>Growth Rate%</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 Nonferrous Metals</td>
<td>m. t</td>
<td>7.84</td>
<td>16.35</td>
<td>8.51</td>
<td>108.5</td>
</tr>
<tr>
<td>cement</td>
<td>m.t</td>
<td>597.14</td>
<td>106.00</td>
<td>426.86</td>
<td>77.51</td>
</tr>
<tr>
<td>Vehicle</td>
<td>m</td>
<td>2.07</td>
<td>5.70</td>
<td>3.63</td>
<td>175.36</td>
</tr>
<tr>
<td>in which cars</td>
<td>m</td>
<td>0.60</td>
<td>2.77</td>
<td>2.17</td>
<td>361.66</td>
</tr>
<tr>
<td>Air conditioner</td>
<td>m</td>
<td>18.26</td>
<td>67.65</td>
<td>49.39</td>
<td>270.48</td>
</tr>
<tr>
<td>P computer</td>
<td>m</td>
<td>6.72</td>
<td>80.84</td>
<td>74.12</td>
<td>1102.97</td>
</tr>
<tr>
<td>Steel products</td>
<td>m.t</td>
<td>131.46</td>
<td>396.92</td>
<td>265.46</td>
<td>201.93</td>
</tr>
</tbody>
</table>
I.2.7 Retail Sales of Consumer Goods Increases

2001-2005 Consumer Goods Retail Sales Volume and Growth Rate

<table>
<thead>
<tr>
<th>Year</th>
<th>Retail Sales Volume (100 million Yuan)</th>
<th>Annual Growth Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>43055</td>
<td>10.1</td>
</tr>
<tr>
<td>2002</td>
<td>48136</td>
<td>11.5</td>
</tr>
<tr>
<td>2003</td>
<td>52516</td>
<td>9.1</td>
</tr>
<tr>
<td>2004</td>
<td>59501</td>
<td>13.3</td>
</tr>
<tr>
<td>2005</td>
<td>67117</td>
<td>12.9</td>
</tr>
</tbody>
</table>
## I.2.8 Real Estate Investment

Investment in real estate development in 2005 increased by 1077.5 billion Yuan or 216.2% comparing with that in 2000.

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Real estate Investment</strong></td>
<td>billion Y</td>
<td>624.6</td>
<td>779.1</td>
<td>1010.6</td>
<td>1315.8</td>
<td>1575.9</td>
</tr>
<tr>
<td><strong>Annual Growth Rate</strong></td>
<td>%</td>
<td>25.3</td>
<td>29.7</td>
<td>30.2</td>
<td>28.1</td>
<td>19.8</td>
</tr>
<tr>
<td><strong>On Going Construction</strong></td>
<td>B. m²</td>
<td>1.787</td>
<td>2.156</td>
<td>2.593</td>
<td>2.919</td>
<td></td>
</tr>
<tr>
<td><strong>Completed Construction</strong></td>
<td>B. m²</td>
<td>0.837</td>
<td>1.102</td>
<td>1.228</td>
<td>1.281</td>
<td></td>
</tr>
</tbody>
</table>
### I.2.9 Export Value and the proportion of Mechanical and electric equipment

<table>
<thead>
<tr>
<th></th>
<th>Unit</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Export Value</td>
<td>billion USD</td>
<td>266.1</td>
<td>325.6</td>
<td>438.2</td>
<td>593.3</td>
<td>762</td>
</tr>
<tr>
<td>mechanical &amp; electrical</td>
<td></td>
<td>44.6</td>
<td>48.2</td>
<td>51.9</td>
<td>54.5</td>
<td>55.99</td>
</tr>
</tbody>
</table>
equipment ratio            |               |        |        |        |        |        |
Outlines

I  Developments
II  Changes in the last five years
III  Problems
IV  Opportunities and challenges
V  Actions to be taken
II. Changes of China’s Steel Industry in the last five years

II.1 Steel mill further expanded their production capacity

Steel Mill over ten million tons in 2000 and 2005

- Baosteel
- Anben Steel
- Tanshan Steel
- WISCO
- Shougang
- ShaSteel
- Jinan Steel
- Laiwu Steel

31% of the country’s total

111.919 Million tons
Steel mills over five million tons up to 10 million tons

- Magang
- Valin Group
- Baotou Steel
- Handan Steel
- Panzhihua Steel
- Taiyuan Steel
- Anyang Steel
- Jiuquan Steel
- Jianlong Steel
- Anshan Steel
- Shougang Corp.
- WISCO

60.51 million tons

2000 - 2005

17.17%

60.51 million tons
Steel mills from 3 to 5 million tons in 2000 and 2005

48.36 million tons
13.72% of the country's total
II.2 Progress achieved in plant equipment modernization

II.2.1 No. of Blast furnaces changes

- **1000M³**
  - 2000: 47
  - 2005: 88
- **2000M³**
  - 2000: 19
  - 2005: 40
- **3000M³**
  - 2000: 4
  - 2005: 9
## II.2.2 Converters changes

<table>
<thead>
<tr>
<th>Year</th>
<th>Over 100t</th>
<th>Over 250</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>30</td>
<td>7</td>
</tr>
<tr>
<td>2005</td>
<td>80</td>
<td>10</td>
</tr>
</tbody>
</table>
### II.2.3 Some rolling facilities changes

<table>
<thead>
<tr>
<th></th>
<th>High speed wire mills</th>
<th>Hot strip mills</th>
<th>Cold strip mills</th>
<th>Plate mills</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>35</td>
<td>9</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>2005</td>
<td>63</td>
<td>24</td>
<td>31</td>
<td>35</td>
</tr>
</tbody>
</table>
● 5 meter super wide and heavy plate mill
● 2250 hot strip mill, 2130 cold strip mill
● stainless steel cold strip mill
● 340 large diameter seamless pipe line
● heavy rail universal rolling mill
● 900mm large H-beam mill
● BHW welded pipe mill
● UOE large diameter welded pipe mill
● special alloy steel metallurgy equipment
● and high precision continuous rolling bar mills
II.3 Great efforts were made in Improving Product Mix

- Flats: increased from 34% to 38%

- Import of high value-added products reduced such as pipes, galvanized sheet, color coated sheet

- The ratio of other products such silicon steel, stainless steel, alloy steel, automobile steel have all increased by big margin
II.4 New progress was made in energy and resource saving and environmental protection
Comparison between 2000 and 2004

- Water consumption reduced: 24t/t to 8t/t, down by 68%
- Used water recycling rate: 87% to 92%
- Treated water rate: 98% to 99%
Comparison between 2000 and 2004

- Exhaust water per ton of steel was down by 14.3%
- Emission of $\text{SO}_2$ per ton of steel was down by 2.99Kg or 49.1%
- Treated gas emission rate increased from 97.33% to 98.9%
Continuous casting Ratio since 2001

Unit: %

<table>
<thead>
<tr>
<th>Year</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>88.2</td>
</tr>
<tr>
<td>2002</td>
<td>91.15</td>
</tr>
<tr>
<td>2003</td>
<td>93.5</td>
</tr>
<tr>
<td>2004</td>
<td>95.95</td>
</tr>
<tr>
<td>2005</td>
<td>97.51</td>
</tr>
</tbody>
</table>
Comprehensive yield increase since 2000

Yield

2000 2001 2002 2003 2004 2005

90.5 91 91.5 92 92.5 93 93.5 94 94.5 95 95.5 96

90.5 91 91.5 92 92.5 93 93.5 94 94.5 95 95.5 96

95.61%
II.5 Breakthrough in science and technology advancement

- The Super Fine Grain Hardening and Control Technology for Low Carbon Ferritic/Pearlitic Steel
- High Grade Automobile Sheet
- The technology for continuous production of Vanadium-Nitrogen Alloy under normal pressure
- Blast furnace smelting technology for high Va-Ti Magnetic Iron Ore
- New concentrating technology for low grade Hematite, producing high quality iron ore concentrate with iron content over 68% and SiO$_2$ < 4%.
- 400m$^2$ and larger sintering machine, 4000m$^3$ and larger blast furnaces, 260 ton and bigger converters, 1780mm hot strip rolling mill and cold strip mill
II.6 diversification of investors in the steel industry

- 31 steel enterprises were listed with a total steel production of 163.94 million ton, accounting for 46.52%.
- Non-state-owned steel enterprises produced about 127 million tons of steel in total, accounting for about 36%.
- 228.15 billion Yuan fixed asset investment, up by 27.5% over the previous year, nearly 40% were made by private entities.
II.7 Enterprises concentration

- Formation of Northeast Special Steel Group by the three special steel enterprises (Dalian, Fushun and Beiman)
- WISCO, Er’cheng and Liuzhou Steel
- Anshan and Benxi Steel
- Tangshan Steel, Xuanhua, Chengde Steel
- Shougang Corp., Shuicheng Steel
- Shougang Jingtang Iron and Steel Company
- New Fushun Steel by Tangshan Jianlon
- Hunan Valin and Mittal Group
- CITIC Pacific take over Daye Special Steel and Shijiazhuang Steel
II.8 Economic performance

- Contribution to the growth of national economy rose from 6.18% to 14%
- Gross profit rate went up from 3.34% to 7.03%
II.9 For the first time, China became a net exporter
Outlines

I. Developments
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III. Problems
IV. Opportunities and challenges
V. Actions to be taken
III.1 Market demand was underestimated

- 150-160 million tons of steel were planned for the year of 2005
- Key steel maker’s development was affected
- Large amount of small ones emerged
III. 2 Irrational production capacity layout

- northern: 33.51%
- eastern: 30.26%
- mid-south: 15.3%
- northeast: 11.83%
- southwest: 6.64%
- northwest: 2.85%
Steel Capacity mainly in North and east

65%
III. 3 Disadvantages of capacity layout

- Small and widespread basing on scattered mines;
- Cities based: 18 LME in provincial cities, 34 in 1 ml population cities
- 60% of capacities in areas short of water
- Pressure of environmental protection.
III.4 Low concentration rate of the industry

- 4,992 metallurgical mills, small and scattered;
- 18 Steel Producers over 5ml tons, accounting for 49% of the national capacity

The first four steel works’ production
- China 18.52% USA 61.29%
- Japan 75.17% Russia 66.89%
- EU (15) 72.59% Korea 79.55% (2 works)
III.5 product mix need to be improved

- 100% self-sufficiency products:
  Large sections, bars, reinforcing bars, wire, heavy plate, heavy & medium plate, narrow strip, seamless pipes, welded pipes;

- Close to self-sufficient products:
  Rails, hot rolling coils;

- Low degree of self-sufficient products:
  Cold rolling sheet, color-coated sheet, electric steel.
III.6 Enterprises are still weak at independent innovation

- Scientific research is not well matching with industry development
- Advanced equipment and technology still need to be imported in large volume (over 21 billion USD were used for import equipment and technology in the last five years)
- The total number of persons engaged in different kinds of scientific and technical activities are small, accounting for only 6.3% of the labor force
- Funds allocated are not sufficient. In 2004, total funds used by LME was only 19.99 billion RMB, accounting for 1.99% of the sales income.
III.7 High proportion outdated capacity

Equipment & technology in most of the existing small steel plants are backward, high energy consuming and polluting:

- 300 M$^3$ BF capacity: 98.8 ml tons
- 20 tons or below Converters capacity: 34.13 ml tons
- 20 tons or below EAF capacity: 20.95 ml tons
III.8 Extensive production

- Comprehensive energy consumption per ton steel in China is 15-20% higher as compared to the world advanced level.

- 299 million tons of standard coal (including mining, ferroalloy and refractory material), was consumed, 16% of the national industrial energy consumption.

- Only about 30% of the thermal energy during the production process is effectively utilized.

- Only 53% of solid waste has been recovered.

- Waste water and gas consist of 14% of the total industrial waste.

- Solid waste consists of 16% of the total industrial waste.
Outlines

I. Developments
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IV.1 Opportunities:

IV.1.1 in pace with Industrialization, steel demand will keep increasing for long time

Steel demands continue to increase in the process of industrialization

Steel demands will become stable and slow down when Per capita GDP reaches 3,500–4,000USD and Third Industry goes up to 60%
IV.1.2. More variety and higher quality products are needed to meet the demands of different industrial sectors

Automobile
Household appliances
Ship building
Chemical Industry
Petrol and Oil industry
Railway
Other manufacturing industries
IV.2.3 Various-level products to meet social demands

- Unbalanced development: urban and rural areas, eastern and western regions

- High quality: Cars and Electrical appliances in Urban area require high technology-steel products, including CR sheets, color-coated sheets, electrical steel, stainless steel

- Common quality: Residential Building require common products, such as wire rods and reinforcing bar. These products will still account for relatively large proportion of the social consumption.
IV.1.4 Urbanization rate will increase

560 million urban residents in 2005
640 million urban residents in 2010
Urbanization of Some Developed countries

- **US**: 73% (1973)
- **Japan**: 73% (1973)
- **UK**: 90% (1970)
- **Belgium**: 94%
IV.2 Challenges

IV.2.1. Constraints for the development

- 52% hot metal depend on imported iron ore
- Insufficient railroad transportation
- Short of electricity
IV.2.2 Stronger competition

Largest steel market draws the attention of global steel competitors.

China still is one of the largest steel importers in the world.

Not only the price, but also quality, variety and service.
Outlines

I. Developments
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V.1 More efforts devoted to Technological and Scientific Progress

V.1.1 R&D institutions are to be set up in major steel works

V.1.2 Investment will be increased for research work to upgrade technology to improve the innovative capabilities and to develop technology, equipment and product with their own intellectual property rights
V.1.3 The technology to be applied:

TRT, CDQ, BF and BOF coal gas recycling
Power generation with coal gas and steam
BF redundant pressure power generation
Smoke, dust and slag recycling

The Producers over 5 million tons are required:

- to be self-sufficient in power supply
- to supply the surplus power to others
V.1.4 Technical Threshold will be stricter

For Green-field construction projects:

Sintering machine: 180 square meters

Coking oven: 6 meters high

BF: 1000 cubic meters

BOF: 120 tons

EAF: 70 tons.
V.1.5 Constructions of steel mill in coastal areas should have:

- Annual capacity: 8 ml tons of crude steel
- BF: 3000 cubic meters,
- BOF: 200 tons

V.1.6 Requirements for Integrated steel enterprise construction:

Comprehensive energy consumption:
- 0.7 tons of standard coal equivalent via BF process,
- 0.4 tons of standard coal equivalent via EAF process
- fresh water: 6 tons via BF process, 3 tons via EAF process
- utilization ratio of water recycling shall be more than 95%
V.1.7  Goal for Reduction of energy and water consumption per ton of steel up to 2020

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comprehensive energy cons. (standard coal)</td>
<td>0.76 t</td>
<td>0.73 t</td>
<td>0.7 t</td>
</tr>
<tr>
<td>Comparable energy cons. (standard coal)</td>
<td>0.71 t</td>
<td>0.68 t</td>
<td>0.64 t</td>
</tr>
<tr>
<td>fresh water cons. (newly added)</td>
<td>12 t</td>
<td>8 t</td>
<td>6 t</td>
</tr>
</tbody>
</table>
V.2. Layout adjustment

V.2.1 Capacity will be decreased or relocated in:
big cities and famous scenic spots
Areas with severe water shortages

Considering factors such as:
mineral resources, energy, water resources
transportation, environment capacity,
market distribution and use of overseas resources
V.2.2 Alliances are to be formed

Goals:

- Several groups formed with more than 10 million tons
- Two Groups formed with annual capacity each of 30 million tons
- By 2010, the number of steel producers will be reduced considerably, and the Top 10 ‘s output should reach more than 50% of the national total and by 2020 reaching 70%
Conclusion:
China’s steel industry has made great progress in the past, and the record breaking of 300 million tons of production is not the end, future development will focus on quality rather than quantitative expansion.

The market changes dramatically, and competition will be more severe. Steel Mills will face a new round of stronger competition for survival.

Challenges and opportunities co-exist in China’s steel industry, only those who are good at adapting to the new situation and seizing the opportunities will become stronger.

China has worked out a practical policy for steel development, the day when this policy’s goal is fulfilled, is the day when China’s steel industry can be regarded as a strong industry.
Thank you!