Global No. 1

Manganese Alloy Company

with Technology and Innovation

Dongbu Metal
About Us

Dongbu Metal, a global leader in the manufacturing of ferroalloys, has achieved global excellence through constant innovation, advancement in technology, and improved production techniques. For over a half century Dongbu Metal has continued to develop, produce, and deliver a wide range of value-added products. Dongbu Metal will put forth the greatest efforts to achieve our vision of becoming “An Excellent Global Company in Metals and Alloys with Technology and Innovation.”

In our quest to be the best and solidify Dongbu Metal’s position among the top metals and alloys manufacturers in the world, our primary focus remains customer satisfaction.
Overview of Dongbu Group

An Excellent Global Company, Dongbu

- Date of establishment: 1969
- Total Assets: US$60 billion
- Total Revenues: US$30 billion
- 59 Subsidiaries
- 40,000 Employees

Dongbu’s Seven Business Segments

- Steel
  - Dongbu Steel Co., Ltd.
  - Dongbu Metal Co., Ltd.
  - Dongbu Special Steel Co., Ltd.
- Chemical
  - Dongbu Chemicals Co., Ltd.
- IT
  - Dongbu Daewoo Electronics Corporation
  - Dongbu T&I Co., Ltd.
- Electronics
  - Dongbu Electronics Corporation
- Construction
  - Dongbu Corporation
- Energy
  - Dongbu Power Corporation
- Real Estate Development
- Corporate Social Responsibility
  - Dongbu Foundation
  - Dongbu Social Philanthropic Foundation
- Logistics
  - Dongbu Express Co., Ltd.
  - Dongbu Passenger Transport Contents
- Passenger Transport Contents
  - Dongbu Express Co., Ltd.
  - Dongbu Passenger Transport Contents
- Corporate
  - Dongbu Express Co., Ltd.
  - Dongbu Passenger Transport Contents
- Banking
  - Dongbu Insurance Co., Ltd.

Dongbu Metal

- One of the two companies in the world which developed UHP and one of the three which developed Refined Fe-Mn
- Single largest Ferro-Alloy Factory (Capacity: 500,000 tons)
- Planned Future Products
  - solar cell materials: metal silicon, polysilicon, thin film solar cell materials
  - manganese based secondary battery materials

<table>
<thead>
<tr>
<th>(2013)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
</tr>
<tr>
<td>Assets</td>
</tr>
<tr>
<td>Employees</td>
</tr>
</tbody>
</table>

History

2008 - 2012 Expanding business to the world

- 2012.12 - $300 million invested into the Export Tower
- 2012.08 - Electric furnace #9 expanded in terms of production capacity (20MVA → 30MVA)
- 2011.12 - UHP electric furnaces completed
- 2011.10 - Electric furnaces (each 50MVA) completed (EF #13, #14)
- 2011.10 - Large-scale sales branch opened in Europe
- 2010.08 - Large-scale sales branch opened in China
- 2010.07 - Large-scale sales branch opened in the Middle East
- 2009.05 - Joint venture between Dongbu Metal and POSCO
- 2008.05 - Large-scale sales branch opened in the U.S.
- 2008.11 - Large-scale sales branch opened in Japan

2008 - 2007 Domestic Leader

- 2005.05 - Electric furnace (20MVA) completed (EF #10)
- 2003.10 - Large-scale sales branch opened in China (a total of 3 units)
- 2003.03 - Electric furnace #8 expanded in terms of production capacity (15MVA → 20MVA)
- 1997.08 - Korea’s first 20MVA electric furnace completed (EF #9)
- 1995.12 - Large-scale sales branch opened in Europe (a-casting facility) completed
- 1994. - Medium carbon/low carbon ferromanganese manufacturing technology developed (first in Korea, 3rd in the world)

1964 - 1989 Aiming to become the best

- 1983. - Domestic furnace #5 (15MVA) completed, the production of electric furnace Fe-Mn started
- 1976.12 - Incorporated into Dongbu Group
- 1964.09 - The production of ferrosilicon started (the first in Korea)
- 1964.05 - Samchok Industrial incorporated
Facilities, Capacity

Total capacity 500,000 tons/year
- FeMn items: 370,000 tons/year
- SiMn items: 130,000 tons/year

Electric furnace
- 10 units (280 MVA)
- EF Sizes (10, 20, 40, 50 MVA)
- Products
  - HC FeMn
  - SiMn
- Capacity
  - HC FeMn: 100,000 tons/year
  - SiMn: 100,000 tons/year

Refining furnace
- 5 units
- AOD Process (Argon Oxygen Decarburization)
- Products
  - MC/LC FeMn
  - LC SiMn
  - Specialized products
- Capacity
  - MC/LC FeMn: 220,000 tons/year
  - LC SiMn: 30,000 tons/year

ULPC refining furnace
- 2 units
- Products
  - ULPC FeMn
- Capacity
  - ULPC FeMn: 50,000 tons/year

Manufacturing process

<table>
<thead>
<tr>
<th>No</th>
<th>Category</th>
<th>Patent No.</th>
<th>Date of Registration</th>
<th>Title</th>
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<tbody>
<tr>
<td>1</td>
<td>ULPC (Ultra Low Phosphorus Carbon)</td>
<td>18-0946621</td>
<td>2019-03-03</td>
<td>Ultra-low carbon, ultra-low phosphorus FeMn manufacturing method and the ultra-low carbon, ultra-low FeMn</td>
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<tr>
<td>3</td>
<td>Waste Treatment Technology</td>
<td>18-0551619</td>
<td>2016-07-01</td>
<td>Waste treatment technology system using the cold top slag method</td>
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<td>4</td>
<td>Waste Treatment Technology</td>
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<td>2016-01-31</td>
<td>Manganese ferronickel manufacturing method using oil and ferrotin slag</td>
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<td>5</td>
<td>Waste Treatment Technology</td>
<td>18-0363606</td>
<td>2012-11-22</td>
<td>Low-carbon FeMn manufacturing method through the recycling of collected dust</td>
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<td>6</td>
<td>Refined manganese ferroalloy</td>
<td>18-0143594</td>
<td>1998-04-10</td>
<td>Low carbon siliconmanganese manufacturing method</td>
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<td>7</td>
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<td>18-0129223</td>
<td>1997-11-07</td>
<td>Ultra-low carbon siliconmanganese manufacturing method</td>
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<td>8</td>
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<td>18-0129282</td>
<td>1997-11-07</td>
<td>Medium carbon/low carbon ferromanganese manufacturing method</td>
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</table>
○ General Products

Manganese alloys (FeMn and SiMn) are a key ingredient for the production of steel, improving the strength, toughness, hardness and hot-working property of steel.

FeMn is used to improve the purity and quality of the steel products as it removes impurities such as oxygen and sulfur and adds manganese during the production of steel.

It is added to the furnace charge of blast furnaces and electric-arc furnaces making high grade steel plates. SiMn has properties to remove oxygen and sulfur and introduces manganese and silicon into steel. It is usually used in electric-arc furnaces making basic steel products.

### High Carbon Ferromanganese (HC FeMn)

*used in the production of basic steel sheet at integrated steelmakers*

<table>
<thead>
<tr>
<th>Product</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
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<tbody>
<tr>
<td>HC FeMn</td>
<td>73-80</td>
<td>1.2</td>
<td>0.4</td>
<td>0.02</td>
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</tbody>
</table>

### Medium/Low Carbon Ferromanganese (MC/LC FeMn)

*used in the production of high grade steel products for automobiles and ships*

<table>
<thead>
<tr>
<th>Product</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MC FeMn</td>
<td>75-80</td>
<td>1.5</td>
<td>0.2</td>
<td>0.02</td>
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</tr>
<tr>
<td>LC FeMn</td>
<td>75-80</td>
<td>0.5</td>
<td>0.2</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>

### Silicon manganese (SiMn)

*used in the production of shape steel and bars at mini mills*

<table>
<thead>
<tr>
<th>Product</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
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</thead>
<tbody>
<tr>
<td>SiMn</td>
<td>60-70</td>
<td>14-16</td>
<td>0.30</td>
<td>0.02</td>
<td></td>
</tr>
</tbody>
</table>

### Low Carbon Silicon manganese (LC SiMn)

*used in the production of stainless steel and welding rod*

<table>
<thead>
<tr>
<th>Product</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
<th>B(ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC SiMn</td>
<td>55-60</td>
<td>25-30</td>
<td>0.10</td>
<td>0.01</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

○ Specialized products

### Ultra Low Phosphorus Carbon Ferromanganese (ULPC FeMn)

ULPC is an alternative alloy of manganese metal. As it contains an extremely high proportion of Mn with very low phosphorus and carbon contents.

It is an essential material for the manufacture of light weight and high-strength steel, commonly used in the production of ultra low carbon steel, API steel and high manganese steel.

<table>
<thead>
<tr>
<th>Product</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
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</thead>
<tbody>
<tr>
<td>ULPC</td>
<td>90.7</td>
<td>1.2</td>
<td>0.1</td>
<td>0.05</td>
<td>0.02</td>
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</tbody>
</table>

### Low Nitrogen Medium/Low Carbon Ferromanganese (LN MC/LC FeMn)

LN MC/LC FeMn is used in manufacturing of high grade steel to prevent defects.

<table>
<thead>
<tr>
<th>Product</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
<th>N(ppm)</th>
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<tbody>
<tr>
<td>LN MC FeMn</td>
<td>75-80</td>
<td>1.5</td>
<td>2.0</td>
<td>0.2</td>
<td>0.02</td>
<td>400</td>
</tr>
<tr>
<td>LN LC FeMn</td>
<td>75-80</td>
<td>0.5</td>
<td>0.5</td>
<td>0.2</td>
<td>0.02</td>
<td>600</td>
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</tbody>
</table>

### Low Boron Silicon manganese (LB SiMn)

LB SiMn improves the quality of steel, increasing weldability as it contains a low proportion of Boron.

<table>
<thead>
<tr>
<th>Product</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
<th>B(ppm)</th>
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</thead>
<tbody>
<tr>
<td>LB SiMn</td>
<td>60-70</td>
<td>14-16</td>
<td>2.5</td>
<td>0.30</td>
<td>0.02</td>
<td>100</td>
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</table>
**Quality, Environment**

**High standards and attention to detail**
Dongbu Metal makes its best efforts on quality management for customer satisfaction. Our motto is ‘Quality first’. Through advanced technology Dongbu Metal maintains strict quality control procedures to ensure optimum customer satisfaction.

**Quality assurance system**
To provide the finest products and services, Dongbu Metal has developed and operated the Quality Assurance System. In addition, we have led the efficient operation of the system and quality standardization through promotion of Six Sigma.

**World-class quality inspection**
Dongbu Metal has world-class quality inspection systems with advanced analysis equipment. We have been recognized throughout the world for producing high-quality products.

<table>
<thead>
<tr>
<th>No</th>
<th>Date</th>
<th>Certification</th>
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<tr>
<td>1</td>
<td>2010.06.14</td>
<td>ISO 9001</td>
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<td>2</td>
<td>1975.10.15</td>
<td>KS D3712 (Ferromanganese)</td>
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<td>3</td>
<td>1975.10.15</td>
<td>KS D3717 (Silicomanganese)</td>
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</table>

**Operation of dust collecting facilities at electric and refining furnaces.**
(Ensuring a clean workplace through a realtime atmospheric environment monitoring system)

**Dust-collecting facilities**
- Electric furnace #11
- 12 Dust collectors

**Dust control**
- Road sweeper
- Yard sprinkler

**Emission control system**
- Measuring equipment
- Monitoring
## Specifications (Wt%)

<table>
<thead>
<tr>
<th>Product</th>
<th>Category</th>
<th>Mn(%)</th>
<th>Si(%)</th>
<th>C(%)</th>
<th>P(%)</th>
<th>S(%)</th>
<th>Package</th>
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<tbody>
<tr>
<td>FeMnH1</td>
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<td>78-82</td>
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<td>7.5</td>
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<tr>
<td>FeMnH2</td>
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<td>73-78</td>
<td>1.2</td>
<td>7.3</td>
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<tr>
<td>FeMnM1</td>
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<td>80-85</td>
<td>1.5</td>
<td>1.5</td>
<td>0.20</td>
<td>0.02</td>
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<tr>
<td>FeMnM2</td>
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<td>80-85</td>
<td>0.5</td>
<td>1.5</td>
<td>0.20</td>
<td>0.02</td>
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<tr>
<td>FeMnMC</td>
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<td>75-80</td>
<td>1.5</td>
<td>0.5</td>
<td>0.20</td>
<td>0.02</td>
<td></td>
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<tr>
<td>FeMn(MC)</td>
<td></td>
<td>75-80</td>
<td>0.5</td>
<td>0.5</td>
<td>0.20</td>
<td>0.02</td>
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<tr>
<td>Others</td>
<td>FeMn(MC)</td>
<td>75-80</td>
<td>1.5</td>
<td>0.5</td>
<td>0.10</td>
<td>0.02</td>
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<tr>
<td></td>
<td>FeMnP1</td>
<td>80-85</td>
<td>1.5</td>
<td>0.8</td>
<td>0.20</td>
<td>0.02</td>
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<tr>
<td></td>
<td>FeMnP2</td>
<td>80-85</td>
<td>0.5</td>
<td>0.8</td>
<td>0.20</td>
<td>0.02</td>
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<tr>
<td></td>
<td>FeMnL1</td>
<td>80-85</td>
<td>1.5</td>
<td>0.5</td>
<td>0.20</td>
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<td>FeMnL2</td>
<td>80-85</td>
<td>0.5</td>
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<td>FeMnL5</td>
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<td>SMn1</td>
<td>65-70</td>
<td>16-20</td>
<td>2.0</td>
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<tr>
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<td>SMn2</td>
<td>60-65</td>
<td>16-20</td>
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<td>SMn</td>
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<td>60-70</td>
<td>14-25</td>
<td>2.5</td>
<td>0.30</td>
<td>0.02</td>
<td>100</td>
</tr>
</tbody>
</table>

### Office Location

**Dongbu Metal (Head Office)**
- Address: Dongbu Financial Center, #432, Teheran-ro, Gangnam-gu, Seoul
- Tel: +82-2-3484-1800
- Fax: +82-2-553-4105
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- E-mail: dometal@dongbu.com

### Overseas

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- Company name: Dongbu Metal Japan Co., Ltd.
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- Tel: +81-3-3519-6971
- Fax: +81-3-3501-4643
- E-mail: jeongsoo@dongbu.com

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- Company name: Dongbu Metal USA INC
- Address: 1701 E. Woodfield Rd., Suite 705 Schaumburg, IL 60173
- Tel: +1-847-463-1464
- Fax: +1-847-463-1464
- E-mail: julian@dongbu.com

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- Company name: Dongbu Metal Europe GmbH
- Address: Ober der Roeth 4 D-65824 Schwarzach Germany
- Tel: +49-6196-550-40-00
- Fax: +49-6196-550-40-29
- E-mail: smjo@dongbu.com

#### Middle East
- Company name: Dongbu Metal Middle East Representative Office
- Address: 4E B242, Dubai Airport Free Zone PO Box 371017, Dubai, UAE
- Tel: +971-4-701-7456
- Fax: +971-4-701-7457
- E-mail: bongj07@dongbu.com