China

Shanghai Baoshan Infrastructure Improvement Project (1)(2)

External Evaluator: Mitsue Mishima

Field Survey: November 2004

1. Project Profile and Japan's ODA Loan

Project site location map
(Shanghai Boashan District)

The berth (left) and power generator (right) constructed under the project

1.1 Background

【Port】

Shanghai Port, the largest commercial port in China[1], is an important center of transportation for the northern and southern coastal regions, the Chang Jiang basin, as well as for international transportation. Berths of the port are located along the Huangpu River running through the central part of the city. The berths in the Shanghai Baoshan District 20km north of the center of Shanghai consisted of 4 berths in the premises of Baoshan Iron and Steel Co., Ltd., the container berth in Baoshan No.14 Port Area, and one berth of the Shidongkou Thermal Power Plant, and had a total handling capacity of 29.4 million tons/year as of 1992; however, as the cargo handling demand in this district was predicted to reach 66.4 million tons in 2002, it was inevitable that existing facilities would not keep up with the increase in demand in the district, and therefore expansion of the handling capacity was necessary.

【Power Plant】

The total power generation in China grew by 9.5% a year on average during the 1990-93 period; however, as pointed out in the 1992 review of the Eighth National 5-Year Plan (1991-95), it was apparent that the situation would continue where power production could not keep up with the growth of industrial and agricultural production. Moreover, the tight power supply/demand situation in Shanghai was so serious that both the reserve capability

[1] The total volume of cargo handled in 1992 was 162.97 million tons, the largest in China (26% of the national total).

(supply capacity - maximum load) and the ratio of actual supply to demand were continuously negative values, indicating that not only the power supply was not enough to meet the peak load demand, but also there was a concern that it would be not enough to meet the base load demand in the near future, and therefore, urgent improvement measures were clearly needed.

Based on the background situation as stated above, this project was designed to expand port facilities to transport main raw materials and expand the power plant to secure electric power for production in response to the increase in the production lines of Baoshan Iron and Steel located in the Shanghai Baoshan District, as part of its third expansion project[2].

1.2 Objectives

The project's objective was to address the increase in the demand for coal and iron ore, etc.by constructing mooring facilities (berths) in the Shanghai Baoshan District situated in the Chan Jiang basin, and to meet the rapidly increasing demand for electric power by constructing a thermal power plant fueled by coal of domestic production, and thereby contribute to the economic development of Shanghai through the growth of the steel industry.

1.3 Borrower / Executing Agency

The Government of the People's Republic of China / Planning Commission, Shanghai Municipal People's Government

1.4 Outline of Loan Agreement

Project	Shanghai Baoshan Infrastructure Improvement Project (1)	Shanghai Baoshan Infrastructure Improvement Project (2)
Loan Amount / Disbursed Amount	14,393 million yen / 12,784 million yen	16,606 million yen / 8,105 million yen
Exchange of Notes / Loan Agreement	January 1995 / January 1995	October 1995 / November 1995
Terms and Conditions - Interest Rate - Repayment Period (Grace Period) - Procurement	 2.6% 30 years (10 years) General untied	 2.3% 30 years (10 years) General untied
Final Disbursement Date	February 2002	December 2002
Principal Contractors (Civil Works and Equipment)	MISTUBISHI HEAVY INDUSTRIES LTD. / MISTUBISHI CORP. / MITSUBISHI ELECTRIC CORP. (Japan), MOTHERWELL SYSTEMS PTY Ltd. (Australia),	

[2] The expansion work started in 1993 and was completed in 2002 with a total investment of 62.34 billion yuan. The goal was to increase production by 3.25 million tons for iron, 1.29 million tons for smelted steel, and 2.944 million tons for steel materials.

	VOEST-ALPINE BERGTECHNIK GMBH (Austria), KONECRANES VLC CORPORATION (Finland)
(Consulting Services)	TOKYO ELECTRIC POWERSERVICES CO., LTD.
Feasibility Study (F/S) etc.	Chinese Government (1992) Chinese Government (1993)

2. Results and Evaluation

2.1 Relevance

China's Ninth National 5-Year Plan (1996-2000) set the goal of enhancing the competitiveness of companies in raw material industries (including steel industry), and the development of coastal ports including Shanghai for transportation of coal, crude oil, and iron ore, etc. was considered an important issue. At the same time, it was planned to increase power supply at an average rate of 7% a year. This project was to address the above-mentioned issue and plan by constructing mooring facilities (berths) and a thermal power plant (the main user is Baoshan Iron and Steel), and therefore was of high priority and urgency.

Development of raw material industries is also included in the goals of the current Tenth National 5-Year Plan (2001-05). In addition, Shanghai's Tenth 5-Year Plan identifies the steel industry as a leading industry and encourages further development of Baoshan Iron and Steel. Increase in the handling volume of major coastal ports remains to be an important issue and in the field of power supply, an increase at an average of 5% a year is planned. Therefore, this project remains highly important in that it accommodates the demand for coal, iron ore, and electric power in the ever-developing city of Shanghai.

2.2 Efficiency

2.2.1 Output

The plan achieved the intended output for both the port and power plant.

【Port】

- 3 berths (handling capacity: 14 million tons/year; yard: 430,000m^3)
- Loading/unloading machines (1,800 tons/h×2; 1,200 tons/h×2, etc.)
- Port control equipment (computers, etc.)
- Port service equipment (tug boats)
- Power supply, water supply and drainage, and communication facilities, etc.

【Power Plant】

- A 350MW thermal power generation unit (boiler and auxiliary equipment, steam turbine and auxiliary equipment, power generator, transformer, coal conveyance and storage facilities, coal ash disposal facility, etc.)
- Consulting service (power plant: 60M/M; air pollutant emission reduction program: 8M/M)

2.2.2 Project Period

The port portion was implemented almost as scheduled according to the appraisal time in 51 months from January 1995 to March 1999, only 4 months longer than the scheduled 47 months from January 1995 to November 1998. The implementation period of the power plant portion was 59 months from January 1995 to November 1999, 9 months longer than the scheduled 50 months from January 1995 to February 1999. The delay is mainly attributable to the time required for the adjustment of the boiler in preparation for normal operation (it took 7 months longer).

2.2.3 Project Cost

The total project cost amounted to 42,332 million yen, which is equivalent to 89% of the planned cost of 47,613 million yen at the time of appraisal. The disbursed amount of the ODA Loan was 20,890 million yen, which was within the approved amount (30.999 million yen). The breakdown is as follows; the port portion amounted to 20,114 million yen compared with the planned cost of 24,153 million yen and disbursed amount of ODA Loan was 6,373 million yen, and the power plan portion amounted to 22,227 million yen compared with the planned cost of 23,460 million yen and disbursed amount of ODA Loan was 14,526 million yen[3]. The project cost was reduced as a result of efficient contracting by competitive bidding.

2.3 Effectiveness

2.3.1 Increase in transportation of coal and iron ore by expansion of port facilities

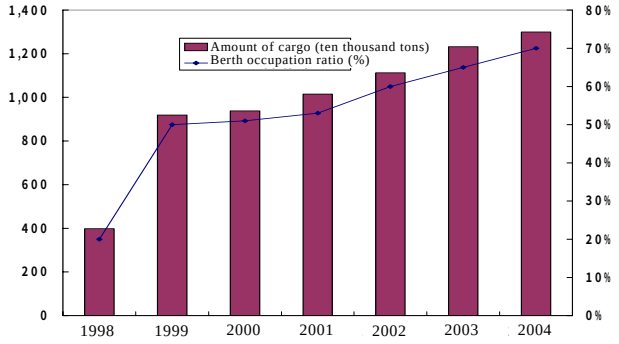
The amount of cargo handled at the port berth constructed under the project[4] and the berth occupation ratio have been increasing every year since the start of operation as shown in Fig.1. The amount of cargo handled reached almost 90% of the handling capacity of 14 million tons/year in 2003. The berth occupation ratio and the average waiting time in 2004 were 70% and 19 hours respectively as against the planned 69% and 27 hours, indicating that the berth is operating smoothly.

[3] The rate utilized by the executing agency was applied for the disbursed amount of ODA Loan.

[4] The total amount of cargo handled at all port berths in Shanghai in 2003 was 316 million tons. The berth constructed under the project has a handling capacity of 1.4 million tons/year, which is equivalent to 4.4% of the above amount.

As shown in table 1, coal and iron ore are handled at this berth. Coal is used as a raw material for coke for iron production as well as a fuel for power plants, and iron ore is used as a raw material for production (Baoshan Iron and Steel).

Fig.1 Operation of Port Berth



Source: Baoshan Iron and Steel Co., Ltd.

Table 1 Cargo Handled at the Port Berth

Unit: ten thousand tons

Cargo content	1999	2003
Iron ore	400	510
Coal	519	722
Total	**919**	**1,232**

Source: Baoshan Iron and Steel Co., Ltd.

2.3.2 Increase in power supply by expansion of the power plant

As shown in Table 2, since the start of the operation of the power generator installed under the project (No.3 generator) in 1999, power generation has increased every year to exceed the planned 2,303Gwh and reach 2,428Gwh in 2003[5]. The plant load factor and the availability factor were 79% and 92% (2003) as against the planned 75% and 79%, indicating that it is operating satisfactorily. As No.1 and No.2 power generators of Baoshan Iron and Steel are old and take time to repair and inspect, No.3 generator is playing an important role.

In the past several years, around 95% of the total electricity generated by Baoshan Iron and Steel has been consumed within the company, and the remaining 5% is supplied to the power grid in Shanghai. Looking at the overall situation of the power demand in Shanghai, the electric load increased at an average rate of 9.7% a year throughout the 1990s. Even today, the supply/demand situation is tight especially during peak hours in summer and winter.

Table 2 Operation of No.3 Power Generator by the Project

	1999	2000	2001	2002	2003
Electric Energy Production at Generating End (Gwh)	439	2,071	2,076	2,390	2,428
Plant Load Factor (%)	14	68	68	78	79
Availability Factor (%)	14	83	83	91	92

Source: Baoshan Iron and Steel Co., Ltd.

[5] Baoshan Iron and Steel owns 4 power generators with a generating capacity of 1,200MW in total, and the generating capacity of No.3 generator installed under this project is 350MW.

2.3.3 Recalculation of Financial and Economic Internal Rate of Return

【Port】

The Financial Internal Rate of Return (FIRR) and the Economic Internal Rate of Return (EIRR) calculated at the time of appraisal were 4.2% and 12.9% respectively, whereas recalculation for this evaluation resulted in 8.9% for FIRR and 16.0% for EIRR. Increase in these values is mainly due to the reduction in the investment cost from the planned amount (by 38% in terms of yuan).

(Assumptions for calculation of FIRR)

Project life: 25 years

Benefits: operating income generated by the project

Costs: initial investment cost + operating cost + administrative cost + taxes

(Assumptions for calculation of EIRR)

Project life: 25 years

Benefits: demurrage cost + alternative transportation cost saved by the project

Costs: initial investment cost + operating cost + administrative cost

【Power Plant】

The FIRR recalculated for this evaluation was 4.4% as against 12.5% calculated at the time of appraisal. The main reason for this lower value is that the actual electricity sales prices were half of those assumed at appraisal time (plan: 0.4 yuan/kwh; actual: 0.2yuan/kwh)[6].

(Assumptions for calculation of FIRR)

Project life: 25 years

Benefits: income from electricity sale

Costs: initial investment cost + fuel cost + maintenance cost + taxes

2.4 Impact

2.4.1 Economic development through the growth of industries (steel industry)

Baoshan Iron and Steel is the largest steel company in China in terms of production, producing an amount of crude steel equivalent to approximately 40% of that produced by Nippon Steel Corporation of Japan. Under this project, infrastructure was expanded in connection with the third expansion project of Baoshan Iron and Steel as already mentioned in

[6] According to Baoshan Iron and Steel, although the price of electricity sold to Shanghai Electric Power is low, the price of electricity purchased from the same company is also low (Baoshan Iron and Steel sells electricity to the power company and then purchases electricity for its own use at 0.295yuan/kwh, lower than the average 0.5-0.6 yuan/kwh in Shanghai's power supply market). If the saving of the electricity purchase cost (difference from the average market price=approx. 0.2 yuan/kwh) is included in the benefits in addition to the income from electricity sales, FIRR would be 26.0%.

1.1, and as a result, production of crude steel increased from 7.5 million tons in 1999 to 11.55 million tons in 2003.

Major customers of Baoshan Iron and Steel are domestic manufacturers, and the domestic share of hot rolled products among steel products amounts to 56% (as of 2003). Before and after the completion of the project, production of major customers' products such as automobiles[7] and home electric appliances marked a significant increase. The production of automobiles and color TVs sharply increased from 1,453 thousand units and 20,577 thousnd units in 1995 to 4,444 thousand units and 65,414 thousand units in 2003 respectively.

While the average nominal GDP growth rate of China during the 1999-2003 period was 7.98%, that of Shanghai was 10.78%, showing that Shanghai achieved economic growth at a rate exceeding the national average.

2.4.2 Environmental Impact

In June 2000, Baoshan Iron and Steel third expansion project including the construction of facilities covered by the project was certified by the Shanghai Environmental Protection Bureau as satisfying the standards set by the national and the local governments. Also, Baoshan Iron and Steel obtained ISO14000 certification for the environmental management system in 1998. With regard to the facilities constructed under this project, the current situation as described below indicates that measures have been taken to minimize negative impacts on the environment.

【Port】

The dust concentration measured in the workplace (in 2003 and 2004) was within the national standard (according to the report by Baoshan Iron and Steel). There is no negative impact on fisheries in the surrounding area. Waste water is collected via drainage and treated after precipitating dust and other particulates.

【Power Plant】

As planned at the time of appraisal, low sulfur coal is used (according to the report by Baoshan Iron and Steel). Monitoring of air and water quality is conducted at the outlet, and the results are reported to the Shanghai Environmental Protection Bureau once every half year. As shown in Table 3, the monitoring results in the past two years are below the upper limit of the current emission standards. For the future, the introduction of desulfurization equipment is being considered.[8]

[7] Baoshan Iron and Steel is focusing efforts on increasing production capacity of steel plate for automobiles, which is the main product, in response to a rapid increase in demand in the domestic car manufacturing industry (a joint company was established with Nippon Steel Corporation last year).

[8] Desulfurizing equipment is to be installed at existing No.2 generator at first and then at No.1 generator.

Table 3 Measurement Data on Air and Water Quality at the Outlet

Category	Measurement Item	(For reference) Upper Limit Set by State Environmental Protection Administration of China[2)]	2003	2004
Air[1)]	SO_2	1,200mg/Nm^3	411mg/Nm^3	664mg/Nm^3
	NOx	650mg/N m^3	385mg/Nm^3	285mg/Nm^3
	Dust	200mg/Nm^3	82mg/Nm^3	90mg/Nm^3
Water Quality	ph	6-9	6-9	6-9
	BOD	60mg/l	1.1mg/l	1.3mg/l
	COD	150mg/l	10.3mg/l	11.7mg/l
	SS	200 mg/l	38mg/l	8mg/l

Source: Data by Baoshan Iron and Steel Co., Ltd. and National Standards of the People's Republic of China "Emission standard of air pollutants for thermal power plants" GB13223-2003

Note 1) Only for No.3 power generator installed under this project
Note 2) Values for air quality are the values of Class II standards[9] of the emission standards GB13223-2003 (promulgated in December 2004 and effective as of January 2005). Values for water quality are the standard values specified in the emission standards of Shanghai City "Standards DB31/199-1997".

2.5 Sustainability

2.5.1 Executing Agency

2.5.1.1 Technical Capacity

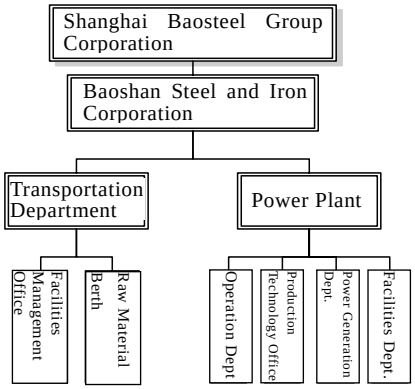
All the facilities covered by this project are operated by Baoshan Iron and Steel, which has many years of experience operating and maintaining existing port facilities and power plants. Employee training for skills, management, and new technology is provided for several months prior to the start of work and on a regular basis thereafter. The technical capability of employees is evaluated every year based on the conditions of facilities and the performance of each employee. Thus, there seems to be no problem with their technical capacity to operate and maintain the facilities covered by this project.

Installation at No.3 generator is scheduled for 2010.
[9] These standards are applied to thermal power plants that were constructed, expanded, or repaired during the period from January 1, 1997 to December 31, 2003.

2.5.1.2 Operation and Maintenance System

Baoshan Iron and Steel Corporation was established in 1977 as Shanghai Baoshan Steel Plant, and at the beginning it was provided with technical assistance by Nippon Steel Corporation of Japan. In 1998, Shanghai Baoshan Steel Plant and other related companies were incorporated into a fully state-owned corporation, Shanghai Baosteel Group Corporation. This is a large group corporation consisting of 22 subsidiaries and 14 holding companies (as of the end of 2003). Baoshan Iron and Steel Co., Ltd. was incorporated in 2000 and 85% of its shares are owned by Shanghai Baosteel Group Corporation (as of 2004). Baoshan Iron and Steel is developing the operation and maintenance system to the level of international standard such as to obtain JIS (Japanese Industrial Standards) and other industrial standards including those of United Kingdom and the United States faster than the other Chinese steel companies, and regarded as a model for them.

Fig.2 Organizational Structure for Operation and Maintenance of the Project Facilities



Source: Baoshan Iron and Steel Co., Ltd.

Fig. 2 shows the organizational structure for operation and maintenance of the facilities covered by this project. As of 2004, Baoshan Iron and Steel owns the assets of these facilities and takes charge of their operation and maintenance. Port facilities are operated and maintained by the Transportation Department composed of the Facilities Management Office with 6 employees and the Raw Material Berth with 130 employees. Power plants are operated and maintained by a total of 64 employees of the Operation Department, Production Technology Office, Power Generation Department, and Facilities Department (breakdown is 8 managerial employees and 56 employees in charge of on-the-field technical control and operation), and appropriate number of people is assigned to each department .

Judging from the situation described above, there seems to be no problem with the operation and maintenance system.

2.5.1.3 Financial Status

According to Baoshan Iron and Steel's profit and loss statement (Table 4) and major financial performance and indicators (Table 5) for the past 3 years, sales increased every year and the net profit recorded a significant increase. The figures of profit ratio of total capital, total assets turnover, and net income to sales ratio also show that the company maintains high

profitability. The high equity ratio of 57% in 2003 indicates there is no problem with financial stability.

Therefore, the financial status is sufficient.

Table 4 Profit & Loss Statement (unit: ten thousand yuan)

Item	2001	2002	2003
Sales	2,920,782	3,389,677	4,452,421
Cost of Sales	2,316,525	2,445,558	3,082,543
Selling Expenses	28,574	32,806	36,775
General and Administrative Expense	159,305	193,997	215,794
Operating Income	370,993	611,322	1,004,927
Nonoperating Expense	25,307	79,049	76,153
Profit/Loss before Taxes	370,956	594,175	992,860

Source: Baoshan Iron and Steel Co., Ltd.

Table 5 Major Financial Indicators and Performance (unit: ten thousand yuan)

Item	2001	2002	2003
Financial Performance			
①Current Assets	789,785	1,161,123	1,143,601
②Current Liabilities	806,938	943,325	982,083
③Equity Capital	2,629,003	3,068,746	3,546,609
④Total Capital	5,804,206	6,091,757	6,148,919
⑤Sales	2,920,782	3,389,677	4,452,421
⑥Net Income	256,121	427,193	697,572
Financial Indicator			
Profit Ratio of total capital (%) ⑥/④	4.4%	7.0%	11.3%
Total Assets Turnover ⑤/④	0.50	0.56	0.72
Net Income to Sales Ratio(%) ⑥/⑤	8.8%	12.6%	15.7%
Current Ratio (%) ①/②	97.9%	123.1%	116.4%
Equity Ratio (%) ③/④	45.3%	50.4%	57.7%

Source: Baoshan Iron and Steel Co. Ltd.

2.5.2 Operation and Maintenance Status

【Port】

In July 2004, two 1,800 tons/h loading/unloading machines broke down due to strong typhoon winds, and they were still being repaired at the time of the field survey. Later it was confirmed that necessary measures were promptly taken and they were put into operation after being repaired. Other facilities have been operating in good conditions without major problems.

【Power Plant】

Project facilities have been operating in good conditions without major problems.

3. Feedback

3.1 Lessons Learned

None

3.2 Recommendations

None

Comparison of Original and Actual Scope

Item	Plan	Actual
①Output	【Port】 1) 3 berths (handling capacity: 14 million tons/year); yard 430,000m^3 2) Loading/unloading machines (1,800 tons/h×2; 1,200 tons/h×3, etc.) 3) Port control equipment (computers, etc.) 4) Port service equipment (tug boats) 5) Power supply, water supply and drainage, electric facilities, and communication facilities, etc. 【Power Plant】 1) A 350MW thermal power generation unit (boiler and auxiliary equipment, steam turbine and auxiliary equipment, power generator, transformer, coal conveyance and storage facilities, coal ash disposal facility, etc.) 2) Consulting service (Power Plant: 60M/M; air pollutant emission reduction program: 8M/M)	【Port】 As planned 【Power Plant】 As planned
②Project Period		
【Port】		
1.Civil engineering	Jul. 1994 – Dec.1996	Aug. 1994 – Nov. 1996
2.Loading/unloading machines	Apr. 1997 – Mar. 1998	Dec. 1997 – Jan. 1999
3.Port control equipment	Jul. 1996 – Mar. 1998	Jul. 1996 – Jul. 1998
4.Port service equipment	Jul. 1994 – Dec. 1996	May 1996 – Nov. 1996
5.Power supply facilities	Jul. 1995 – Sep. 1997	Aug. 1995 – Jun. 1998
6.Water supply and drainage facilities	Jul. 1995 – Mar. 1997	July 1995 – Jun. 1998
7.Communication facilities	Jul. 1996 – Sept. 1997	Jul. 1995 – Jul. 1998
8.Control system wiring	Jan. 1997 – Sep. 1997	Jul. 1995 – Jul. 1998
Completion	Nov. 1998	Mar. 1999
【Power Plant】		
1.Selection of consultants	Jan. 1995 – Jun. 1995	Jan. 1995 – June. 1995
2.Bidding preparation – contract approval	Feb. 1995 – Jan. 1996	Feb. 1995 – Jul. 1996
3.Building	May 1996 – Jul. 1997	Feb. 1997 – Dec. 1997
4.Boiler	Feb. 1997 – Jul. 1998	Dec. 1997 – Jan. 1999
5.Turbine and power generator	Jun. 1997 – Jul. 1998	Jan. 1998 – Jan. 1999
6.Fuel system, ash removal equipment, water supply system, electricity system	Dec. 1996 – Jul. 1998	Aug. 1997 – Feb. 1998
7.Trial operation (contractor)	Apr. 1997 – Apr. 1998	Jan. 1999 – Mar. 1999
8.Trial operation (owner)	Aug. 1998 – Oct. 1998	Mar. 1999 – Oct. 1999
Completion	Feb.1999	Nov. 1999

③Project Cost		
Foreign Currency	30,999million yen	20,890million yen
Local Currency	16,614million yen (1,420million yuan)	21,442million yen （1,420million yuan）
Total	47,613million yen	42,332million yen
ODA Loan Portion	30,999million yen	20,890million yen
Exchange Rate	1yuan＝11.7yen	1yuan＝15.1yen