JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF INDUSTRY
THE REPUBLIC OF BULGARIA

STUDY ON RESTRUCTURING AND MODERNIZATION OF THE STEEL INDUSTRY IN THE REPUBLIC OF BULGARIA

SUMMARY

MARCH 1996

KAWASAKI STEEL CORPORATION
SUMITOMO METAL INDUSTRIES, LTD.
KOBE STEEL, LTD.

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF INDUSTRY
THE REPUBLIC OF BULGARIA

STUDY ON RESTRUCTURING AND MODERNIZATION OF THE STEEL INDUSTRY IN THE REPUBLIC OF BULGARIA

SUMMARY

MARCH 1996

KAWASAKI STEEL CORPORATION
SUMITOMO METAL INDUSTRIES, LTD.
KOBE STEEL, LTD.

CONTENTS

Study of Restructuring and Modernization of the Steel Industry of Bulgaria

1. Background of the Study

Heavy industries in the Republic of Bulgaria developed with importing most of the necessary materials and energy from the former USSR under the former COMECON regime. Crude steel production peaked at 3,040 thousand tons in 1987. However, after the COMECON regime collapsed in 1989, the Bulgarian economy began to suffer from inflation, chronic national budget deficits and a deteriorating balance of payments, and steel production decreased to 1,550 thousand tons in 1992.

With this background, the Japanese government, in response to a request from the Bulgarian government, dispatched a team of JICA experts to Kremikovtzi Steelworks to conduct technical cooperation and study on environmental pollution prevention and energy saving. As a result of this study, the JICA experts proposed that the environmental pollution and energy saving measures should be executed simultaneously with the restructuring and modernization of the steel industry.

Based on the result of the above study, the Bulgarian government requested a study of the restructuring and modernization of the steel industry in March 1993.

The Japanese government dispatched a preliminary study mission through JICA to Bulgaria in January 1994, and the study was executed between August 1994 and February 1996.

2. Purposes of the Study

The purposes of this study are to propose to the Bulgarian side a restructuring and modernization plan for the Bulgarian steel industry including several scenarios, an evaluation of the scenarios and improvement items in order to rebuild the steelworks of Kremikovtzi, Stomana, Kamet, Promet, and Leko ko into vigorous companies in a market economy.

3. Study Methods

The study was executed in three steps:

a. Preparation of a steel production plan for the steel industry of Bulgaria

b. Proposal of combinations of production processes (scenarios)

c. Modernization plan for the five steelworks based on the scenarios.

The Bulgarian side will select and execute the most suitable scenario from several scenarios proposed by the JICA study team, taking into consideration political and economical conditions, labor problems, etc. in Bulgaria.

The scenarios have been studied and evaluated according to the criteria of production

costs, investment for improvement of operation and facilities, government relief, and reduction of the number of regular workers, assuming that the steelworks are to be rebuilt into vigorous companies.

Scenarios have been studied according to the following concrete procedure.

A. Preparation of steel production plan

   a. Investigation of the economy, industries, energy and environment in Bulgaria with assistance of the ministries and agencies concerned

   b. Investigation of the present state of the five Bulgarian steelworks

   c. Investigation of the present state of the steel industry in the world and neighboring countries

   d. Forecasts of the economic growth of Bulgaria

   e. Preparation of a steel production plan for the Bulgarian steel industry

B. Preparation of scenarios

   a. Preparation of scenarios which meet the future steel production plan

   b. Estimate of production costs and preparation of equipment improvement plan

   c. Selection of scenarios according to criteria

C. Formulation of modernization plan for the five steelworks

   a. Estimate of production costs and preparation of equipment improvement plan

   b. Evaluation of modernization scenarios according to the criteria

4. General Procedure of the Study

The study was executed in two phases (I and II) as follows.

4.1 Phase I

Three site investigations were executed between August 1994 and February 1995.

The inception report, progress report I and interim report II were submitted.

Major contents of the study included forecasts of economic growth, a production plan for the Bulgarian steel industry and the establishment of the scenarios.

4.2 Phase II

Four site investigations were executed between May 1995 and February 1996.

The progress report II, interim report II and draft final report were submitted.

Major contents of the study in Phase II included estimation of production costs and preparation of an equipment improvement plan, evaluation of scenarios by the criteria, and prepation of a final report.

5. Macroeconomic Trends in Bulgaria

High growth period (1950-mid 1970s):

The development of heavy industry was accelerated during the first five-year development plan started in 1949. Notwithstanding the scarcity of energy resources, the country attained high investment growth of 14% as an annual average from 1950 to 1970 by investing in the electricity, steel, non-ferrous, and chemical industries, owing to the cooperation of the former USSR, which supplied raw materials and financial assistance.

Declining growth period (mid 1970s-mid 1980s):

During the 7th five-year plan from 1976 to 1980, the growth of net material products was 6.1% as an average annual rate against the planned figure of 8.2%.

Years preceding the collapse of COMECON (1986-1989):

In 1986-87, owing to favorable agricultural conditions, growth of about 5% was attained. However, since 1989, the poor condition of agriculture resulted in a contraction in the country's economy, the real growth of GDP declining to minus 3.3% in 1989, and to minus 9.1% in 1990. The collapse of the COMECON regime occurred at the end of 1989. The Bulgarian economy fell into a deep recession as a result of the collapse of the COMECON regime, and since then has been struggling with inflation, increasing national deficits and unfavorable balance of payments.

Inflation:

There was an apparent slow-down in inflation in 1993. However, in 1994, due to the fall of the leva against the dollar, the increase in public service charges, and the introduction of a VAT tax system, the inflation rate again increased to the previous level by the middle of the year, and was 11% in September 1994.

National budget deficit:

It seems that the country's economy bottomed out in 1993-1994, as seen by the example of the GDP growth ratio (+0.5% in 1994, against --5.7% in 1992).

Balance of payments and external debt;

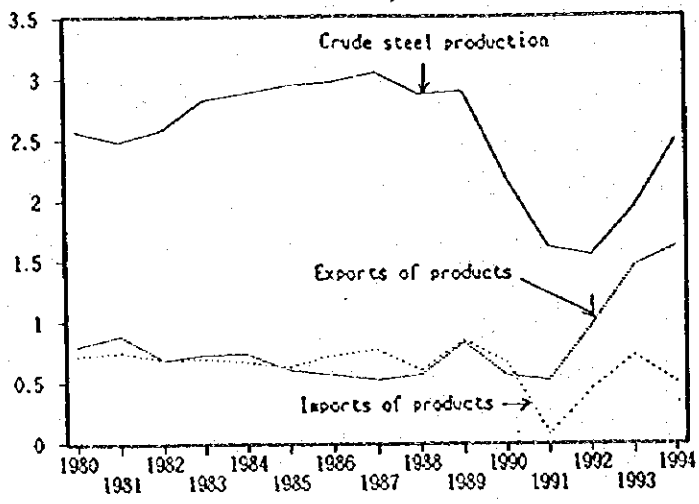
Debt accumulation and repayment, even after obtaining a consensus for rescheduling from the London Club, will burden the country with more than 30% of DSR in the short term, especially in 1995 and 1996. According to the recommendations of the IMF, the country needs to maintain foreign reserves of about one billion dollars. Under such circumstances, the value of the leva against the dollar will continue to fall.

6. Present State and Problems of the Steel Industry

1) Trends of Steel Production in the Bulgarian Steel Industry

Crude steel production has ranged between approximately 2,500 and 3,000 thousand tons/year since 1980, peaking at 3,040 thousand tons in 1987 and declining rapidly after the collapse of the COMECON regime in 1989. The output of crude steel production temporarily fell to near 1,600 thousand tons /year, but has recovered since 1993 due to Bulgaria's low labor cost advantage. Specifically, most of the finished steel is currently exported low prices, but it must be noted that this has given rise to trade friction between western Europe and eastern Europe. The following table shows the trend in steel production.

Trend in Crude Steel Production (million tons/year)



2) Problems of steelworks

(1) Major products, production capacity and actual production in 1993 in each steelworks

	Major Products	Production capacity of crude steel (1000 t/y)	Actual production in 1993 (1000 t/y)	Number of workers
Kremikovtzi	Steel sheet, Wire rods, Pipes	2,180	1,476	16,070
Stomana	Steel plate, Middle shapes, Wire rods	960	489	5,619
Kamet	Wire rods, Hot press, Electroslag products	43.8	8.5	1,352
Promet	Shapes, Wire rods	(800)	(53)	1,087
Leko ko	Castings, Forging	150	17	1,591
Total		3,333.8	1990.5	25,719

Figures in ( ) for Promet are not included in total crude steel production because Promet does not produce crude steel.

(2) Problems of steelworks

The followings are significant problems which tend to offset Bulgaria's advantages of low labor cost and extremely low depreciation.

a. Low profit

The steelworks have not shown a profit since the collapse of the former COMECON regime.

b. Excessive steel production capacity

The production capacity of the various production processes is unbalanced because of the sharing system of steel production used in the former COMECON countries.

c. High production costs

Low production yield, high unit energy consumption (two times more than that of Japanese mills), low equipment productivity, low labor productivity, etc. cause high steel production costs.

d. Insufficient environmental pollution prevention

Especially, Sofia is seriously suffering from air and water pollution caused by Kremikovtzi Steelworks. There are few environmental pollution prevention facilities at Kremikovtzi, since its facilities are not well maintained, and also Kremikovtzi Steelworks does not fully comply with environmental law.

It is necessary for Kremikovtzi to install and improve many environmental pollution prevention facilities and for Stomana to improve the dust collector of the lime kiln and for oil-contaminated waste water treatment plant.

e. Trade friction

Since the steel industry produced low grade and semi-finished steel products which are exported at low prices, it causes, trade friction between western Europe and Bulgaria.

f. Increase of government relief

The steel industry has received material and immaterial relief from the Government, and immaterial duties have been imposed on it.

The former includes assumption of loans, reduction of interest, and restrictions on increase in scrap prices (by ban on exports of scrap); the latter includes political cooperation by accepting over-employment, etc.

(3) Characteristics of each steelworks

a. The major products of Kremikovtzi, Stomana, Kamet and Promet steelworks are standardized carbon steel products . Their finished products are different, but the semi-finished products are similar. Furthermore, the steel markets for these steelworks are the same.

b. Because Leko ko produces casting and forging products, their production process and clients are different from those of the above four steelworks. Finished products are supplied to a restricted group of clients. Semi-finished products are also different from those of the four other steelworks.

c. The major methods of restructuring and modernization of the steel industry in order for steel products of the present Bulgarian steel industry to be competitive in world markets are to merge Kremikovtzi, Stomana, Kamet, and Promet steelworks, and to reduce the capacity and improve the quality of their production processes. On the other hand, Leko ko should place great importance on the improvement and development of sales activities and marketing promotion, production control, etc. Investment for the equipment is not required because Leko ko is a new plant and produces special steel products.

(4) Courses for the study of the restructuring

In consideration of the above (3) a, b, and c, the study of the restructuring and modernization of Leko ko steelworks and the other four steelworks should be performed separately. Mainly, the combinations of production processes

(scenarios) should be studied for the four steelworks, and a system from order to delivery of products should be studied for Leko ko.

7. Restructuring and Modernization of Kremikovtzi, Stomana, Kamet and Promet Steelworks

1) Forecasts of Bulgarian economic growth

There exists at present no specific development plan for Bulgaria, which is necessary to forecast economic growth. Consequently, the economic growth was estimated based on the information from the ministries and agencies concerned, and various projections for the economic growth by international organizations. The forecasts of the economic growth given by the Ministry of Finance were adopted as a pessimistic growth forecast. The forecasts of economic growth by the JICA study team were accepted by the Ministry of Finance and Central Bank of Bulgaria, and are shown in Table 1.

Forecast of Economic Growth (GDP %)

	1994	1995	1996	1997	1998-2000	2001-2004
Optimistic	0.0	3.0	4.0	4.0	4.5	4.0
Pessimistic	- 1.0	2.0	3.0	3.25	3.5	4.0

2) Steel production plan (until 2004)

Steel production at Leko ko steelworks is excluded from domestic apparent steel consumption.

a. Forecasts of domestic apparent steel consumption

Because there exists no specific development plan for Bulgarian industries, it is impossible to make a forecast of domestic apparent steel consumption by the micro-method. Forecasts of consumption were therefore made by the macro-method, that is, based on economic growth.

b. Forecasts of possible export of steel products

The investigation of steel supply and demand in the world and neighboring countries found that excess steel production capacity exists worldwide. The present ratio of exports to total steel production in Bulgaria is 91%, but ten years from now it is predicted to be 55%, which nears current figure of 50% to 60% in western Europe.

c. Preparation of production plan

Steel production in 2004 was estimated at 1,860 thousand tons from forecasts of domestic apparent steel consumption and exports of steel products in 2004.

Steel production by product classes is predicted to show an industrial composition similar to that of the advanced western countries. Consequently, the share of long products will be lower and that of flat products will be higher in 2004 than at present.

The steel production plan and steel production by product classes are as follows.

Steel Production Plan (million tons/year)

	1993	1999	2004
Production	1.60	1.65	1.86
Domestic Consumption	0.86	1.00	1.23
Exports	1.46	1.04	1.03
Imports	0.72	0.40	0.40
Exports Ratio vs. Production	91%	63%	55%

Steel Production by Product Classes

Steel Product	1993		2004	
	(million t /y)	(%)	(million t /y)	(%)
Long Products	770	48	638	34
Flat Products: Plates	648	41	872	47
Flat Products: Coating, Pipes	184	11	353	19
Total	1,602	100	1,863	100

3) Preparation of modernization plan

(1) Procedure for study of modernization plan

The following problems should be improved to make the Bulgarian steel industry competitive in world markets, based on the results of the investigation in 6. 2) (2) and the steel production plan in 7. 2).

a. Although the steel production capacity is at present 3,500 thousand tons/y, a capacity of 1,860 thousand tons/y is needed in the next ten years.

Consequently, it is necessary to reduce the present steel production capacity.

b. Investment is needed, mainly for Kremikovtzi steelworks, in order to complete the steel industry's environmental pollution prevention facilities.

c. It is necessary for the steel industry to dramatically reduce production costs in order to become competitive in world steel markets.

Improvement of production yield, reduction of costs for raw materials, reduction of energy consumption, reduction of expenses, etc. should be achieved by improvement of operation and equipment. Reduction of production costs should be exhaustively pursued to recover the cost increases due to investment for environmental pollution prevention and by rising raw material and energy prices.

d. Reduction of the number of workers due to reductions in production processes.

For preparation of the above improvement, first, effective combinations of the production processes in the steelworks were studied, assuming that the reductions, closures, and merger of production processes are executed over a framework of all four steelworks. Consequently, during the study of the improvement, many combinations (that is, scenarios) were prepared. Each scenario should be evaluated by the criteria of production costs, investment for improvement, and reduction of the regular number of workers to determine which scenarios can produce the most competitive and profitable steel products in world steel markets.

(2) Selection of scenarios

Scenarios were selected as follows.

a. Kamet steelworks should be closed because of its financial condition. The steelworks is in bankruptcy and profits can not be expected.

b. The scenarios are then as follows:

- Promet is closed. Kremikovtzi and Stomana are operated separately as before. (A and A-2)

  Hot metal output from the two blast furnaces at Kremikovtzi is increased, avoiding imports of scrap in A-2 scenario.

- Only steel sheets are produced at Kremikovtzi steelworks. Bars and shapes are produced at Stomana and Promet. (B-1 and B-2)

- The bar and shape production process at Stomana steelworks moves

to Promet steelworks and Kremikovtzi, Stomana, and Promet steelworks continue operation. (C and C-2)

Hot metal output from the two blast furnaces at Kremikovtzi is increased, avoiding imports of scrap in C-2 scenario.

- All the blast furnaces are closed and crude steel is produced by electric arc furnaces at Kremikovtzi steelworks. (D-1, 2 and 3)

(3) Criteria for evaluation of scenarios

a. Production costs:

Improvement of operation and equipment and reduction of expense were planned based on actual production costs in 1993.

Production costs take into account the increases in depreciation and operation costs due to improvement of equipment and environmental pollution control, and the increases in scrap and electricity prices.

b. Investment for improvement:

If it is impossible to reduce production costs by improving operation, the reduction of cost is achieved by improvement of the production facilities.

c. Environmental pollution prevention measures

Complete air and water pollution prevention measures mainly for Kremikovtzi are planned as follows.

Steelworks	Air pollution prevention measures	Water pollution prevention measures
Kremikovtzi		
Coke ovens	- Dust emission prevention during pushing - Gas leakage prevention from doors - De-sulfurizing of coke oven gas	- Removal of NH_3 and CN from ammonia liquor
Sintering plant	- Strengthening of dust catchers for main exhaust gas - Strengthening of dust catchers for exhaust gas from coolers	
Blast furnaces	- Prevention of dust emission from casting house	
Lime kiln	- Strengthening of dust catchers for kiln	
Converters	- Strengthening of dust catchers for main exhausts gas - Prevention of dust emission from charging hole	
Electric furnaces	- Prevention of dust emission for EAF	
Waste water treatment		- Strengthening of waste water treatment
Stomana		
Lime kiln	- Strengthening of dust catchers for kiln	- Strengthening of waste water treatment

d. Grant of government relief to the steelworks, or receipt of dividends from the steelworks:

The amount by which the total production costs exceed the sales is regarded as grant. CIF prices of steel products at Bangkok are utilized as a base of sales prices to determine the sales amount.

e. Reduction of the regular number of workers:

A 30% reduction of workers was assumed. Provable effect of reduction of numbers of workers due to discontinuation of production processes and closure of works is evaluated by scenario.

Share of Steel Production of Steelworks (1,000t/y)

	Scenario	Kremi-kovtzi	Stomana	Promet	Kamet	Others	Total
1993		74%	24%	2%	-	-	1602
2004	A, A-2	70	25	0	0	5	1863
	B-1, D-2	47	35	13	0	5	1863
	B-2, D-3	47	27	21	0	5	1863
	C, C-2	70	11	13	0	5	1863
	D-1	58	24	13	0	5	1863

(4) Comparison of scenarios

First, nine scenarios were selected from many possible combinations of production processes according to the criteria. Kremikovtzi's share of steel production in 2004 is the largest in all scenarios, but is smaller than at present. The share of steel production of each steelworks is as follows. Details are shown in Table 3.

A comparison of the nine scenarios in terms of production costs, investment for improvement, grant of government relief, and reduction of the regular number of workers, is shown in the "Comparison of Nine Scenarios" on the next page.

Half of the US$ 270 million investment in scenarios A to C, where blast furnaces at Kremikovtzi steelworks operate, is for environmental pollution prevention investment. One third of the US$ 160 million investment in scenario D, in which blast furnace operation is discontinued, is for environmental investment. Details of the investment are shown in Table 3

Improvement of operation and equipment, environmental pollution prevention, training for top and middle management, and training for workers to be relocated should be executed systematically in implementing a scenario. An example of the modernization schedule is shown in Figure 1, although the schedule would be slightly different depending on the scenario.

4) Conclusions and recommendations

(1) Conclusion

Scenarios A, A-2, B-2, C, C-2, and D-3 were selected for further consideration.

Scenarios A, A-2, C, and C-2 were selected in consideration of high profit and Scenario D-3 was selected in consideration of low investment. Scenario B-2 was selected by the Bulgarian government.

The Bulgarian government should select a scenario suitable for the present Bulgarian situation from among the six scenarios in consideration of the political situation, reduction of the regular number of workers, etc.

(2) Recommendations by the JICA study team on scenario executed

The JICA study team recommends scenarios executed and absolutely necessary conditions for executing the scenarios based on the study above mentioned.

The following scenarios were selected from among the six scenarios in consideration of realizing the most vigorous and profitable steel company in a market economy.

The scenarios recommended as the most profitable are A-2 and C-2.

As the volume of domestic steel scrap in Bulgaria is estimated at 700,000 tons/year and an increase in the volume is not expected in the future, the Bulgarian steel industry will have to purchase imported scrap at higher prices. Consequently, scenarios B-2 and D-3, which reduce or discontinue production of hot metal from the blast furnaces at Kremikovtzi steelworks, should not be selected.

(3) Absolutely necessary conditions for executing the recommendations

a. Merger of Kremikovtzi, Stomana, and Promet steelworks

If Promet steelworks operates independently, it will not be profitable. This steelworks should be closed. In case of selecting Scenario A-2 or C-2, three steelworks should be merged into one company with Kremikovtzi as the leading company.

b. Reduction of production costs

Production yield should be improved and energy consumption should be reduced for semi- and finished products.

c. Completion of environmental pollution prevention measures

Because environmental pollution prevention in the steelworks, mainly Kremikovtzi is not complete, the area surrounding the steelworks is affected by environmental pollution from the steelworks. Environmental pollution prevention measures should be completed.

d. Decrease of interest rate on loans

The Bulgarian government should make an effort to lower the interest rate of as much as 30% p.a. on loans.

e. Training of personnel

The management of the steelworks should be trained in corporate management and production control.

f. Preparation of implementation plan for restructuring and modernization of the steel industry

Persons responsible for the implementation plan, including those in the Ministry of Industry, should understand the recommendations of the JICA study. Based on the scenarios recommended by the JICA study, the Ministry of Industry should prepare an implementation plan for the restructuring and modernization of the Bulgarian steel industry, and promote finalization of the plan.

(4) Necessary conditions for execution of the recommendations

a. Amendment of regulations and laws concerned

Problems in and improvement methods for the Ministry of Industry, board of directors including executive director, and steelworks were studied. A concept of the modification of the organization of the above three parties is shown below as reference.

A board of directors is established in a steel company to prepare and implement the business plan. Each member of the board will be in charge of the management of some departments. The Ministry of Industry representing the shareholders will hold shareholders' meetings. In these meetings, an executive director and directors of the board are assigned and a business plan is approved so that shareholders will receive a profit from the steel company. The purposes of this idea are to establish clearcut lines of responsibility and roles by separation of functions to protect the profit of the shareholders and to manage the steel company effectively.

The regulations and laws concerned should be amended to implement the modification.

b. Ministries and agencies concerned

The ministries and agencies responsible for preparing an implementation plan and promoting finalization of restructuring and modernization of the steel industry are as follows.

a) Ministries and Agencies

- Advisor to Prime Minister
- Ministry of Finance
- Ministry of Trade
- Ministry of Labor
- Ministry of Environment

- Ministry of Economic Development
- Bulgarian National Bank
- Energy Committee
- Privatization Agency
- Sofia University of Technology

b) Steelworks

- Kremikovtzi steelworks
- Stomana steelworks
- Promet steelworks
- Branch Chamber of Ferrous and Non-ferrous Metallurgy
- Trade Union Metalicy

8. Restructuring and Modernization of Leko ko Steelworks

1) Production plan

The main problems for restructuring Leko ko steelworks are sales promotion and cost reduction. The solution of these problems will lead to increase in production, reduction of the ratio of fixed costs of products, and increased profits. A production plan by the year 2005 is shown in Table 4. The following points should be implemented in order to accomplish this production plan.

a. Receive roll orders from all the domestic mills

b. Expand exports of rolls

c. Sales promotion of castings and forgings for shipbuilding

d. Re-entry to the CIS market

e. Development of a new product mix in the future

f. Cooperation between sales staff and shop engineers

2) Improvement plan for modernization

At present, it is unnecessary to improve the equipment at Leko ko. Development of marketing, promotion of sales, and improvement of production control from acceptance of orders to delivery of products are most important. The following development is needed for modernization.

a. Training of engineers and workers

As there are few engineers and workers with more than ten years' experience, engineers and workers in the steelworks should be trained by job training.

b. Introduction of production control system

The number of control department personnel should be reduced step by step introduction of a production control system.

c. Improvement of productivity

Leko ko's productivity and yield are far behind those of other advanced steel casting and forging shops and there is much room for improvement of productivity and yield. The number of control department personnel not directly involved in production is large compared to that of personnel directly involved in production.

3) Conclusion

(1) Main markets for heavy castings and forgings

Because the domestic market in Bulgaria for castings and forgings is small, Leko ko should attempt to enter the international market. At this point, Leko ko steelworks has no choice but to produce products which are competitive in the international markets in quality, delivery and cost, and increase sales amount.

(2) Sales promotion and production plan

Target markets should be the EC, CIS and the Middle East, and Asia in that order. Leko ko should develop casings for shipbuilding and mining, runners, and rotors as new products in that order in addition to rolls for steel rolling mills. The production plan and sales promotion schedule are shown in Table 4.

(3) Scenario for modernization

The competitiveness of forgings and castings depends on production and management technologies, and the skill of production. Therefore, the following should be implemented.

a. Improvement of technology and skills by training and education

b. Growth in production by sales promotion

c. Improvement in production control system

d. Increase in machining capacity

e. Improvement of productivity

4) Recommendations

a. Marketing of products at reasonable prices

b. Transfer of roll technology

Table 1 Forecasts of GDP Growth

		1994	1995	1996	1997	1998-2000	2001-2004
Published economic forecasts							
E I U *		-1.0%	1.5%	3.5%	4.3%	4.5%	
O E C D		0.0	0.0				
Consultant; WS Atkins **	(O)	0.0	3.0	4.0	4.0	4.5	4.0
	(P)	0.0	1.5	3.0	3.0	3.5	3.5
I B R D ***		2.0	2.0	3.0	1997--------2000 3.8		
Government of Bulgaria ****		0.0	2.0	3.0	3.25		4.0
J I C A	(o)	0.0	3.0	4.0	4.0	4.5	4.0
Consultant	(p)	-1.0	2.0	3.0	3.25	3.5	4.0

* EIU Economic intelligence unit

** (O) Optimistic

(p) Pessimistic

*** World Bank, An economic update May 12-13 1993
There are other projection figures made earlier.

**** Ministry of Finance. With the condition that the figures have not been approved yet by all the Ministries.

Table 2 Forecasts of Supply and Demand of Steel Products

			Optimistic Forecast (1000MT)			Pessimistic Forecast (1000MT)	
		1993	1999	2004	(*)	1999	2004
Iron & flat steels & products (= Hot rolled production)	P	1802	1847	1863	1863	1543	1713
	E	1387	955	955		955	955
	K	598	351	350		348	345
	AC	813	1043	1258		938	1103
	AAC	629	741	905		662	791
Iron products	P	644	663	782	638	618	688
	E	817	325	305		325	305
	K	483	274	275		274	274
	AC	490	632	752		567	657
	AAC	418	508	608		456	532
Ingots & semis	P	364	204	232	232	188	209
	E	342	120	120		120	120
	K	106	80	80		80	80
	AC	128	184	192		148	169
Railway-track material	P	0	0	0	0	0	0
	E	0	0	0		0	0
	K	3	4	5		4	4
	AC	3	4	5		4	4
Sections	P	6	11	15	15	9	12
	E	92	10	10		10	10
	K	103	20	20		20	20
	AC	17	21	25		19	22
Bars	P	226	207	218	156	169	190
	E	200	100	80		100	80
	K	102	80	80		80	80
	AC	127	187	218		169	190
	AAC	104	133	156		121	137
Wire rods	P	195	185	223	148	184	195
	E	185	80	80		80	80
	K	119	80	80		80	80
	AC	149	185	223		184	195
	AAC	104	120	148		106	129
Special steel	P	55	76	94	87	68	82
	E	18	15	15		15	15
	K	30	10	10		10	10
	AC	67	71	89		83	77
	AAC	62	66	82		56	71
Flat products	P	758	984	1081	872	925	1025
	E	570	630	650		630	650
	K	135	77	75		74	71
	AC	322	411	508		389	446
	AAC	211	233	297		206	259
Hot rolled sheets & strip (More than 3mm in thickness)	P	620	673	700	814	658	679
	E	543	580	560		580	560
	K	47	30	30		30	30
	AC	124	143	170		128	149
	AAC	60	66	84		59	73
Hot rolled sheets & strip (3mm and less in thickness)	P	35	39	49	49	34	43
	E	0	0	0		0	0
	K	0	0	0		0	0
	AC	35	39	49		34	43
Cold rolled sheets & strip	P	104	252	332	209	233	303
	E	25	70	90		70	90
	K	60	20	10		20	10
	AC	139	202	252		183	223
	AAC	91	101	129		59	112
Electrical sheets & strip	P	0	0	0	0	0	0
	E	0	0	0		0	0
	K	12	12	17		11	15
	AC	12	12	17		11	15
Stainless steel	P	0	0	0	0	0	0
	E	1	0	0		0	0
	K	8	8	10		7	9
	AC	7	8	10		7	9
Steel for tool	P	0	0	0	0	0	0
	E	2	0	0		0	0
	K	8	7	8		6	7
	AC	6	7	8		6	7

			Optimistic Forecast (1000MT)			Pessimistic Forecast (1000MT)	
		1993	1998	2001	(*)	1998	2001
Steel products	P	384	502	553	553	474	512
	E	74	80	71		80	71
	K	319	40	40		40	40
	AC	229	282	328		234	287
Tinplate	P	12	53	68	68	48	60
	E	7	15	15		15	15
	K	39	10	10		10	10
	AC	44	48	63		43	55
Galvanized sheets & strip	P	27	38	40	40	34	37
	E	12	18	18		18	18
	K	0	0	0		0	0
	AC	15	18	22		16	19
Cold Tapes	P	8	12	15	15	12	14
	E	5	6	6		6	6
	K	2	1	1		1	1
	AC	7	7	10		7	9
Sections	P	3	8	9	9	7	8
	E	1	2	2		2	2
	K	3	0	0		0	0
	AC	5	8	7		5	8
Rails	P	5	5	7	7	5	6
	E	0	0	0		0	0
	K	0	0	0		0	0
	AC	5	5	7		5	6
Seamless tubes	P	23	54	62	62	48	53
	E	19	15	10		15	10
	K	46	20	20		20	20
	AC	50	59	72		53	63
Welded tubes	P	61	69	77	77	62	68
	E	18	15	10		15	10
	K	9	5	5		5	5
	AC	51	59	72		52	63
Drawn wires & bars	P	45	65	75	75	58	68
	E	14	15	10		15	10
	K	21	10	10		10	10
	AC	52	60	75		53	68
Steel products total	P	1002	1047	1863	1663	1543	1713
	E	1461	1041	1028		1041	1028
	K	717	397	398		394	391
	AC	858	1003	1233		896	1078
Long	AAC	480	579	697		519	610
Flat	AAC	278	306	392		272	342
Tube	AC	101	118	144		105	126
Total	AC	858	1003	1233		896	1078
Long	AAC	55.9%	57.7%	56.5%		57.9%	56.6%
Flat	AAC	32.4%	30.5%	31.8%		30.4%	31.7%
Tube	AC	11.7%	11.8%	11.7%		11.7%	11.7%
Total	AC	100.0%	100.0%	100.0%		100.0%	100.0%
Export/Production		91.2%	63.2%	55.1%		67.5%	59.0%
Net exports		744	644	630		647	635

(*) Production which excludes material for downstream processing

Sources: National statistical Institute & Ministry of Industry of Bulgaria
(Forecast: JICA Consultant)

Table 3 Improvement Cost

(Unit: 1,000$)

Steelworks			Scenario								
			A	A-2	B-1	B-2	C	C-2	D-1	D-2	D-3
Total	Kremikovtzi	Environmental pollution prevention	136,437	123,790	117,903	117,903	136,437	123,790	29,241	25,334	25,334
		Improvement	110,097	114,802	53,581	53,581	110,097	114,802	70,411	24,310	24,310
		Total	246,534	238,592	171,484	171,484	246,534	238,592	99,652	49,644	49,644
	Stomana	Environmental pollution prevention	9,178	9,178	15,845	15,845	9,178	9,178	16,041	15,845	15,845
		Improvement	18,864	18,864	80,852	80,011	21,244	21,244	51,326	80,852	80,011
		Total	28,042	28,042	96,697	95,856	30,422	30,422	67,367	96,697	95,856
	Total	Environmental pollution prevention	145,615	132,968	133,748	133,748	145,615	132,968	45,282	41,179	41,179
		Improvement	128,961	133,666	134,433	133,592	131,341	136,046	121,737	105,162	104,321
		Total	274,576	266,634	268,181	267,340	276,956	269,014	167,019	146,341	145,500

Figure 1 Overall Schedule of Modernizing the Steelworks

Scenario B-1, C, C-2, D-1, D-2

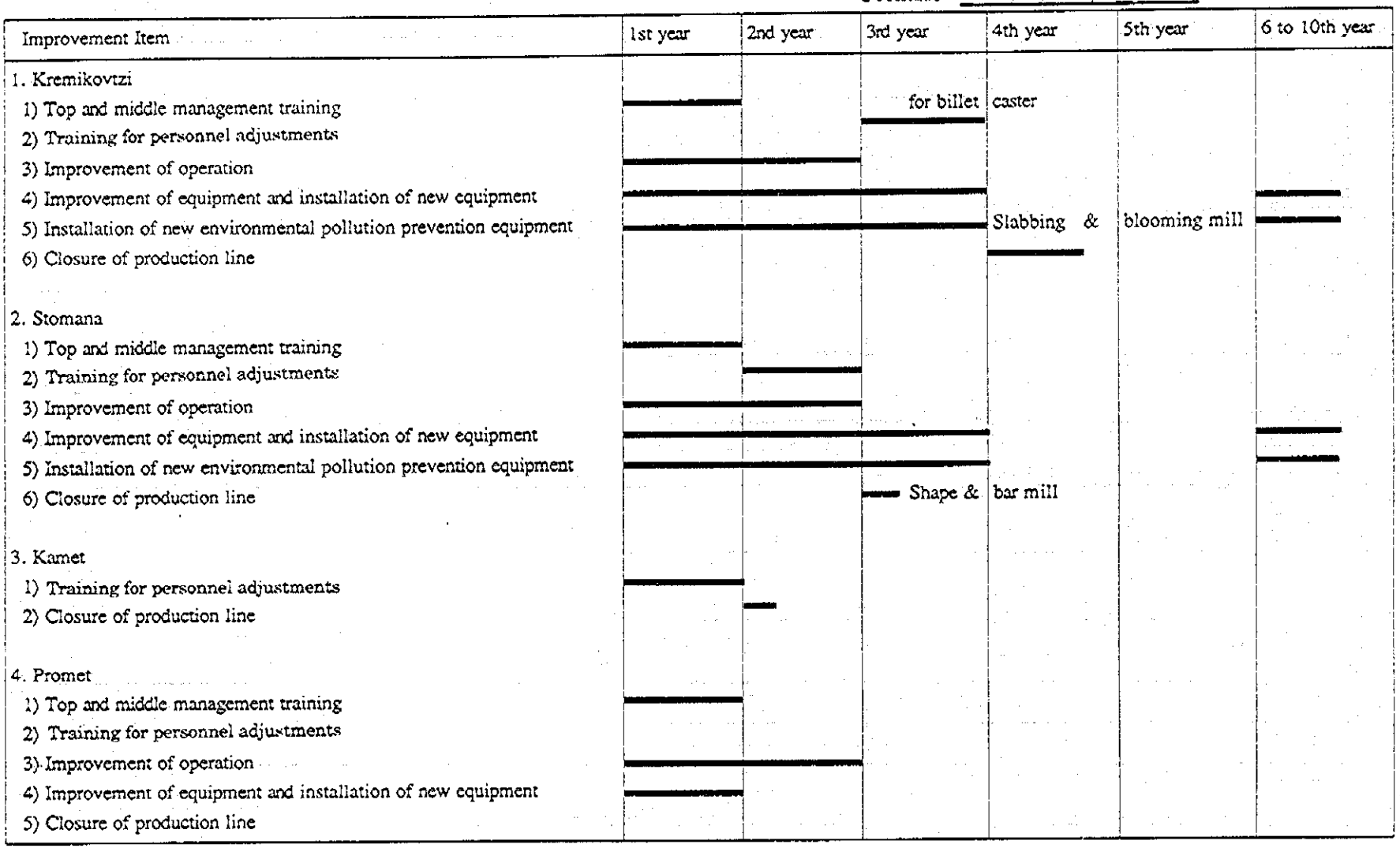


Table 4 Sales and Production Plan

	1995	1996	1998	2000	2005
Steel melting	16,783 ton	27,437 ton	54,274 ton	70,000 ton	80,000 ton
Ingot for sale	2,821 ton	5,642 ton	11,284 ton	14,552 ton	20,000 ton
Forging	8,524 ton	12,524 ton	24,580 ton	31,700 ton	36,228 ton
Casting	985 ton	1,970 ton	3,940 ton	5, 081 ton	5,806 ton
Export ratio	68%	74%	86%	89%	90%
Market	Domestic ⇨				
	EC ⇨				
	CIS ⇨				
	Middle East ⇨				
	Asia ⇨