5-3 Operation Planning

5-3-1 General

As mentioned in Chapter 4-1, the opration rate (or the production capacity) shall be increased paying attention to the supply-demand relation. Also, an abrupt increase of the operation rate should be avoided because the capacity increasing speed should depend on productivity improvement, i.e., enhancement of worker's skill and improvement of managerial ability.

Since repair work cannot avoid fluctuation of daily operations, such fluctuations shall be absorbed by using subcontractors. Therefore, it is necessary from the early stage of the operation to make efforts to train and utilize subcontractors.

5-3-2 Preparation for commencement of operation

As shown in Fig. III-4-17, the dockyard will start the operation in January, 1992. And various preparations including constructions should be started early in 1990.

It is planned even in the first year to repair about 30 ships of average gross tonnage of 15,000 tons, i.e., docking repair work of 390,000 GT in total and afloat repair alongside-quay of 60,000 GT in total.

In order to deal with this amount of work to customers' allowable quality and delivery, the dockyard shall establish its management organization and should raise workers' skill to a satisfactory level by the commencement of the operation.

In repair dockyard, the rational organization should be established and engineers should be gradually trained through the management of yard construction and fabrications of steel frames from two years prior to the commencement of the operation. Also, off-shore repair

work should be conducted from six months before the operation on ships staying in Lazaro Cardenas Port to let engineers and workers have experiences of actual repair work of ship.

5-3-3 Stable period of operation

The first stability of business operation is planned to be attained by 1995. The stability means the balance of income and expenditure after the completion of the first of the construction work, stability of internal productivity and stability of business relations with local companies in Lazaro Cardenas district through subcontract and purchasing activities.

The operation volume at this stage is planned to increase to about 2.6 times the one in 1992, or 68 ships or about 1,190,000 GT in total.

In order to make the ability to deal with this volume of work readily in the dockyard, such methods shall be taken to provide intensive training at the early stage of the operation and to assign managerial and technical staffs from advanced countries of shipbuilding to appropriate positions for the early period to let local staffs get accustomed with actual business gradually. Table III-5-3 shows the details of foreign executives and engineers to be accepted, and shows their positions to be assigned in the organization.

5-3-4 Operations in 2005 and 2015

The dockyard will have attained maturity around 13 years or 23 years after the commencement of the operation and will have been realizing a stable profit by making regular efforts for a better management or improving the management steadily. At the time, the dockyard should grope for next steps and will face product diversification as the results of various researches and

developments, equipment replacement due to out-datedness, consequent rapid improvement of work efficiency, and other various matters which cannot be imagined at the stage of this feasibility study.

These new problems are not studied in this report, but the present mode of operation is considered to keep going. Therefore, in these days, the productivity will not be improved so greatly as would be experienced early in 1995, but small and steady improvement of productivity will increase productions without large increase of worker. It is now predicted that the work volume to be handled in 2005 and 2015 are 94 ships or 1,600,000 GT and 131 ships or 2,300,000 GT respectively.

Table III-5-3 MANNING PLAN

	1990 T	1990 G	1991 T	1991 G	1992 T	1992 G	1993 T	1993 G	1994 T	1994 G	1995 T	1995 G	1996 T	1996 G	1997 T	1997 G	1998 T	1998 G	1999 T	1999 G	2000 T	2000 G	2005 T	2005 G	2015 T	2015 G
General Manager	1		1		1		1		1		1			1		1		1		1		1		1		1
Secretary				1		1		1		1		1		1		1		1		1		1		1		1
General Affairs Dept.																										
Personnel — Chief				1		1		1		1		1		1		1		1		1		1		1		1
Personnel — S. Clerk				1		2		2		2		2		2		2		2		2		2		2		2
Personnel — J. Clerk		1		1		1		1		1		1		1		1		1		1		1		1		1
Personnel — Boy						2		2		2		2		2		2		2		2		2		2		2
Personnel — Guardman		5		12		12		12		12		15		15		15		15		15		15		15		20
Personnel — Total		6		15		18		18		21		21		21		21		21		21		21		21		21
Account — Chief	1			1		1		1		1		1		1		1		1		1		1		1		1
Account — S. Clerk				1		1		1		1		1		1		1		1		1		1		1		1
Account — J. Clerk						1		1		1		2		2		2		2		2		2		2		2
Account — Total		1		2		3		3		3		4		4		4		4		4		4		4		4
Purchase — Chief	1			1		1		1		1		1		1		1		1		1		1		1		1
Purchase — S. Clerk						1		1		1		1		1		1		1		1		1		1		1
Purchase — J. Clerk		1		1		1		1		1		1		1		1		1		1		1		1		1
Purchase — Total		2		2		3		3		3		3		3		3		3		3		3		3		3
Total		5		8		13		13		13		14		14		14		14		14		14		14		14
Business Dept.																										
Manager	1		1		1		1		1		1			1		1		1		1		1		1		1
Design — Chief			1			1		1		1		1		1		1		1		1		1		1		1
Design — Engineer			3	1	3	3	2	3		4		5		5		5		5		6		6		6
Design — Draftman								1		1		2		2		2		2		3		3		3
Design — Total		1			4	1	4	4	3	4	1	6		8		8		8		10		10		10
Sales — Chief				1		1		1		1		1		1		1		1		1		1		1		1
Sales — S. Clerk						1		2		2		2		2		2		2		2		2		2		2
Sales — J. Clerk						1		2		2		2		2		2		2		2		2		2		2
Sales — Total		1	1	1		3		5		5		5		5		5		5		5		5		5		5
Total	1		2	1	5	4	5	9	4	9	2	11		14		14		14		14		16		16		16
Total of ADM.	2	10	3	22	6	30	6	35	5	38	3	41		45		45		45		45		47		47		52
Repair Dept.																										
Manager			1		1		1			1		1		1		1		1		1		1		1		1
Control — Chief			1			1		1		1		1		1		1		1		1		1		1		1
Control — Engineer						2		3		3		3		3		3		3		3		3		3		3
Control — J. Clerk (T. Keep)						2		2		2		2		2		2		2		2		2		2		2
Control — J. Clerk (Mat)				1		1		1		1		1		1		1		1		1		1		1		1
Control — Asst. Forman (Mat)						1		1		1		1		1		1		1		1		1		1		1
Control — Ind. Work (Mat)				3		5		6		6		6		6		6		6		6		6		6		6
Control — Engineer (Subcont)				1		1		1		1		1		1		1		1		1		1		1		1
Control — J. Clerk (Subcont)						1		1		1		1		1		1		1		1		1		1		1
Control — Total			1	5	1	13		16		16		16		16		16		16		16		16		16		16
Hull Ind. Total			1	3	1	10	1	12		14		14		14		14		14		15		15		15		17
Mach. Ind. Total			1	3	1	11	1	13		15		16		16		16		17		17		17		19		19
Dock Ind. Total				6		21		21		21		25		25		25		25		25		26		26		26
Total of Ind.			4	17	4	55	3	62		67		72		72		72		73		74		75		77		79
Repair Dept.																										
Dir. Worker				40		260		330		390		470		470		470		480		490		500		560		600
Sub Contractor						151		193		231		293		284		292		294		301		307		344		641
Total Dir. W.				40		411		523		621		763		754		762		774		791		807		904		1241
Hull — Chief			1		1		1			1		1		1		1		1		1		1		1		1
Hull — Engineer				1		2		3		3		3		3		3		3		3		3		3		3
Hull — Forman						3		4		5		5		5		5		5		6		6		6		7
Hull — Ind. Worker				2		5		5		5		5		5		5		5		5		5		5		6
Hull — Sub Total			1	3	1	10	1	12		14		14		14		14		14		15		15		15		17
Hull — Asst. Forman				6		10		14		16		20		20		20		20		21		21		24		26
Hull — Dir. Worker				10		90		126		144		180		180		180		180		189		189		216		234
Hull — Sub Total				16		100		140		160		200		200		200		200		210		210		240		260
Machine — Chief			1		1		1			1		1		1		1		1		1		1		1		1
Machine — Engineer				1		3		4		4		4		4		4		4		4		4		4		4
Machine — Forman						3		4		5		6		6		6		7		7		7		8		8
Machine — Ind. Worker				2		5		5		5		5		5		5		5		5		5		6		6
Machine — Sub Total			1	3	1	11	1	13		15		16		16		16		17		17		17		19		19
Machine — Asst. Forman				7		13		16		20		24		24		24		25		25		26		29		31
Machine — Dir. Worker				10		117		144		180		216		216		216		225		225		234		261		279
Machine — Sub Total				17		130		160		200		240		240		240		250		250		260		290		310
Dock — Chief			1		1		1			1		1		1		1		1		1		1		1		1
Dock — Engineer				1		2		2		2		2		2		2		2		2		2		2		2
Dock — Forman						1		1		1		1		1		1		1		1		1		1		1
Dock — Ind. Worker				4		17		17		17		21		21		21		21		21		22		22		22
Dock — Sub Total				6		21		21		21		25		25		25		25		25		26		26		26
Dock — Asst. Forman				1		4		4		4		4		4		4		4		4		4		4		4
Dock — Dir. Worker				6		26		26		26		26		26		26		26		26		26		26		26
Dock — Sub Total				7		30		30		30		30		30		30		30		30		30		30		30
Total of Dir. W.				40		260		330		390		470		470		470		480		490		500		560		600

Abbr: T : Personnel despatched by Technical Assistance.
G : General personnel employed at Lazaro Cardenas.

- 235 -

5-4 Productivity and Manpower

5-4-1 Productivity of repair work in Mexican shipyards

It has been revealed on the visits to four main Mexican shipyards that their average productivity was very low as compared with that of Japanese shipyards, even though excluding an extreme example in which the docking period was more than ten times that of Japanese shipyards.

This does not mean that each worker is lazy, but is considered to have resulted from the whole dockyard operating methods including equipment, layout, working techniques, tool management, material procurement, schedule control, etc.

5-4-2 Productivity in the new repair dockyard

Table III-5-4 shows various targets concerning the productivity in the new dockyard from the viewpoints of work efficiency (work quantity per direct working hour) and work period.

Though it is not certain whether the productivity can be improved as scheduled, the experiences of consultants and the latest management method will certainly enable them to attain the targets.

Assumptions in Table III-5-4 are based on two-shift work system.

Table III-5-4   ESTIMATION OF MANHOUR AND WORKING PERIOD FOR AN AVERGE REPAIR SHIP

		periodical survey	casual repair	afloat repair	remarks
1983 1984	MH/GT	2.65			estimation based on records of Veracruz Shipyard
	dock period (day)				
	afloat period (day)				
	total working day				
1995	MH/GT	1.59	1.27	0.196	
	dock period (day)	6.0	4.5	—	
	afloat period (day)	7.5	6.0	7.5	
	total working day	13.5	10.5	7.5	
2005	MH/GT	1.33	1.07	0.164	
	dock period (day)	4.8	3.6	—	
	afloat period (day)	6.0	4.8	6.0	
	total working day	10.8	8.4	6.0	
2015	MH/GT	1.27	1.02	0.157	
	dock period (day)	4.0	3.0	—	
	afloat period (day)	5.0	4.0	5.0	
	total working day	9.0	7.0	5.0	

5-5   Organization

Fig. III-5-4 shows the organization of repair dockyard.

5-5-1 Proper organization

The dockyard should set up the best suitable organization as a private corporation aiming at efficient management in Lazaro Cardenas without being restricted by the existing Mexican shipyard organization but paying attention to the followings:

(1)   To keep indirect personnel to the minimum

(2)   To set up a clear-cut line of command

(3)   To give priority to work control and engineering functions

(4)   To introduce a two-shift system to part of work-site section where even night tasks are less dangerous

5-5-2 Management organization

This feasibility study is conducted on the assumption that this repair dockyard will be operated as a private corporation. However, the actual conditions including the lineup of stockholdes cannot be imagined, and this report is prepared on the assumption that this yard is managed and operated by fully authorized general managers selected by stockholders in accordance with the management policy worked out by representatives of stockholders.

It is also supposed that, for the initial period, or until around 1995, general managers well versed in shipbuilding and repair works shall be invited.

5-5-3 Organization of middle management

This repair dockyard is composed of three departments, i.e., Repair Department, Business Department and General Affairs Department.

(1) Repair Department

The Repair Department consists of Control Section as a staff section and three line sections, i.e., Hull Section, Machinery Section and Dock Section, having charge of practical repair work.

1) Control Section

The Control section functions as staff to the department manager and provides various services to the line sections.

As the former function, various managerial data are prepared for the manager and are input in computer so as to be readily taken out whenever they are needed. As the services to the line sections, this section procures parts and materials necessary mainly for repair work, preserves them and investigates subcontractors. Also, this section makes clerical procedures for placing orders in accordance with the requests of the line sections.

2) Line Sections

Foreman, assistant foreman and general workers are posted in each line section and carry out productive activities under the direction of engineer or section chief. Table III-5-5 and III-5-3 shows the work in charge and a manning plan of each section.

When starting a repair work, each section receives job specification, guide to repair work, working budget and milestone schedule from the Business Department, decides detailed working methods within the specified framework, draws up and decides daily schedule, and let the workers execute the repair work. And if necessary, they employ and manage subcontractor (outside workers).

Engineers assigned to each line section shall
assist the section chief as staffs, execute
chief's jobs for him when he is away, but the
engineer's main job is to improve the efficiency
and safety of the working methods at site, apply
improved method to site work through the foreman,
supervise safety in work and give proper guidance
to the worker on safety in work.

(2) Business Department

The Business Department is composed of Engineering
Section and Sales Section. Table III-5-5 shows the
work in charge and manning plan of each section.

Business Department and Repair Department bring about
profits to this repair dockyard. Especially, the
Engineering Section of the Business Department is the
brain of this yard which devices measures to secure
profit in executing repair work to customer's
quality, within the date of delivery and at his
price.

1) Engineering Section

The work of the Engineering Section might be
unfamiliar to people other than the dockyard
interests and will be explained a bit in detail.

a) Progress Control

The master schedule for dock operation is
made out considering the movements of ships
ordered or to be ordered for repair and the
details of repair work. As for ships already
ordered for repair, the milestone schedule is
made out after having studied working methods
while keeping consistency with the master
schedule.

b) Determination and issuing of job specification

A specification for repair work is determined after discussions with representative of shipowner. The contents are studied very carefully, and then a job specification is issued to the Repair Deparatment in compliance with the internal job sharing system.

c) Study of repairing methods

When issuing the milestone schedule and the job specification, shipowner's specification should be studied in full, overall determination is required with regard to the current working situations in the shops (operating conditions of major equipments, number of workers, etc.), working situations on the ship (ship age, conditions of working area, conditions of oil tanks, etc.), the arriving schedule of materials and parts, and then the most economical and efficient repairing method for the ship at the time should be designed.

With regard to hydrostatic calculation, structural calculation and other work requiring professional design technology, such required technologies should be purchased from proper consultant in case of necessity because this repair dockyard is not provided engineers capable to do so.

d) Estimation and determination of working budget

Repairing charges are estimated for receiving orders, and, after the completion of the repair, the work carried out is also estimated. When receiving orders, this

section provides the working budget to the Repair Department for the Executon of the repair.

2) Sales Section

The Sales Section takes charge of clerical work concerning sales, for example, public relations to shipping companies, collection of information on repair work of ship, bidding procedures, collection of the bill and other related work. In this feasibility study, the sales are considered to be promoted by this section itself without employing selling agents.

(3) General Affairs Department

The General Affairs Department assists activities of this repairing yard indirectly as a service division, and is composed of Personnel Section, Accounting Section and Purchasing Section.

1) Personnel Section

The Personnel section takes charge of employment of staffs and workers, preparation of education and training plans for staffs and workers, safety and health supervision in the dockyard, treatment of labour disputes of staffs and workers, drafting and management of salary and wage policy and other related work.

2) Accounting Section

The Accounting section takes charge of execution of the corporate accounting, control of fund raising, receipt and disbursements of cash, and cost calculation. All such clerical work is processed by computer. In addition, the section draws up the profit plans of the all repair dockyard and controls the budget and results.

3) Purchasing Section

The Purchasing section procures domestic and overseas materials and parts for repair in compliance with the request of the Repair Department. The section also takes the import procedures and conducts customs clearance work of those purchased abroad. The purchasing differs from the subcontract arranged by the Control Section of the Repair Department, and means to buy products available in the market and parts produced as maker's standard.

It is necessary for the section to purchase products at proper prices and exactly on schedule paying regular attentions to the product markets, tendency of makers, delivery date of materials, etc. At the beginning of the establishment, the Purchasing Section is required to take charge of purchasing construction machinery, purchasing and placing orders concerning public engineering and construction work.

5-5-4 Shop floor organization

The shop floor organization like Hull Section, Machinery Section, and Dock Section of the Repair Department are to be composed of as follows, in view of the features of Lazaro Cardenas district that factory workers are readily available and in order to cope with the diversity of repair work:

(1) Line organization of foreman, assistant foreman and general worker with clear-cut channel of command and share of responsibility.

(2) Workers shall be of two types, direct worker and indirect worker, and they shall be trained to become multitalented. Direct workers shall be repairers for single job trade and be kept ready all the time to be

made multitalented anytime. Training for the purpose should be provided to such workers at any proper time or at the time of employment as worker.

Certain posts should be manned with same workers, for example, for operation surveillance of power plant, crane operation, etc., but even for such posts, shifts should be always ready to replace for two-shift system and for a countermeasure against vacation.

(3) Utilization of subcontractors

Many subcontractors (outside workers) are utilized at Mexican shipyards. An industrial park of small scale enterprise is established in Lazaro Cardenas Industrial Port, and some factories have already started operations.

On the other hand, since repair jobs are very various and not steady, it is not economical to keep workers and equipment readily available all the time for carrying out all repair jobs with their inside workers. Therefore, the holding of inside workers' capacity should be limited below the minimum operation rate, and the constant shortage of workers shall be supplemented with subcontractors.

The work done by outside workers should not be left to subcontractors themselves. Their work schedules and quality should be instructed and controlled as well as that of in-house workers by building the supervisors of subcontractors in the shop-floor organization, who a responsible persons of each group of subcontractors who is treated as in-house foreman or assistant foreman depending on his ability.

The line sections of the Repair Department should take charge of this guidance.

(4) Organization for two-shift system

To reduce work period, work should be carried out for 16 clear hours, and the two-shift system will be applied to the nonclerical division.

Each shop-floor organization of two-shift should have the normal hierarchical structure composed of foreman, assistant foreman and workers. Two-shift system should not be applied to managers and staffs, and their work pattern should be such that they work overtime in case of necessity.

Also, no docking and undocking work should be done at night as a rule.

5-5-5 Temporary organization at the early stage of factory construction

When the repairing yard is constructed, or for about two years before the opration is to be started, the dockyard should be organized so as to put emphasis on the construction. And the organization has Construction Department and General Affairs Department under a general manager.

At the beginning, the Construction Department consists of only groups of engineers who supervise and control the construction work, but as the work makes progress, they will employ workers to let them take part charges of steel frame manufacture, piping work, machinery installation, etc. The field organization will be reorganized gradually to the Repair Department.
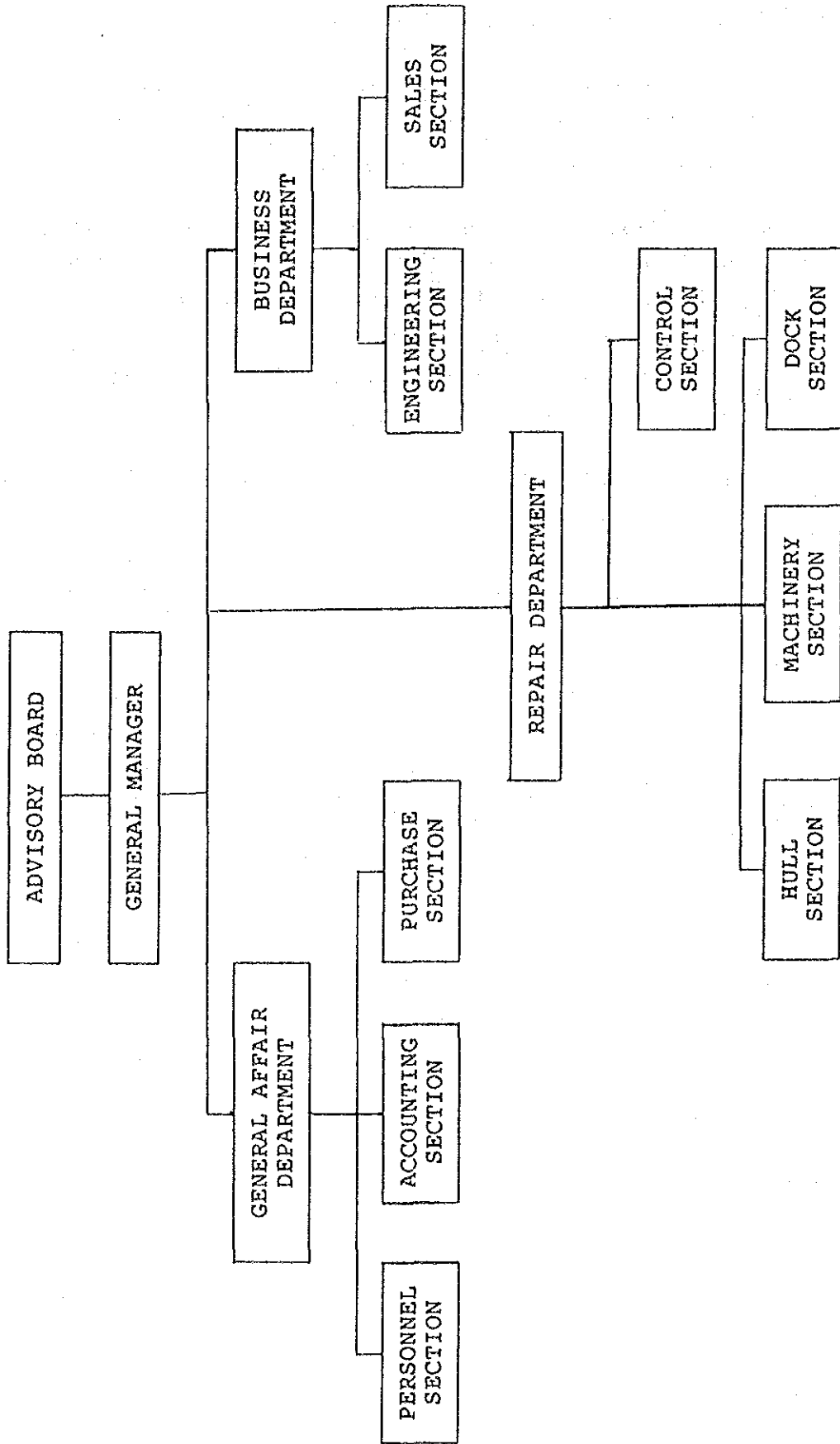
Fig. III-5-4   ORGANIZATION CHART

Table III-5-5   FUNCTION OF ORGANIZATION

Department	Section	Job assigned
General Affair	Personnel	Employment Plannning for training Safety & sanitation control Labor relation administration Salay & wage administration
	Accounting	Financial management Cost accounting Profit planning Budget control
	Purchase	Market research Evaluating potential vendors Purchase/Import Delivery control Custom clearance
Business	Engineering	Pre/final estimation Engineering of repair work Master schedule preparation Job specification and ship issue Preparation of milestone schedule for each repair ship
	Sales	Sales promotion Quotation Money collection

Repair	Hull	Hull structure repair
		Outfitting
		Piping of hull of hull part
		Carpenter
		Maintenance of own facilities
		Transport & staging
		Technical training of workers
	Machinery	Machinery repair
		Electrical equipment repair
		Pipe piece fabrication
		Piping of machinery space
		Sheet metal work of machinery space
		Galaniging
		Maintenance of own facilities
		Transport & staging
		Technical Training of workers
	Dock	Docking, undocking & mooring
		Tug & launch control
		Painting
		Regging
		Maintenance of own facilities
		Substation operation
		Power plant operation
		Technical training of workers
	Control	Preparation & follow-up of repair work
		Material preparation
		Stock control
		Evaluating potential subcontractors
		Making contract with subcontractors
		Actual data collection and inputting

5-6   Technology Transfer and Training

To operate the repairing yard, the following technical elements are required: skill of workers, engineering ability of engineers and managers' capacity to control processes.   These elements differ greatly depending on individual knowledge and experience.   It is regrettable that at present their ability to repair ship has not reached such level that they can compete internationally. So, it is necessary for them to introduce technology from proper overseas shipyard(s) or consultant(s).

In Fig. III-5-5, the outline of technology transfer and training is shown for reference.

5-6-1 Transfer of management technology to managers or senior engineers

Though there are many textbooks and reference books on the general consideration of management, experience is more important for the operation of repair dock.   It is required that Mexican engineers having knowledge of general consideration learn practical management technology through experience of works.

The main learning method is to be On-the-Job Training by experienced manager or engineer to be dispatched to the repair dockyard in Lazaro Cardenas, and supplement the OJT it is useful to visit good overseas shipyards to see how their managements are taken place.

Main contents to be learnt in the overseas shipyards are concept or principle on the management of repair work and handling methods of unexpected problems.   Since concrete managerial procedures should also be learnt, they will be provided in a package with software of computer as the instruction manual for the same.

On-the-job training, referred to in this instance, is a means of enhancing the operational capability of personnel through appropriate guidance provided by the superior in the performance of daily operations.   The

		90	91	92	93	94	95
General Theme		Guidance to set up Dockyard Organization					
		Fostering of Subordinates and Successors in Organization					
			Training to develop job knowledge and skill				
Trainee	Trainer	Schedule & Principal Theme					
Senior Engineer & Officer	Despatched Manager & Engineer	On the Job Training (OJT) for Management and Professional Competence					
					*	*	*
Engineer	Despatched Manager & Engineer	OJT for Engineering and Control Technique of Shiprepair					
Foreman & Assist. Foreman	Competent Instructor		TWI for the development of supervising competence				
Worker in shops	Engineer & Foreman		Training of Basic Skill and job knowledge				
				Training for Special Skill (When it is required)			
Other worker	Manager, officer, etc.		OJT for develop Job Knowledge and skill				

Note) *: Training at an adequate overseas shipyards

FIG. III-5-5   TECHNOLOGY TRANSFER AND TRAINING

advantage of this system of training is that no time needs to be spared specifically for the purpose of training, and that the training activities contribute directly to enhancement of the practical business operations.

The pitfall presented by the system, on the other hand, is that occupation with daily work is liable to letting the training aspect be laid aside and become forgotten. The measures commonly adopted to avoid this pitfall are:

(1) To have the instructor --the superior- draw up a definite program covering the instructional aspect of daily operations, and to let the program that he has drawn up be approved by the instructor's own superior.

(2) To further let the instructor explain to his trainee the substance of training and the target to be achieved, prior to proceeding with the training program.

(3) In conducting the training program, to let the trainee be encouraged to achieve the envisaged target through his own efforts, with guidance and advice provided by the instructor only as and when called for.

(4) In the course of program implementation, to have discussions regularly held between instructor and trainee on the substance of training; to let the trainee submit written reports as and when necessary, for the purpose of ascertaining his progress; and the instructor revise the target or the substance of the training program, whenever he deems necessary.

(5) In the particular case of training personnel in supervisory position or of a high-ranking engineer, the substance and target of training are apt to become abstract in nature, to make it difficult to evaluate the progress made with training. For this reason, the substance and target of the training program should be fully discussed beforehand between instructor and trainee, and in progress evaluation, to recall and

review cases where the trainee actually dealt with concrete problems in performing his duties.

5-6-2 Transfer of engineering technology

Engineering requires more practical experience than the matter just mentioned above. So, engineers shall learn practical work by the OJT or by using drawings as teaching materials under the engineers dispatched to the yard.

As already explained, engineering means to design the most economical and efficient method to carry out work considering the factory environment and ship's conditions at the time of work execution. In order to carry out the work efficiently, therefore, it is absolutely necessary that the basis of the repair work procedures is fully understood in addition to the above experiences. It is necessary to introduce the whole know-hows on these matters from good shipyards or consultants. Also, it is planned to train engineers to take charges of these works like managers at addvanced overseas shipyards to let them deepen their practical experiences.

5-6-3 Training of foreman and assistant foreman

This repair dockyard does not recruit foreman and assistant foreman from outside directly but is to appoint workers experienced at the yard even for short times as foreman and assistant foreman one after another. Since foreman and assistant foreman are front-line supervisors at site, they should be able to teach skills and to control their subordinates in accordance with the management policy of the company, to understand various rules of the company, and also to get familiarity with the atmosphere of the company. A long time is necessary for selecting suitable persons.

Though being a front-line supervisors, a assistant foreman is engaged in repair works together with field workers for long hours, but a foreman is a supervisor and

should bring his ability into full play. Therefore, sufficient TWI (training within industry) will be provided to foremen and foreman expectants by Mexican instructors.

Though being a front-line supervisor, a assistant foreman is engaged in repair work together with field workers for long hours, but a foreman is a supervisor and should bring his ability into full play. Therefore, sufficient TWI (Training Within Industry) will be provided to foremen and foreman expectants by Mexican instructors.

TWI is a training system in the enterprice for supervisors to develop their competence for supervising and instructing their subordinates.

5-6-4 Training to workers

Training to workers is divided into the following three types:

(1) Teaching of basic knowledge

The following knowledges will be provided tonewly employed workers:

1) Introduction of company's organization and office or shop regulatons.

2) Structure and names of ships

3) How to read drawings

4) Education on safety and health

5) Others

(2) Basic skill training

The following training will be provided to newly employed workers:

1) Practical training of gas cutting

2) Practical training of electric welding

3) Practical training of wiring works

4) Practical training to handle heavy items

5) Others

(3) Education of special skills

The following educations will be provided to those workers who necessitate special skills:

1) Operation of various machines

2) Training of special welding

3) Operation of crane

4) Others

6. Financial Analyses

The financial analyses are conducted to study the financial soundness and profitability of this repair dockyard to be operated as a private company and also to study the propriety of the execution of this project from financial point of view. For the purpose, projected financial statements will be made out at first in accordance with financial projections. Secondly, various financial ratios will be obtained from data in the projected financial statements to study the financial soundness. In addition, the break-even point is analyzed for the purpose and the payback period of invested capital is also calculated. Thirdly, the financial internal rate of return (FIRR) of this project will be calculated by the discounted cash flow method to study the profitability. The sensitivity analyses will also be made to check how the FIRR is influenced by modifying assumptions on key variables (sales amount, operating cost, investment cost).

6-1 Premises for Financial Analyses

The financial analyses of this project will be made under the following premises:

(1) The prices are expressed in U.S. Dollars based on those in June, 1987. No inflation is taken into acccount.

(2) Exchange rates are as follows:

Between Mexican Peso and U.S. Dollar:
    1,317 peso = US$1.00 (THE controlled rate in the middle of 1987)

Between U.S. Dollar and Japanese Yen:
    US$1.00 = ¥150.00

(3) The project life shall be 30 years.

(4) No value added tax is taken into account.

(5) The fund required for the construction of this repair dockyard shall be raised as follows:

1) Raising methods

   Long-term loan payable: Capital = 1:1

2) Borrowing conditions of long-term loan payable

   Grace period   : 2 years
   Term of repayment : 10 years
   Interest   : 5% per annum

   Also, short-term debts will be borrowed at 8% per annum as the working capital for the operation of this dockyard.

(6) Sales revenue shall be received by cash at the time of completion, and the payments for materials and services will be made by cash when materials are delivered to warehouse or when services are provided.

(7) Material inventory shall be kept two months portion of the annual material cost.

(8) Cash on hand shall be retained 4% of the annual operation cost.

6-2   Financial Projections

6-2-1 Forecast of sales revenue

The sales revenue is forecast as shown in Table III-5-2 based on the unit prices per GT mentioned in Section III chapter 5-2 and the operation schedule in Section III Chapter 5-3.

Unit prices per GT are as follows:

Unit price for general repair :   US$17.80/GT
Unit price for offshore repair: US$2.23/GT

6-2-2 Investment cost of this project

The costs necessary for the construction of this project are shown in Table III-6-1 in each of the following items and in two ways as local currency cost and foreign currency cost:

(1) Costs for civil engineering work

- Site preparation and dredging work: Site preparation work to level the site to the designed height and dredging work to dredge with a 1:3 slope from the site boundary.

- Quay construction work: The construction work of repair quay including its crane foundation.

- Work bay construction work: The construction work of the work bay including its crane foundation.

- Exterior work: Pavement work, drainage work, fence arrangement, piping and fitting work for electric wiring inside the factory site.

- Expenses for supervisor: Expenses of construction supervisors as consultants of civil engineering are included.

(2) Costs for building work

- Factory: Expenses necessary for constructing factory building.

- Office: Expenses necessary for construction of office building.

- Other work: Other work related to construction of factory and office building is included.

- Expenses for supervisor

Expenses of construction supervisors as consultants of building work are included.

(3) Floating dock: Cost for floating dock which can accomodate ships of approximate 80,000 DWT and has the system that enables the docked ships to trasfer safely and quickly of ships to work bay by the computer-controlled method.

(4) General machinery and equipment in shops: Costs of various machinery such as marking and cutting surface plates, shearing machine, bending machine, press, etc. to be installed in the Steel shop, and such as surface plate for moulded pipings, bending machine, various lathes, dynamic balancing machine, Cleaning equipment, drying furnace, etc. in the repair shop. The cost of towing tractors to be used for transferring docked ships to and from the work bay is included in this item.

(5) Crane: Costs of horizontal level luffing crane at the quay and the work bay, overhead travelling crane and semi gantry crane in shops.

(6) Anti-pollution equipment: Costs of anti-pollution equipment such as plant for waste disposal, oil fence, etc. are included.

(7) Communication equipment: Costs of communication equipment such as telephone system facsimile equipment and telex machine are included.

(8) Costs of office furniture: Costs of various furniture to be used in office are included.

(9) Transportation facilities and automobiles: Costs of heavy-duty trailer for heavy material such as hull block, and automobiles are included.

(10) Initial expenses: Expenses for the establishment of company, bid preparation for construction, personnel

training and interest, from the start of the
construction to the commencement of operation.

(11) Working capital: Initial working capital necessary
for the commencement of operation is included.

The following conditions were taken into account when
estimating the expenses for the construction of this
projec:

(1) Contingency

Expenses which cannot be easily forecast at the time
of the feasibility study are included as contingency
to cope with unexpected increase of the construction
cost including machinery & equipment cost when
executing the construction. Contingency for major
facilities are about 5%.

(2) Expenses for installation and trial operation of
machinery

Labor Expenses necessary for installation and trial
operation of machinery are included in the cost of
respective machines.

(3) Ocean freight, transport insurance and inland
transportation

Ocean freight and transport insurance premium for
machinery to be imported by marine transport, and
transporting expenses of domestic machinery are
included in the cost of respective machines.

(4) Expenses for bid and construction preparation

Expenses for construction preparation including detail
design and bid are included in the initial expenses.

(5) Various machines are equipped in this repair dockyard and their useful lives vary. If properly maintained or repaired, machines can be generally used longer than the legal useful lives, excluding those heavily abrased.

Therefore, reinvestments have been considered to be necessary for various machines such as transpotation machines and automobiles, communication equipment, welding machine, machine installed in galvanizing shop, pipings, anti-pollution equipment.

(6) Import duties on imported equipment and materials for the construction have been regarded to be exempted due to preferential measures.

Table III-6-1   ESTIMATION OF INVESTMENT FOR CONSTRUCTION (1/2)

(Unit: 1,000 US$)

	Year	1990 (1)			1991 (2)			1992 (3)		
	Item	Domestic	Imported	Total	Domestic	Imported	Total	Domestic	Imported	Total
1.	Civil engineering works	1,600	165	1,765	13,700	165	13,865	4,800	165	4,965
	Site preparation/dredging	1,200		1,200	4,100		4,100	200		200
	Quay/foundation work				7,100		7,100	3,800		3,800
	Work bay/foundation work									
	Exterior	400		400	2,500		2,500	800		800
	Supervision fee		165	165		165	165		165	165
2.	Construction works	2,500	248	2,748	7,600	248	7,848	3700	165	3,865
	Factory	2,100		2,100	2,800		2,800	3,300		3,300
	Office				4,200		4,200			
	Other works	400		400	600		600	400		400
	Supervision fee		248	248		248	248		165	165
3.	Floating dock & trans. sys.				70	35,200	35,270	30		30
4.	Machinery & equipment		1,122	1,122	1,193	3,542	4,735	636	1,464	2,100
5.	Crane				955	1,040	1,995	445	1,130	1,575
6.	Anti-pollution equipment				30	1,400	1,430	265	222	487
7.	Communication equipment							20	20	40
8.	Office furniture				300		300			
9.	Transportation equipment	35		35	56		56	157	103	260
10.	Initial expense	287	1,808	2,095	1,778	989	2,767			
11.	Working capital				46	184	230			
12.	Total	4,422	3,343	7,765	25,728	42,768	68,496	10,053	3,269	13,322

Note: ( ) shows project year

Table III-6-1   ESTIMATION OF INVESTMENT FOR CONSTRUCTION   (2/2)

(Unit: 1,000 US$)

	Item	1995 (6)			1996 (7)			Total		
		Domestic	Imported	Total	Domestic	Imported	Total	Domestic	Imported	Total
1.	Civil engineering work	2,700	165	2,865	3,600	83	3,683	26,400	743	27,143
	Site preparation/dredging							5,500		5,500
	Quay/foundationwork							10,900		10,900
	Workbay/foundation work	2,700		2,700	2,800		2,800	5,500		5,500
	Exterior				800		800	4,500		4,500
	Supervision fee		165	165		83	83		743	743
2.	Construction work	100		100	200		200	14,100	661	14,761
	Factory							8,200		8,200
	Office							4,200		4,200
	Other work	100		100	200		200	1,700		1,700
	Supervison fee								661	661
3.	Floating dock & trans. sys.				350	1,700	2,050	450	36,900	37,350
4.	Machinery & equipment				205	1,860	2,065	2,034	7,988	10,022
5.	Crane				110	1,040	1,150	1,510	3,210	4,720
6.	Anti-pollution equipment							265	222	487
7.	Communication equipment							50	1,420	1,470
8.	Office furniture							300		300
9.	Transportation equipment							248	103	351
10.	Establishment expense							2,065	2,797	4,862
11.	Working capital							46	184	230
12.	Total	2,800	165	2,965	4,465	4,683	9,148	47,468	54,228	101,696

6-2-3 Operating expenses

Expenses for the operation of this project have been derived as follows:

(1) Personnel expenses

Personnel expenses have been calculated on the basis of the Table III-5-3 of Maning Plan and Table III-6-2 for the expenses by position. The table of personnel by expenses were set up referring to the expenses of existing companies at Lazaro Cardenas Industrial Port and of Mexican shiprepair companies.

Table III-6-2   PERSONNEL EXPENSES BY POSITION

(Unit: US$)

Position	Annual expenses	Position	Annual expenses
Plant manager	17,500	Senior office worker	4,100
Manager	10,200	Skilled worker	3,800
Chief	8,200	Typist	2,900
Engineer	6,200	Unskilled worker	2,300
Foreman	5,600		

Note: Labor costs include welfare expenses.

(2) Material cost

Main materials required for repairing ships consist of steel manufactures (steel plate, section steel), pipe, joint, valve, paint, welding rod and machine parts. Material costs vary with the details of work but generally occupy certain percentage of the sales. Therefore, the material cost to sales ratio has been assumed as 13.2% based on data of Japanese and Mexican shipreparing companies.

(3) Direct expenses

Direct expenses are composed of insurance premium for repairing ships, transportation expenses, inspection charges, travelling expenses and other expenses for payment. The direct expenses have been set as 3% of the sales (or 2.5% later than ten years after the commencement of operation).

(4) Manufacturing overhead (excluding personnel expenses)

Manufacturing overhead are composed of expenses related to sales and production and those co-related to facilities including building and machinery.

Main expenses co-related to equipmetns are depreciation expenses, repairing expenses and insurance premium. The depreciation expenses of equipments and machinery in the repair dockyard were calculated by the method shown in Table III-6-3.

Repairing expenses have been set as Zero for the first two years after the completion, 0.5% of the acquisition cost of building and equipment for 3 to 7 years, 1 for 8 to 12 years, 1.5% for 13 to 17 years, and 2.0% for 18 to 30 years. Expenses related to sales and production are composed of towage, tools, electric, gas and water expenses, travelling expenses, communication expenses, and other miscellaneous expenses, and they have been regarded as 3% of the sales.

Also, land rent has been regarded as fixed expense. And special expenses for training employees have been added up for the first three years after the commencement of operation.

(5) General administrative and selling expenses
    (Excluding personnel expenses)

    General administrative and selling expenses are mainly
    composed of depreciation expenses of offices, inland
    travelling   expenses,   entertainment   expenses,
    convention   expenses,   communication   expenses,
    advertizing and general publicity expenses and other
    miscellaneous expenses.

    General administrataive and selling expenses excluding
    depreciation expenses for fixed assets have been
    regarded equivalent to 1% of the sales, and the
    depreciation expenses for fixed assets were included
    in the manufacturing overhead.

(6) Non-operating expenses and income

    1) Interest   expenses   have   been   calculated   in
       accordance   with   the   fund   raising   conditions
       mentioned in Section 6-1.

    2) Amortization of deferred charges
       Deferred   charges   are   initial   expenses   occurred
       before the commencement of operaton as labor costs,
       training   expenses,   interest   and   other   general
       administratiave   expenses,   and   have   been   amortized
       by   the   method   shown   in   Table   III-6-3.   The
       amortization   expenses   have   been   included   in   the
       non-operating expenses.

    3) Interests   earned   have   been   included   in   the   non-
       operating income.

(7) Corporation tax, profit sharing and devidend

1) Corporation tax

The corporation tax rate has been assumed to be 42%
and the following preferential measures have been
also assumed to be available.

Investment tax credit - 20% of invested amount can
become the object of tax exemption for five years.

Employment creation tax credit - The amount
obtained by multiplying newly created number of
employment by the minimum wage can become the
object of tax exemption for two years.

2) Profit sharing

Profit sharing has been assumed supposed to be 10%
of the tax profit.

3) Dividend

That dividend will be distributed when both the
retained earnings and the current net profit are
larger than zero, and that the amount will be a
half of the current net profit.

Table III-6-3 DEPRECIATION & AMORTIZATION METHOD

Item	Method	Useful Life	Residual Value
Graving dock	Straight line	20	0
Floating dock	Straight line	20	0
Ship lift	Straight line	20	0
Building	Straight line	20	0
Machinery equipment	Straight line	10	0
Quays	Straight line	20	0
Transportation equipment	Straight line	5	0
Automobiles	Straight line	5	0
Office appliances	Straight line	10	0
Deferred assets	Straight line	10	0

Table III-6-4   INTEREST PAYMENT & REPAYMENT SCHEDULE

(Unit: 1000 US$)

year	Loan Balance (Beginning)	New Loan	Repayment	Loan Balance (End)	Interest Payable
1990	0	3,882	0	3,882	97
1991	3,882	34,248	0	38,130	1,050
1992	38,130	6,661	388	44,403	2,063
1993	44,403	0	3,813	40,590	2,125
1994	40,590	0	4,479	36,111	1,918
1995	36,111	1,483	4,479	33,115	1,731
1996	33,115	4,574	4,479	33,210	1,660
1997	33,210	0	4,627	28,583	1,545
1998	28,583	0	5,084	3,499	1,302
1999	23,499	0	5,084	18,415	1,048
2000	18,415	0	5,084	13,331	794
2001	13,331	0	5,086	8,245	539
2002	8,245	0	4,694	3,551	295
2003	3,551	0	1,272	2,279	146
2004	2,279	0	605	1,674	99
2005	1,674	0	605	1,069	68
2006	1,069	0	608	461	38
2007	461	0	461	0	11

6-2-4 Projected financial statements

Income and cost caused in the execution of this project were estimated in accordance with the sales plan, construction plan, training schedule and manpower planning, and the following projected financial statements have been made up:

o   Projected income statement (Table III-6-5)

o   Projected balance sheet (Table III-6-6)

o   Projected cash flow statement (Table III-6-7)

Table III-6-5   PROJECTED INCOME STATEMENT   (1/2)

Unit: 1000US$

ITEM\YEAR	+/-	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
SALES AMOUNT	+			6,558	10,055	13,152	17,003	17,394	18,102	19,394	20,104	20,313	21,522	22,234	22,943	23,663	24,373	25,435
MATERIAL COST	-			920	1,328	1,736	2,234	2,275	2,463	2,560	2,554	2,747	2,841	2,935	3,028	3,124	3,218	3,357
DIRECT EXPENSE	-			205	302	395	513	503	561	582	603	524	646	556	574	522	603	533
LABOR COST	-			2,444	2,721	2,594	3,123	3,100	3,129	3,173	3,246	3,307	3,397	3,397	3,397	3,307	3,572	3,572
INDIRECT COST	-			4,356	5,395	5,345	6,335	6,420	6,324	6,374	7,282	7,370	7,295	6,629	6,351	5,763	5,955	5,742
G. PROFIT	Sub			-950	312	2,582	5,332	5,553	5,719	6,199	6,219	6,765	7,034	8,313	8,573	9,377	10,023	11,029
A. & S. EXP.	-			1,252	1,065	1,179	903	332	391	395	403	419	426	433	440	447	455	455
OP. PROFIT	Sub			-2,215	-944	1,403	4,429	5,177	5,339	5,103	5,315	6,345	6,308	8,380	8,223	9,420	9,568	10,553
AMORTIZATION	-			466	466	466	466	466	466	466	466	466	480					
INTEREST-STL	-			32	150	259	49	-29	-147	-54	-38	-487	-54	-501	-721	-993	-1,066	-1,247
INTEREST-LTL	-			2,063	2,125	1,518	1,731	1,550	1,545	1,332	1,043	794	503	295	161	99	52	33
OR. PROFIT	Sub			-4,795	-3,755	-1,251	2,053	3,060	3,446	4,273	4,170	5,553	6,423	8,566	3,303	10,223	10,566	11,772
PROFIT SHAR.	-						206	306	345	428	477	555	543	363	831	1,022	1,057	1,177
PROFIT B.T.	Sub			-4,795	-3,755	-1,251	1,957	2,754	3,101	3,851	4,222	4,999	5,782	7,317	9,327	9,201	9,509	10,595
TAX	-									445	1,285	2,947	2,072	2,999	3,737	3,564	3,392	4,399
PROFIT A.T.	Sub			-4,795	-3,755	-1,251	1,957	2,754	3,101	3,468	2,507	2,551	3,710	4,328	5,120	5,357	5,511	6,197
DIVIDEND	-										1,254	1,476	1,355	2,414	2,560	2,653	2,309	3,099
RETAINED EARNINGS				-4,795	-3,755	-1,251	1,957	2,754	3,101	1,405	1,253	1,475	1,355	2,414	2,550	2,568	2,309	3,099

- 271 -

Table III-6-5 PROJECTED INCOME STATEMENT (2/2)

Unit: 1000US$

ITEM/YEAR	+/-	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SALES AMOUNT	+	25,508	27,590	28,537	29,709	30,783	31,939	32,911	33,993	35,075	35,075	35,075	35,075	35,075
MATERIAL COST	-	3,499	3,541	3,780	3,922	4,063	4,203	4,344	4,486	4,630	4,630	4,630	4,630	4,630
DIRECT EXPENSE	-	663	690	716	743	770	795	823	850	877	877	877	877	877
LABOR COST	-	3,572	3,572	3,572	3,572	3,572	3,572	3,572	3,572	4,912	4,912	4,912	4,912	4,912
INDIRECT COST	-	6,516	6,678	7,095	7,194	7,223	4,165	3,770	3,843	3,882	3,561	3,434	3,434	3,445
G. PROFIT	Sub	12,058	12,399	13,373	14,178	15,055	19,003	20,302	21,135	20,775	20,995	21,223	21,223	21,212
A. & S. EXP.	-	476	487	497	508	519	529	540	551	574	574	574	574	574
OP. PROFIT	Sub	11,582	12,412	12,876	13,670	14,535	18,474	19,762	20,584	20,201	20,422	20,549	20,549	20,533
AMORTIZATION	-													
INTEREST-STL	-	-1,439	-1,545	-1,951	-2,080	-2,287	-2,487	-2,589	-2,383	-3,059	-3,223	-3,399	-3,555	-3,735
INTEREST-LTL	-	11												
OR. PROFIT	Sub	13,010	14,057	14,737	15,750	16,823	20,961	22,451	23,467	23,260	23,550	24,047	24,214	24,373
PROFIT SHAR.	-	1,301	1,406	1,474	1,575	1,682	2,096	2,245	2,347	2,326	2,355	2,405	2,421	2,437
PROFIT B.T.	Sub	11,709	12,651	13,263	14,174	15,141	18,865	20,206	21,120	20,934	21,285	21,642	21,793	21,935
TAX	-	4,866	5,013	5,570	5,919	6,003	7,529	8,467	8,370	8,456	8,388	9,038	9,153	9,213
PROFIT A.T.	Sub	6,843	7,338	7,693	8,255	9,138	11,235	11,719	12,250	12,478	12,397	12,504	12,540	12,723
DIVIDEND	-	3,422	3,669	3,847	4,128	4,569	5,618	5,860	6,125	6,239	6,199	6,302	6,320	6,362
RETAINED EARNINGS		3,421	3,669	3,846	4,127	4,569	5,618	5,859	6,125	6,239	6,198	6,302	6,320	6,361

Table III-6-6 PROJECTED BALANCE SHEET (1/2)

Unit: 1000US$

ITEM =YEAR +/-	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
CURRENT ASSETS +		230	384	413	433	617	4,346	8,917	13,385	18,916	21,916	23,619	26,553	33,456	40,497	47,519	55,180
CASH ON HAND +			154	183	203	227	227	227	237	254	252	266	267	271	291	304	311
DEPOSIT WITH 1. +							3,709	8,170	13,218	18,222	21,194	22,383	25,773	32,580	39,580	46,575	54,309
INVENTORIES +		230	230	230	290	380	400	410	430	440	460	470	430	505	520	540	560
FIXED ASSETS +	5,570	71,169	80,440	75,574	70,508	68,542	72,355	66,322	61,191	55,459	49,397	45,343	42,453	37,782	33,131	28,505	24,250
TANGIBLE F. A. +	5,570	71,169	84,491	84,491	84,491	87,491	95,625	95,355	95,355	95,355	97,125	98,906	100,378	100,378	100,378	100,437	100,674
A. DEPRECIATION -			4,051	3,017	13,933	18,949	24,300	30,032	35,764	41,455	47,229	52,953	57,925	62,585	67,247	71,908	76,424
DEF. CHARGES +	2,095	4,862	4,176	3,399	2,404	2,818	2,432	1,946	1,460	974	483						
INITIAL EXPENSES +	2,095	4,862	4,362	4,362	4,862	4,862	4,862	4,862	4,862	4,862	4,862	4,862	4,862				
ACC. AMORTIZATION -			486	972	1,458	1,944	2,430	2,915	3,402	3,888	4,374	4,952					
TOTAL ASSETS +	7,655	76,261	85,200	79,777	74,453	72,077	73,173	72,586	76,556	75,349	72,301	73,552	68,294	71,238	73,518	76,024	72,430
CURRENT LIABI. +			801	2,966	3,304	633	305	345	972	3,517	4,078	4,570	6,272	7,248	7,555	7,758	8,574
ACCOUNT PAYABLE +							306	345	373	3,317	4,933	4,573	5,272	7,248	7,555	7,758	8,574
SHORT TERM LOAN +			801	2,966	3,304	427											
LONG TERM DEBT +	3,982	38,130	44,403	40,590	36,111	33,115	33,216	28,560	23,493	18,451	13,331	9,245	3,551	2,279	1,574	1,063	451
SHAREHOLD. EQ. +	3,893	38,131	39,995	35,241	34,820	38,329	45,557	46,753	52,154	55,477	54,892	56,747	58,151	61,721	64,289	67,197	70,295
SHARED CAPITAL +	3,893	38,131	44,732	44,732	44,732	46,274	50,348	50,848	50,348	50,348	50,348	50,348	50,848	50,848	50,848	50,848	50,848
A. R. EARNINGS +			-4,795	-9,551	-9,902	-7,945	-5,121	-2,099	1,316	2,559	4,041	5,399	8,313	10,873	13,541	16,349	19,447
TOTAL LI. & EQ. +	7,655	76,261	85,200	79,777	74,405	72,077	79,173	77,568	76,555	75,349	72,301	69,552	58,984	71,248	73,518	76,024	79,430

Table III-6-6 PROJECTED BALANCE SHEET (2/2)

Unit: 1000US$

ITEM 2/YEAR +/-	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
CURRENT ASSETS +	63,155	71,893	80,692	88,741	97,517	106,033	113,933	121,706	128,431	135,422	142,154	149,020	155,338
CASH ON HAND +	317	324	342	350	357	362	362	377	421	421	421	421	421
DEPOSIT WITH L. +	62,259	71,049	79,720	88,741	95,480	104,277	112,300	120,579	127,240	134,211	140,953	147,829	154,205
INVENTORIES +	580	610	630	550	580	700	720	750	770	770	770	770	770
FIXED ASSETS +	23,150	15,790	11,430	7,240	4,663	4,349	4,007	3,155	2,338	1,995	1,855	1,452	1,055
TANGIBLE F.A. +	100,934	100,934	100,934	101,104	102,385	104,357	104,357	104,357	104,392	104,653	104,913	104,913	104,913
A. DEPRECIATION -	60,784	85,144	89,504	93,864	98,221	99,508	100,350	101,202	102,034	102,557	103,054	103,451	103,848
DEF. CHARGES +													
INITIAL EXPENSES +													
ACC. AMORTIZATION -													
TOTAL ASSETS +	83,305	87,773	92,122	96,381	102,181	110,889	117,995	124,871	130,789	137,418	144,013	150,482	156,951
CURRENT LIABL. +	9,599	10,388	10,891	11,523	12,254	15,343	15,532	17,342	17,021	17,452	17,745	17,994	18,012
ACCOUNT PAYABLE +	9,593	10,388	10,891	11,523	12,254	15,343	16,532	17,342	17,021	17,452	17,745	17,994	18,012
SHORT TERM LOAN +													
LONG TERM DEBT +													
SHAREHOLD. EQ. +	73,716	77,385	81,231	85,358	89,927	95,545	101,404	107,529	113,768	119,956	126,256	132,588	138,949
SHARED CAPITAL +	50,848	50,848	50,848	50,848	50,848	50,848	50,848	50,848	50,848	50,348	50,848	50,848	50,848
A.R. EARNINGS +	22,868	25,537	30,383	34,510	39,079	44,697	50,555	56,681	62,920	69,118	75,420	81,740	88,101
TOTAL LI. & EQ. +	83,305	87,773	92,122	96,381	102,181	110,888	117,995	124,871	130,789	137,418	144,013	150,482	156,951

- 274 -

Table III-6-7 PROJECTED CASH FLOW STATEMENT (1/2)

Unit: 1000US$

ITEM/YEAR +/-	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
SALES REVENUE +			6,986	10,059	13,152	17,303	17,994	18,702	19,394	20,104	20,813	21,523	22,234	22,943	23,669	24,378	25,435
OPERATING EXP. +			5,130	6,087	6,783	7,928	7,466	7,640	7,859	8,458	8,735	8,880	8,892	9,049	9,579	10,149	10,356
MATERIAL COST +			920	1,328	1,736	2,284	2,375	2,469	2,560	2,654	2,747	2,841	2,935	3,028	3,124	3,218	3,357
DIRECT EXPENSE +			209	302	395	519	540	561	582	603	624	843	558	574	592	609	634
LABOR COST +			2,444	2,721	2,594	3,133	3,103	3,129	3,179	3,248	3,307	3,307	3,337	3,397	3,307	3,672	3,672
INDIRECT COST +			305	430	879	1,069	1,067	1,092	1,142	1,550	1,638	1,666	1,661	1,700	2,108	2,195	2,225
A. & S. EXP. +			1,152	1,336	1,179	903	382	389	398	403	419	426	433	440	448	455	465
NON-OP. EXP. +	7,785	88,494	15,417	2,275	2,228	4,970	11,061	1,074	1,403	1,533	4,014	5,864	5,755	5,712	6,469	6,612	6,839
TANGIBLE F.A. +	5,670	65,499	13,322			3,300	9,204	286			170	1,781	1,472			35	28
WORKING CAP. +		230			60	99	20	19	23	19	23	19	23	15	15	23	20
DEF. CHARGES +	2,095	2,767															
INTEREST-STL +			32	159	250	119	-35	-147	-234	-388	-487	-544	-301	-721	-893	-1,066	-1,347
INTEREST-LTL +			2,063	2,125	1,913	1,731	1,666	1,545	1,382	1,618	794	539	295	161	99	66	30
PROFIT SHAR. +							286	306	345	428	477	555	643	869	781	1,022	1,057
TAX +										445	1,781	2,047	2,072	2,959	3,707	3,864	3,692
DIVIDEND +											1,251	1,476	1,855	2,444	2,560	2,669	2,809
SURPLUS OR DE. +	7,785	88,494	-13,581	1,687	4,143	4,425	-533	9,088	10,132	10,105	8,064	6,779	7,586	8,182	7,621	7,617	8,249
FUND PROCURE. +	7,785	88,496	13,735	-1,668	-4,121	-4,351	4,252	-4,227	-5,084	-5,084	-5,064	-5,826	-4,694	-1,272	-805	-805	-808
CAP. INCREASE +	3,883	34,248	6,661			1,482	4,574										
L.T. LOAN PAY. +	3,882	34,248	6,661			1,483	4,574										
LTL REPAYMENT +			388	3,813	4,479	4,479	4,479	4,627	5,084	5,084	5,084	5,085	4,694	1,272	805	805	808
S.T. LOAN PAY. +			801	2,451	358	427											
STL REPAYMENT +						3,504	427										
SURPLUS CASH +			154	29	20	39				17	18	41	19	41	18	17	7
SURPLUS DEPOS. +							3,709	4,461	5,340	5,084	2,972	1,389	2,071	6,395	7,003	6,995	7,634

Table III-6-7 PROJECTED CASH FLOW STATEMENT (2/2)

Unit: 1000US$

ITEM/YEAR +/-	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SALES REVENUE +	26,590	27,590	28,637	29,709	30,783	31,839	32,911	33,988	35,076	35,076	35,076	35,076	35,076
OPERATING EXP. +	10,561	10,808	11,401	11,677	11,890	12,078	12,397	12,560	14,633	14,633	14,630	14,630	14,341
MATERIAL COST +	3,499	3,641	3,780	3,722	4,063	4,203	4,344	4,486	4,630	4,630	4,630	4,630	4,630
DIRECT EXPENSE +	663	690	718	743	770	786	823	855	877	877	877	877	877
LABOR COST +	3,672	3,672	3,672	3,672	3,672	3,672	3,672	3,672	4,912	4,912	4,912	4,912	4,912
INDIRECT COST +	2,250	2,313	2,736	2,334	2,866	2,878	2,928	3,301	3,040	3,030	3,037	3,037	3,348
A.S.S. EXP. +	478	487	497	508	519	529	540	551	574	574	574	574	574
NON-OP. EXP. +	7,528	7,974	8,547	9,001	11,147	11,259	12,674	13,739	14,538	14,059	14,314	14,600	14,159
TANGIBLE F.A. +	360			170	1,783	1,472			35	281	239		
WORKING CAP. +	20	30	20	23	35	20	20	30	20				
DEF. CHARGES +													
INTEREST-STL +	-1,637	-1,645	-1,386	-2,380	-2,287	-2,487	-2,639	-2,933	-3,059	-3,208	-3,399	-3,609	-3,735
INTEREST-LTL +	11												
PROFIT SHAR. +	1,177	1,361	1,406	1,474	1,578	1,662	2,998	2,255	3,347	2,333	2,385	2,451	2,431
TAX +	4,398	4,866	5,313	5,570	5,919	6,003	7,629	9,497	9,370	8,458	8,388	9,233	9,153
DIVIDEND +	3,099	3,422	3,691	5,947	4,123	4,559	5,618	5,860	6,125	6,239	6,199	6,502	6,323
SURPLUS OR DE. +	8,488	6,798	8,689	9,429	7,748	8,502	7,939	7,687	6,705	6,991	6,722	6,866	6,876
FUND PROCURE. +	-461												
CAP. INCREASE +													
L.T. LOAN PAY. +													
LTL REPAYMENT +	461												
S.T. LOAN PAY. +													
STL REPAYMENT +	61	71	181	31	71	51	71	31	441				
SURPLUS CASH +													
SURPLUS DEPOS. +	7,949	8,793	8,671	9,021	7,739	8,497	7,933	7,679	6,861	6,991	6,732	6,866	6,876

- 276 -

6-3 Analyses of Financial Soundness and Profitability

6-3-1 Analyses of financial soundness

(1) Financial ratios

The following five financial ratios are selected from the generally accepted management indices as the object of analyses:

1) Current ratio - This is a ratio of short term debt to fund necessary to pay back the debt. The larger is the ratio, the more surely the debt can be paid back. It is desirable that the ratio is kept larger than 150%. The calculation formula is as follows:

Current ratio
    = Current assets/Current liabilities x 100

2) Fixed assets to net worth ratio - This ratio shows how the fixed assets like building, equipment, etc. are covered by the net worth, and it is desirable that the ratio is less than 100%.

Fixed assets to net worth ratio
    = Fixed asset/Net worth x 100

(The fixed assets exclude the depreciation expenses.)

3) Debt service coverage ratio - This is an index to show the ability to pay back debt, and it is desirable that the value is larger than 150.

The calculation formula is as follows:

Debt service coverage ratio
    = (After tax profit + Depreciation
       expenses + Interest expenses)/(Refund
       principal + Interest expenses) x 100

4) Turnover of total operating assets - This ratio
   shows the turnover of capital invested for the
   business, and a higher value means that the capital
   is used highly efficiently.

   The calculation formula is as follows:

   Turnover of total operating assets
   = Sales/Total operating assets

5) Ratio of operating profit to net sales - This is an
   important ratio, which shows the profitability and
   business efficiency as well as profit margin.

   The calculation formula is as follows:

   Ratio of operating profit to net sales
   = Operating Profit/Sales x 1000

   The financial ratios calculated from the financial
   statements are shown in Table III-6-8.

Table III-6-8   FINANCIAL RATIOS

Ratio / Year	Current ratio (%)	Fixed assets to net worth ratio (%)	Debt service coverage ratio (%)	Turnover of total operating assets (Time)	Ratio of operating profit to net sales (%)
1992	50	200	73	0.08	-32
2002	400	72	202	0.32	38

Table III-6-9 shows financial ratios of Japanese shipbuilders and repair shops in 1986 as reference data.

Table III-6-9   FINANCIAL RATIOS OF JAPANESE
SHIPYARD AND SHIPREPAIR YARD

Kind of ratio	Large enterprise	Medium & small	
		Positive	Deficit
Current ratio (%)	126	175.8	144.6
Fixed assets to net worth ratio (%)	157	114.7	198.8
Turnover of total operating assets (Time)	0.64	1.2	1.2
Ratio of operating profit to net sales (%)	1.3	1.8	-5.2

(Source: "Management indices of Medium and Small
Enterprises (1986)" by Medium and Small
Enterprises Diagnosis Association

"Business   Analysis   of   Japanese   Enterprises
(1985)" by Ministry of International Trade and
Industry

(2) Break-even point analysis

Break-even   point   analysis   is   necessary   to   assess
the   relations   among   sales,   cost   and   profits.   The
break-even   point   shows   a   level   of   business   activity
where the income is equal to the cost.   This means
that no profit is obtained at this point.

The break-even point ratio can be obtained by the
following calculation formula, and the results are
shown in Table III-6-10:

Ratio of break-even point to sales amount
    = Ratio of fixed cost to net sales/(1-Ratio of
      variable cost to net sales) x 100

Ratio of fixed cost to net sales
    = Fixed cost/Net sales x 100

Fixed cost
    = Labor cost + Manufacturing overhead less expenses
      strongly related to sales (production) + General
      administrative and selling expenses + Net non-
      operating expenses

Variable cost
    = Total cost - Fixed cost

Total cost
    = Cost of production + General administrative and
      selling expense + Net non-operating expenses

Table III-6-10   BREAK-EVEN POINT RATIO

Year	Ratio
1992	185
1993	146
1994	112
1995	87
1996	81
1997	79
2002	57

(Reference data —   The break-even point ratio
                    of Japanese large shipyard
                    and repair yard was 95% in
                    1984)

(3) Simple payback period of invested capital

The payback period shows in how many years the total invested capital can be recovered. The calculation of the payback period is shown in Table III-6-11. It takes no less than 13 years to recover the invested capital for the reason of a large amount of investment.

6-3-2 Analyses of profitability

(1) Financial internal rate of return (FIRR)

The FIRR is generally used to evaluate profitability of such projects to which great amounts of capital have been invested for long terms, and this index is used for the evaluation of this proejct.

The FIRR is a discount rate satisfying the following calculation formula:

$$\sum_{i=0}^{n-1} \frac{Ii - Oi}{(1 + FIRR)^i} = 0$$

n = Period of calculation
Ii = Cash inflow in the ith year.
Oi = Cash outflow in the ith year.

Table III-6-12 shows the calculation of the FIRR, and the FIRR of this project is 9.9%.

(2) Sensitivity analyses

The purpose of sensitivity analyses is to find out how the FIRR is influenced by the change of assumption of key variables (sales amount, operating cost, investment cost).

Table III-6-11 SIMPLE PAYBACK PERIOD

Unit: 1000US$

ITEM/YEAR	+/-	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
INVESTMENT	+	7.765	68.496	13.476	29	80	5.124	9.224	270	20	27	198	1.795	1.493	19	19	72
TANGIBLE F.A.	+	5.670	65.499	13.322			5.000	9.204	260			170	1.781	1.472			35
DEF. CHARGES	+	2.095	2.767														
WORKING CAP.	+		230	154	29	80	124	20	10	20	27	28	14	21	19	19	37
PAYBACK	+			1.836	3.972	6.369	9.189	10.222	10.717	10.682	9.385	9.476	9.928	9.434	9.206	9.204	9.228
OP. PROFIT BIT	+			-2.215	-994	1.403	4.429	5.177	5.330	5.603	5.916	6.346	6.908	6.360	9.233	9.429	9.458
+ DEPRECIATION	+			4.051	4.966	4.966	4.966	5.351	5.732	5.732	5.732	5.732	5.735	4.962	4.692	4.661	4.661
-TAX	-									445	1.786	2.047	2.072	2.989	3.707	3.664	3.892
-PROFIT SHAR.	-							206	366	345	428	477	555	643	869	981	1.022
BALANCE UNPAID	+	7.765	76.261	87.901	83.958	77.669	71.604	70.606	60.159	49.517	40.159	30.881	22.748	14.757	5.570	-3.603	

Table III-6-12 FIRR CALCULATION (1/2)

Unit: 1000US$

ITEM\YEAR	+/-	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
SALES REVENUE	+			6,786	10,059	13,152	17,303	17,994	18,702	19,394	20,104	20,813	21,523	22,234	22,945	23,689	24,378	25,451
LABOR COST R.	-			1,746	2,199	2,594	3,133	3,100	3,129	3,179	3,246	3,307	3,307	3,307	3,307	3,307	3,672	3,672
LABOR COST A.	-			117	140	147	160	202	202	202	202	211	211	211	211	211	211	211
O.COST(INC.DP)	-			7,318	8,715	9,008	9,581	9,515	10,041	10,210	10,749	10,949	11,097	10,333	10,192	10,722	10,927	10,989
DEPRECIATION	+			4,051	4,986	4,986	4,866	5,351	5,732	5,732	5,732	5,732	5,735	4,962	4,661	4,661	4,661	4,516
PROFIT SHAR.	-							206	306	345	423	477	555	643	869	981	1,022	1,057
TANGIBLE F.A.	-	5,670	85,499	13,322			3,000	9,204	260			170	1,781	1,672			35	261
DEFERRED EXP.	-	1,998	1,717															
WORKING CAP.	-	230	154	29	90	124	20	10	20	27	28	14	21	19	31	37	27	
NET CASH F. REAL		-7,668	-87,446	-11,640	3,933	6,289	6,271	1,093	10,486	11,170	11,193	11,403	10,293	11,239	13,006	13,073	13,135	13,734

ITEM\YEAR	+/-	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
SALES REVENUE	+	26,508	27,580	28,637	29,709	30,783	31,839	32,911	33,986	35,076	35,076	35,076	35,076	35,076
LABOR COST R.	-	3,672	3,672	3,672	3,672	3,672	3,672	3,672	3,672	4,912	4,912	4,912	4,912	4,912
LABOR COST A.	-	211	211	211	211	211	211	211	211	223	223	223	223	223
O.COST(INC.DP)	-	11,043	11,285	11,878	12,156	12,364	9,482	9,266	9,519	9,740	9,519	9,292	9,292	9,303
DEPRECIATION	+	4,360	4,360	4,360	4,360	4,357	1,287	842	842	842	623	397	397	397
PROFIT SHAR.	-	1,177	1,301	1,406	1,474	1,576	1,682	2,096	2,245	2,347	2,326	2,335	2,465	4,858
TANGIBLE F.A.	-	260			170	1,781	1,472			35	261	260		-1,865
DEFERRED EXP.	-													
WORKING CAP.	-	6	7	18	8	8	5	7	8	44				-1,191
NET CASH F. REAL		14,499	15,464	15,812	16,378	15,329	16,662	18,501	19,173	18,637	18,458	18,421	18,641	18,433

Table III-6-12 FIRR CALCULATION (2/2)

Year\D. Rate	N. C. F.	P. V.	C. P. V.
1990 1.000	-7,668	-7,668	-7,668
1991 0.910	-67,446	-61,354	-69,022
1992 0.827	-11,640	-9,632	-78,654
1993 0.753	3,943	2,968	-75,686
1994 0.685	6,289	4,306	-71,379
1995 0.623	6,271	3,906	-67,473
1996 0.567	1,098	622	-66,851
1997 0.515	10,486	5,405	-61,446
1998 0.469	11,170	5,237	-56,208
1999 0.427	11,193	4,774	-51,434
2000 0.388	11,403	4,424	-47,010
2001 0.353	10,293	3,633	-43,377
2002 0.321	11,206	3,598	-39,779
2003 0.292	13,006	3,799	-35,981
2004 0.266	13,078	3,475	-32,506
2005 0.242	13,135	3,175	-29,332
2006 0.220	13,734	3,019	-26,312
2007 0.200	14,499	2,900	-23,412
2008 0.182	15,464	2,813	-20,599
2009 0.165	15,812	2,617	-17,982
2010 0.151	16,378	2,466	-15,517
2011 0.137	15,529	2,127	-13,390
2012 0.125	16,602	2,068	-11,322
2013 0.113	18,501	2,097	-9,225
2014 0.103	19,173	1,976	-7,249
2015 0.094	18,617	1,746	-5,503
2016 0.085	18,458	1,575	-3,929
2017 0.078	18,421	1,429	-2,499
2018 0.071	18,641	1,316	-1,184
2019 0.064	18,433	1,184	0

Unit of N. C. F.: 1000US$
Discount Rate: 9.9302 %
Total of OPV from 1990 to 2019 : .0773926

The result of sensitivity analyses is shown in Table III-6-13.

Table III-6-13   SENSITIVITY ANALYSES OF FIRR

Varying factor	Variation	FIRR (%)
Basis	-	9.9
Sales	10% up	11.7
	10% down	8.0
Initial investment & reinvestment	10% up	9.0
	10% down	11.0
Labor cost	10% up	9.6

(On the assumption that each variable fluctuates independently)

6-4 Evaluation of Financial Analyses

The financial soundness of the project at the start of operation on 1992 is not so good in the light of five indices of financial ratio, such as current ratio, fixed asset to net worth ratio, debt service coverage ratio, turnover of total operating assets, and ratio of break-even point to net sales, because small amount of sales, deficit in revenue and borrowing the short term loan in order to make up the deficit.

However, the soundness will be improved gradually in accordance with the enhancement of productivity and increasing of sales. On 2002 after 10 years from the start of operation, the indices of soundness are observed as to be excellent.

The FIRR indicating the profitability of the project is 9.9% and the results of sensitivity analysis corresponding to the decrease of 10% for the projected sales amount and increase of 10% for the projected investing amount are given 8% and 9% respectively.

The foregoing results of calculation indicate the projected dockyard to be worth implementing from financial aspects, in view of the prevailing levels of deposite rate in Mexico which is assumed as 3 - 4%.

7. Economic Analyses

In the previous Chapter, the profitability and
financial soundness of this project from the standpoint of
a private shiprepairing company were examined.

In this Chapter, this repair dockyard will be analysed
from wider viewpoint such as Mexican economy or Lazaro
Cardenas area. For the purpose, the benefits and costs of
the construction and operation of this repair dockyard will
be quantitatively assessed at first from the point of
Mexican economy. As a step of the assessment, the benefits
and costs will be reassessed from the point of opportunity
cost, and the economic internal rate of return (EIRR) is
calculated on the basis of the results.

In addition, the economic effects (increase of employ-
ment opportunity, reduction of outflow of foreign currency,
acquisition of foreign currency, improvement of managerial
and technical abilities, and linkage effects on related
industries) caused by the construction and operation of
this repair dockyard will be analysed.

7-1 Calculation of Economic Internal Rate of Return

When calculating the financial internal rate of
return, costs and benefits of a project are calculated by
using dominant market prices at a time. On the other hand,
in the calculation of the economic internal rate of return,
the net benefit of a project is obtained by using the
shadow price based on the opportunity cost instead of
market prices. Whether or not the net benefit of this
project exceeds the opportunity cost of the capital comes
to be important data to know the feasibility of this
project.

In this economic analyses, the economic internal rate
of return will be calculated by removing transfer items and
partly applying the shadow price.

7-1-1   Removal of transfer items

Subsidy and tax are generally considered as transfer items. For example, when a government subsidy is available for the production of certain goods, the subsidy is not a financial expense to the producer but is a social expense. Tax is a expense to an enterprise which pay the tax. But tax only flows to the government. It does not consume resources and is not an expense from the view point of national economy.

No subsidy will be provided for the construction and operation of this repair dockyard, and the import duties on imported equipments and materials for the construction of this repair dockyard have been assumed to be exempted due to favourable treatment in the taxation system. The construction and operation of this shiprepair dockyard causes an expense to invite a supervisor from a country advanced in shiprepairing. This expense includes tax on technical assistance fee. Since this tax is transfer item, it is excluded from the expense. Materials imported for the operation of this repair dockyard are exempted from import duties if they are used for foreign flag ships, but import duties are imposed on those imported materials used for Mexican flag ships. Since such import duties are transfer items, they can be removed from expense. Also, engineers should be invited from countries advanced in shiprepairing for several years before and after the commencement of the operation, but the expenses for inviting experts include tax. Since this tax is a transfer item, it can be removed from the expense.

7-1-2   Shadow wage rate

Economic cost of labor is generally obtained by considering what is lost by using labor for a project. In other words, the economic cost of labour is measured by the value of a marginal product which is lost in

other application of total economy by employing a worker additionally for the project. Labor is classified to skilled and unskilled ones in general.

It has been assumed that the market mechanism works as far as skilled labor is concerned, and the market wage rate used for the financial analysis almost reflects the opportunity cost of skilled labor.

On the other hand, a problem concerning unskilled labor is how the labor force is supplied. If the wholly unemployed are used to fill the labor force, the opportunity cost is considered to be zero. If the labor force is supplied by workers of other companies, the opportunity cost is considered to be almost equal to the market wage of unskilled worker.

The minimum wage in Mexico, though renewed taking inflation into account, was 3,050 peso/day.man in January, 1987 and 3,660 peso/day.man in April, 1987, and, even if expenses for social insurance, etc. are taken into account, the annual minimum wage is presumed to be about 1.5 million peso. This amount is only about a half of the unskilled worker's wage assumed in the financial analysis.

Though Mexico has no authorized statistic data on unemployment, considerable amount of unskilled labor force is supposed to be in an underemployment conditions.

Taking this situation into account, the shadow wage rate has been calculated on the basis of the following premises: It has been assumed that average value added for an employed worker is almost equal to the minimum wage in the division where labor force is pooled in an underemployment condition, and that the law of diminishing returns works so that the marginal productivity is smaller than the average productivity and is about 70%. The marginal productivity was calculated with the following formula:

Average value added for a person in under-employment condition

   = Minimum wage

Marginal productivity in under-employment condition

   = Average value added per person in uder-employment condition x 0.7 = Minimum wage x 0.7

Shadow wage rate

   = Minimum wage x 0.7 = 1.5 million peso x 0.7

   = 1.05 million peso = About 1/3 of market wage

7-1-3   Shadow exchange rate

There is a certain gap between the price level in the domestic market and the border price due to various trade and foreign exchange policies.

On the occasion of the economic crisis in 1982, the dual foreign exchange market of controlled and free exchange rates was adopted, and the controlled foreign exchange market has been applied to about 80% of foreign exchange transactions in Mexico.   The controlled exchange rate has been set by the central bank in view of domestic and overseas price tendencies, demand and supply of exchange, foreign exchange reserves, etc., and the basis of the exchange policy was the improvement of trade balance (restraint of import and promotion of export).   Mexico devalued the exchange rate with the U.S. Dollar greatly every year.   In connection with these facts, the shadow exchange rate was assumed to be peso 1,200 = US$1.0, through the discussion between the Study Team and the counterparts, considering the foreign exchange policy of Mexican Government in July 1987.

Based on the new data obtained by the Study Team and the counterparts, however, the shadow the exchange rate has been set to be peso 1,289 to US$ one by the following calculation.

The relations between shadow exchange rate (SER), official exchange rate (OER) and standard conversion factor (SCF) is described in the following formula:

$$SER = \frac{OER}{SCF}$$

SCF is calculated by the following formula:

$$SCF = \frac{M + X}{(M + Tm) + (X - Tx)}$$

where,

    M : CIF value of imports
    X : FOB value of exports
    Tm: All taxes on imports
    Tx: All taxes on exports

The conversion rates applied to this feasibility study are shown in Table III-7-1, which indicates SCF is 0.948.

The table was made in July 1984, but SER has been calculated as follows on the assumption that there were no big variance on the standard conversion factor.

$$SER = \frac{OER}{SCF} = \frac{1,317}{0.948} = 1,389$$

Table III-7-1 CONVERSION FACTOR

Conversion factor	Foreign currency	Wage (quali- fied)	Wage (Un- quali- fied)	Economi- cal surplus	Accounting price ratio
Conversion factor of intermediate goods	0.195	0.088	0.096	0.496	0.875
Conversion factor of private consumption	0.173	0.230	0.015	0.511	0.929
Conversion factor of public consumption	0.081	0.651	0.008	0.217	0.957
Conversion factor of investment	0.292	0.311	0.014	0.381	0.998
Standard conversion factor	0.198	0.278	0.015	0.458	0.948

(Source: Nacional Financiera, S.A. Y Banco Interamericano de Desarrollo Seminario para el Calculo de los Precios de Cuenta en Mexico Julio de 1984)

7-1-4   Evaluation of benefits and costs

(1)   Evaluation of benefits

When this repair dockyard is operated, the direct benefit is the sales income obtained from the shiprepair service. The service price for repairing ships used in the financial analyses has been set on the basis of price tendencies in the international markets in order to make this dockyard an internationally competitive one. Therefore, if this project is not executed, Mexico will encounter outflow of foreign currency equivalent to international market price and also loose the opportunity to acquire foreign currency.

Therefore, the service price in this economic analyses has been based on the one used in the financial analyses.

(2)   Evaluation of costs

The economic costs of goods invested for the construction and operation of this shiprepair dockyard were calculated on the basis of the price used in the financial analyses together with the following premises, and, as for locally supplied goods, the shadow foreign exchange rate was applied to get their economic costs:

1)   Demands increased by this project will be met by flexible increase of supply and will not take opportunities of other consumers.

2)   For suppliers of goods to this project, no large production capacity will be made idle.

3)   Goods shall be freely purchased without restriction by distribution or managed price.

As for the labor costs incurred during the construction and operation of this shiprepair dock

yard, it has been assumed that 30% of them are to be paid to unskilled workers during construction and in the stage of operation, 10% of total direct workers are to be unskilled workers. The shadow wage rate was applied to the economic cost of unskilled workers.

7-1-5   Economic internal rate of return (EIRR)

The economic profitability of this project is assessed by the economic internal rate of return (EIRR), and it is a discount rate which satisfies the following calculation formula:

$$\sum_{i=0}^{n-1} \frac{Bi - Ci}{(1 + EIRR)^i} = 0$$

where, n =   Period of calculation
       Bi =   Benefit amount in the ith year
       Ci =   Cost amount in the ith year

Table III-7-2 shows calculation of EIRR. The EIRR from this comes to be 11.0%. Opinions differ in deciding how many percents of the internal rate of return is required for a project to be feasible. But when the EIRR exceeds the opportunity cost of the capital, the project is considered to be feasible.

The cut-off rates used in some development bank are around 10%.

In case of newly-established shiprepair yard project 10% of the internal rate of return is considered to be among the high group. The EIRR of this project is 11%, and this project is considered to be feasible.

Table III-7-2 EIRR CALCULATION (1/2)

Unit: 1000US$

ITEM/YEAR	+/-	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
BENEFIT	+			6,966	10,059	13,152	17,303	17,994	18,702	19,354	20,104	20,613	21,523	22,234	22,943	23,659	24,378	25,453
LABOR COST	-			1,686	2,121	2,478	2,986	2,997	3,022	3,039	3,129	3,193	3,193	3,193	3,193	3,193	3,526	3,526
OTHER COST	-			2,811	3,305	3,700	4,305	3,974	4,113	4,274	4,778	4,976	5,115	5,128	5,277	5,781	5,976	6,174
PROFIT SHAR.	-							195	290	327	406	452	526	610	624	530	969	1,002
TANGIBLE F.A.	-	5,236	63,499	12,460			2,729	8,832	246			161	1,688	1,395				247
DEFERRED EXP.	-	1,898	1,591															
WORKING CAP.	-		228	146	27	76	118	19	9	19	26	27	13	20	18		29	26
NET BENEFIT		-7,134	-65,118	-10,137	4,608	6,898	7,165	1,977	11,022	11,705	11,765	12,004	10,988	11,888	13,651	13,736	13,839	14,460

ITEM/YEAR	+/-	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
BENEFIT	+	26,508	27,580	28,657	29,709	30,785	31,839	32,911	33,988	35,076	35,076	35,076	35,076	35,076
LABOR COST	-	3,526	3,526	3,526	3,526	3,526	3,526	3,526	3,526	4,656	4,656	4,656	4,656	4,656
OTHER COST	-	6,375	6,606	7,170	7,435	7,636	7,816	8,035	8,276	8,486	8,486	8,486	8,485	8,495
PROFIT SHAR.	-	1,116	1,235	1,333	1,397	1,494	1,595	1,987	2,128	2,225	2,205	2,242	2,280	4,605
TANGIBLE F.A.	-	246			161	1,688	1,395			33	247	246		-1,065
DEFERRED EXP.	-													
WORKING CAP.	-	6	7	17	8	7	5	7	8	42				-1,129
NET BENEFIT		15,239	16,208	16,591	17,182	16,432	17,502	19,356	20,048	19,652	19,452	19,447	19,655	19,514

Table III-7-2   EIRR   CALCULATION (2/2)

Year\D. Rate	N. C. F.	P. V.	C. P. V.
1990	1.000	-7,134	-7,134	-7,134
1991	0.901	-65,118	-58,670	-65,804
1992	0.812	-10,137	-8,229	-74,032
1993	0.731	4,608	3,370	-70,662
1994	0.659	6,898	4,545	-66,117
1995	0.594	7,165	4,254	-61,863
1996	0.535	1,977	1,058	-60,806
1997	0.482	11,022	5,312	-55,494
1998	0.434	11,705	5,082	-50,411
1999	0.391	11,765	4,603	-45,809
2000	0.352	12,004	4,231	-41,578
2001	0.318	10,988	3,489	-38,088
2002	0.286	11,888	3,401	-34,687
2003	0.258	13,631	3,514	-31,173
2004	0.232	13,736	3,190	-27,983
2005	0.209	13,839	2,896	-25,087
2006	0.189	14,460	2,726	-22,360
2007	0.170	15,239	2,589	-19,772
2008	0.153	16,208	2,481	-17,291
2009	0.138	16,591	2,288	-15,004
2010	0.124	17,182	2,135	-12,869
2011	0.112	16,432	1,839	-11,030
2012	0.101	17,502	1,765	-9,265
2013	0.091	19,356	1,759	-7,506
2014	0.082	20,048	1,641	-5,865
2015	0.074	19,632	1,448	-4,417
2016	0.066	19,482	1,295	-3,122
2017	0.060	19,447	1,164	-1,958
2018	0.054	19,655	1,060	-897
2019	0.049	19,514	948	51

Unit of N. C. F.: 1000US$
Discount Rate: 10.991 %

7-1-6   Sensitivity analyses

        In the financial analyses, sensitivity analyses
were carried out on five cases, and the EIRR of each
case is as follows:

        10% increase of Sales - 12.8%
        10% decrease of Sales - 9.1%
        10% increase of initial investment and reinvestment
                                                - 10.0%
        10% decrease of initial investment and reinvestment
                                                - 12.1%
        10% increase of labor costs - 10.7%

7-2   Economic Effects of the Construction and Operation of this
       Shiprepair Dockyard.

       This project is considered to bring about the follow-
ing benefits additionally:

(1)   Increase of employment opportunity

(2)   Diminution of foreign currency outflow and increase
       of foreign currency inflow

(3)   Enhancement of managerial and technical capabilities

(4)   Linkage effects on associated industries

7-2-1   Increase of employment opportunity

       As mentioned in Section II, Chapter 3, Industrial
Development Program in Mexico, the Mexican economy has
come under the challenge that the new labor force of
900,000 workers participates in the market every year
according to the National Program of Industrial
Development and Foreign Trade 1984 - 1988 (Programa
Nacional de Fomento Industral y Comercial Exterior 1984
- 1988) prepared by the SECOFIN (Secretaria de Comercio
y Fomento Industrial), and creation of new employment
has become an urgent matter.

Ship repairing industry is said to be a labor-intensive
industry as it is easily understood from the fact that
labor cost occupies higher percentage of cost, and
advanced   countries   like   Japan   have   lost   their
comparative   advantages   while   nations   with   abandant
inexpensive   good   labor   force   have   come   to   get
comparative advantages.   Such circumstances being taken
into   account,   ship   repairing   industry   can   be   said
suitable to Mexico.

       Table III-7-3 shows employment opportunities, which
are to be created by the construction and operation of
this shiprepair dockyard, by the various categories of
labor.   It is indicated that, in 1991 --at the peak of

construction of this shiprepair dockyard --1,300 Jobs will be offered, and upon entrance into stable operation --for instance in 2015, the Jobs established will number 1,400.

The number of employment opportunity to be created by this project is not so small as the number of employees of the existing projects in the Lazaro Cardenas area.

Also, this project can employ unskilled workers for its construction and operation, and this means that this project can provide employment opportunities even to half-unemployed workers without special skills. So, this project can be said to be very important from a social point of view.

7-2-2 Diminution of foreign currency outflow and increase of foreign currency inflow

As mentioned in Section II, Chapter 3, Industrial Development Program in Mexico, the Mexican economy has faced the basic problems of "Lack of Balance between Industrial Development and Foreign Trade".

Though Mexico's trade balance has been in the black since 1982, the current balance marked surpluses in 1984 and 85, but turned to red in 1986. Also, in view of the fact that Mexico has the world second largest cumulative debt after Brazil (except the U.S.A.), saving and acquisition of foreign currency are said to be very important problems to Mexican economy, and it is desirable that any project for industrial development can contribute for saving and acquisition of foreign currency.

To judge that a project is for saving, acquiring or consuming foreign currency, "the modified Bruno ratio (Bruno ratio modified to a discount basis)" is used as an index. This ratio is used to calculate the amount of domestic currency required to save or acquire a unit of

foreign currency throughout the whole period of a project (net domestic currency cost modified to a discount base/net foreign currency benefit modified to a discount base), and when both the domestic currency cost and the foreign currency benefit are shown in the same currency, 1.0 is the cut-off rate.

"The modified Bruno ratio" of this project was calculated in the pattern shown in Table III-7-4 under the following premises:

(1) Mexican flag ships which may enter this repair dockyard have been supposed to be repaired outside Mexico unless this dock yard exists.

(2) Foreign currency cost has been assumed to take 50% of direct material costs.

(3) Foreign currency cost has also been assumed to cover labor costs of engineers dispatched from outside Mexico.

(4) Education and training expenses outside Mexico have been assumed to be foreign currency cost.

(5) Other operational expenses have been assumed to be domestic currency costs.

(6) Investment cost

The labor costs for civil engineering and construction supervisors were assumed to be foreign currency costs, and other expenses related to civil engineering and construction works were to be domestic currency costs.

Initial expenses such as labor costs for foreign engineers and engineering expenses for bid preparation etc. have been assumed to be foreign currency cost, and other initial expenses have been assumed to be domestic currency costs.

(7) The discount rate has been assumed to be 10%

The resulted modified-Bruno-ratio has proved to be 0.89, indicating the positive nature of the present project in respect of its contribution to saving foreign currency outflow and to increasing its inflow.

Based on the premise above mentioned, the concrete figure of total amount of both saving and foreign currency acquisition is estimated as follows:

Approximately US$17,303,000 in 1995
Approximately US$24,378,000 in 2005
Approximately US$35,076,000 in 2015

The net total amount of both saving and foreign currency acquisition throughout the project life, offsetting the amount of imported equipment for the dockyard construction and imported material for the dockyard operation, become to US$603,282,000 which is valued as US$106,878,000 at present, applying the discount rate of 10%.

Table III-7-3 NEW EMPLOYMENT CAUSED BY CONSTRUCTION AND
OPERATON OF SHIPREPAIR DOCKAYRD

(Unit: Number of person)

Item \ Year	1990	1991	1992	1993	1994	1995	2000	2005	2015
Civil engineering & building									
Indirect worker	10	20	20			5	5		
Direct worker (skilled)	110	560	230			80	100		
Direct worker (unskilled)	130	650	260			90	120		
Total	250	1,230	560			175	225		
Operation									
Indirect worker	10	39	85	97	105	113	117	124	131
Direct worker (skilled)		36	370	471	559	687	679	814	1,117
Direct worker (unskilled)		4	41	52	62	76	75	90	124
Total	10	79	496	620	726	876	871	1,028	1,372
Grand total	260	1,309	1,006	620	726	1,051	1,096	1,028	1,372

Table III-7-4 MODIFIED BRUNO RATIO CALCULATION (1/2)

Unit: 1000US$

ITEM\YEAR	+/-	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
F.N. EARNING	+	-3,252.01	-42,877.01	1,322.01	8,143.01	11,572.01	15,521.01	16,824.01	17,466.01	18,133.01	18,787.01	19,460.01	20,124.01	20,788.01	21,452.01	22,130.01	22,733.01	23,722.01
BENEFIT	·			5,386.01	10,053.01	13,132.01	17,393.01	17,954.01	18,792.01	19,354.01	20,164.01	20,213.01	21,523.01	22,234.01	22,943.01	23,688.01	24,378.01	25,435.01
IMP. MATERIAL	+			493.01	654.01	865.01	1,125.01	1,176.01	1,216.01	1,261.01	1,367.01	1,353.01	1,399.01	1,446.01	1,491.01	1,523.01	1,535.01	1,651.01
DIS. ENGINEER	+			1,375.01	1,232.01	702.01	445.01											
TRAINING IN FC	+				23.01	23.01	23.01											
TANGIBLE F.A.	+	1,444.01	41,534.01	3,196.01			129.01	4,665.01										
DEF. CHARGES	+	1,306.01	593.01															
WORKING CAP.	+		184.01															
DISCOUNTED E.	+	-3,252.01	-38,798.01	1,605.01	6,118.01	7,504.01	9,674.01	9,497.01	8,974.01	8,459.01	7,972.01	7,502.01	7,053.01	6,623.01	6,215.01	5,827.01	5,457.01	5,175.01
D.N. COST	+	3,382.01	22,441.01	12,079.01	3,535.01	4,674.01	8,416.01	10,182.01	6,494.01	6,428.01	7,032.01	7,455.01	9,135.01	8,900.01	7,821.01	8,394.01	8,954.01	9,322.01
LABOR COST	+			1,886.01	2,121.01	2,478.01	2,957.01	3,022.01	3,063.01	3,123.01	3,193.01	3,193.01	3,193.01	3,362.01	3,193.01	3,193.01	3,526.01	3,526.01
OTHER COST	+			503.01	1,367.01	2,100.01	2,712.01	2,804.01	2,837.01	3,013.01	3,471.01	3,622.01	3,716.01	3,682.01	3,785.01	4,242.01	4,391.01	4,521.01
PROFIT SHAR.	+						195.01	290.01	327.01	465.01	492.01	525.01	510.01	824.01	930.01	933.01	1,002.01
TANGIBLE F.A.	+	3,792.01	21,995.01	9,264.01		2,580.01	4,157.01	246.01			181.01	1,688.01	1,335.01		22.01	247.01
DEF. CHARGES	+	90.01	462.01														
WORKING CAP.	+		44.01	146.01	27.01	76.01	118.01	8.01	18.01	27.01	13.01	23.01	23.01	18.01	23.01	35.01	25.01
DISCOUNTED C.	+	3,552.01	20,461.01	8,982.01	2,555.01	3,132.01	5,225.01	5,748.01	3,327.01	2,938.01	2,522.01	2,874.01	2,202.01	2,633.01	2,228.01	2,223.01	2,444.01	2,022.01
		8,394.01	28,455.01															

Note: DISCOUNTED NET FOREIGN EARNING(ACCUMULATED)=106878 DISCOUNTED NET DOMESTIC COST(ACCUMULATED)=95532 BASED ON 10% DISCOUNT RATE ==BRUNO RATIO=95532/106878=0.89==

Table III-7-4   MODIFIED BRUNO RATIO CALCULATION (2/2)

Unit: 1000US$

ITEM\YEAR	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
F.H. EARNING +	24,765.0	25,737.0	26,775.0	27,777.0	28,782.0	29,766.0	30,772.0	31,777.0	32,736.0	32,736.0	32,736.0	32,736.0	32,736.0
BENEFIT +	26,508.0	27,590.0	28,637.0	29,705.0	30,783.0	31,839.0	32,911.0	33,986.0	35,076.0	35,076.0	35,076.0	35,076.0	35,076.0
IMP. MATERIAL +	1,723.0	1,793.0	1,862.0	1,932.0	2,001.0	2,070.0	2,139.0	2,209.0	2,280.0	2,280.0	2,260.0	2,280.0	2,280.0
DIS. ENGINEER +													
TRAINING IN FC +													
TANGIBLE F.A. +													
DEF. CHARGES +													
WORKING CAP. +													
DISCOUNTED E. +	4,902.0	4,633.0	4,378.0	4,128.0	3,888.0	3,656.0	3,437.0	3,225.0	3,027.0	2,752.0	2,502.0	2,273.0	2,066.0
O.H. COST +	9,546.0	9,579.0	10,184.0	10,595.0	12,350.0	12,267.0	11,416.0	11,729.0	13,154.0	13,314.0	13,349.0	13,141.0	13,282.0
LABOR COST +	3,526.0	3,526.0	3,526.0	3,526.0	3,526.0	3,526.0	3,526.0	3,526.0	4,656.0	4,656.0	4,656.0	4,656.0	4,656.0
OTHER COST +	4,852.0	4,813.0	5,308.0	5,503.0	5,635.0	5,746.0	5,896.0	6,057.0	6,208.0	6,206.0	6,205.0	6,205.0	6,215.0
PROFIT SHAR. +	1,116.0	1,233.0	1,333.0	1,397.0	1,494.0	1,595.0	1,987.0	2,128.0	2,225.0	2,205.0	2,242.0	2,280.0	4,605.0
TANGIBLE F.A. +	245.0			161.0	1,688.0	1,335.0			33.0	247.0	246.0		-1,065.0
DEF. CHARGES +													
WORKING CAP. +	6.0	7.0	17.0	8.0	7.0	5.0	7.0	8.0	42.0				-1,128.0
DISCOUNTED C. +	1,588.0	1,723.0	1,665.0	1,574.0	1,552.0	1,506.0	1,275.0	1,190.0	1,215.0	1,117.0	1,019.0	911.0	837.0
	78,638.0	80,560.0	83,895.0	85,388.0	91,622.0	93,024.0	92,366.0	95,845.0	106,722.0	108,649.0	108,371.0	99,618.0	99,618.0

Note: DISCOUNTED NET FOREIGN EARNING(ACCUMULATED)=106878 DISCOUNTED NET DOMESTIC COST(ACCUMULATED)=95532 BASED ON 10% DISCOUNT RATE ==BRUNO RATIO=95532/106878=0.89===

7-2-3   Enhancement of managerial and technical capabilities and linkage effects on associated industries

This project aims at getting international competitiveness. To attain this purpose, as shown in Table III-7-5, it is planned to receive various experts from countries advanced in shiprepair industry and at the same time to dispatch engineers of this shiprepair dockyard to such advanced countries. It is also planned that this dockyard provides personal training within industry centering on OJT in managerial and technical areas.

Executing the above methods, this company, at first, will obtain know-hows on advanced business and sales managements and also on factory management, and at the same time this dockyard will play a role to spread such know-hows to industries in Lazaro Cardenas area and to shiprepair industry and its related industries in Mexico and also to improve the business management technology in this country. Secondly, since shiprepair industry necessitates such jobs as those mentioned in Table III-7-6 from technical point of view, the operation of this dockyard will contribute to raise the technical levels of these jobs.

These jobs are not peculiar to the shiprepair industry and are widely useful for machine and metal working industries as well. So, this dock yard will help improve the technologies of these industries not only in Lazaro Cardenas area but also in Mexico.

In addition, input goods to shiprepair industry exert backward linkage effects on various industries as those to shipbuilding industry, a so-called comprehensive assembly industry do. Table III-7-7 shows the main input goods to ship repairing industry of Japan.

Principal input goods to shiprepair industry are ropes and fishing nets, paints, hot rolled steels, metal

door and shutters, other metal products, prime motors and boilers, conveyors.

Most of these main input goods can be domestically supplied in Japan, but in case of Mexican projects, some of them should probably be imported. Having been proceeding domestic production of intermediate goods, however, Mexico would increase domestic supplies. For example, when the second phase works of SICARTSA, which has already started the operation in the Lazaro Cardenas area, complete, this repair dockyard becomes a consumer of SICARTSA products and also of cast and forged steel products of Grupo Industrial NKS.S.A., de C.V.

As explained above, the shiprepair industry has comparatively wide inter-industrial relationship. So, the operation of this dockyard will surely contribute for the development of metalworking industry in the Lazaro Cardenas area. Table III-7-8 shows main input goods to construction industry of Japan, and they include gravels and building stones, fire bricks, raw concrete, hot rolled steel, metal products for construction repair of general machine etc. Some of these input goods are not available in Mexico, but as far as the construction of this dockyard is concerned, the civil engineering and building works are to be supplied by domestic suppliers. The construction of this dockyard does not exert influences outside Mexico, but on Mexican civil engineering and construction industries, contributing for the growth of construction industry in Lazaro Cardenas area.

Table III-7-5   RECEIPT AND DISPATCH OF ENGINEERS

(Unit: Number of person)

Year / Department	1990	1991	1992	1993	1994	1995
Receipt of engineers						
General administraton	1	1	1	1	1	1
Technology & sales	1	2	5	5	4	2
Factory management		2	2	1		
Hull		1	1	1		
Machine		1	1	1		
Total	2	7	10	9	5	3
Dispatch of engineers				2	2	2

Table III-7-6   TYPE OF JOBS IN SHIPREPAIR INDUSTRY

Department	Type of Job
Indirect job	Material control, (Procurement, Inventory control), Power supply, Tool keeping, Transportation, Crane operation, marshaling
Hull part	Metal work (fabrication, erection etc), Piping, Fitting, Welding, Wood work, Testing, Scaffolding, Docking work, Rigging, Painting, Cleaning
Enginer part	Machining, Finihsing, Fitting, Piping, Metal work, Welding, Cleaning, Electricity, Heat insulation, Plating, Galvanizing, Acid pickling

Table III-7-7   MAIN INPUT GOODS TO SHIPREPAIR INDUSTRY

(Japan, 1980)

(Unit: Mill. Yen)

Intermediate input goods	Price
Ropes and fish nets	9,311
Lumber	1,214
High-pressure gas	1,716
Paint, varnish and lacquer	19,831
Other final chemical products	3,141
Other glass and glass products	1,927
Hot rolled steel (ordinary steel)	38,615
Hot rolled steel (special steel)	1,011
Steel pipes and tubes (ordinary steel)	2,213
Steel pipes and tubes (special steel)	1,002
Cold-finished steel	2,334
Forged steel	1,768
Cast steel for machinery	2,652
Forged material for machinery	1,357
Other steel products	2,724
Cast and forged material for machinery (non-ferrous)	1,463
Metal doors and shutters	15,387
Other metal products for construction	20,643
Other metal products	1,694
Prime motors and boilers	41,093
Pumps and compressors	2,863
Conveyors	7,645
Other general industrial machinery and equipments	2,377
Other machinery and their parts	1,990
Transmission and distribution apparatus	2,274
Other industrial heavy electrical machinery	1,004
Other applied electronic equipments	1,371
Telecommunication machinery & related equipments	1,222
Electric power	1,750
Wholesale trade	29,077
Financial service, private	13,850
Road freight transport	3,694
Self-research	1,067
Packing	1,061
Total of intermediate sectors	285,656
Total of final demand sectors	144,368
Total domestic products (gross outputs)	430,024

(Source: Input-output table 1980 by the Administrative
Management Agency)

Table III-7-8   MAIN INPUT GOODS TO CONSTRUCTION INDUSTRY
(Japan, 1980)

(Unit: Mill. Yen)

Intermediate input goods	Price
Gravel and building stone	229,710
Lumber	33,904
Plywood	35,644
Rubber products	40,046
Light oil	34,880
Other petroleum refinary products	11,677
Paving material	29,038
Fire bricks	105,336
Raw concrete	342,956
Other cement products	150,737
Other non-metallic mineral products	38,183
Hot rolled steel (Ordinary steel)	162,791
Metal products for construction	224,009
Repair of general machinery	200,276
Copper electric wires and cables	112,696
Wholesale trade	285,545
Transport by private motor cars	101,637
Civil engineering and construction services	146,271
Total of intermediate sectors	3,377,091
Total of final demand sectors	2,453,617
Total domestic products	5,830,708

(Source: Input-output table 1980 by the Administrative
Management Agency)

7-3.   Evaluation of Economic Analyses

EIRR of this project is 11%.   The result of the
sensitivity analysis shows that even in case of decrease
10% for the proejcted sales amount or increse of 10% for
the projected investing amount, 9% and 10% of EIRR can
be kept respectively.

Considering   that   cut-off   rates   used   in   the
development banks   are   around   10%   in   general   and
consequential economic benefits, such as increase of
employment opportunities, increase of foreign currency
inflow, enhancement of managerial and technological
capabilities,   and   linkage   effects   on   associated
industries,   are   expected   from   this   Proejct
implmentation, the projected dockyard will efficiently
use country's resources and is economically viable.

JICA