

#### #4-4 Increase of Forging Capacity

- No.3 HI: Forging Shop -

##### (1) Objectives and Outline of the Plan

The existing forging shop was initially built to mainly produce forged parts for light vehicles. Although it is now producing some of the forged parts for heavy vehicles and agricultural machinery, it is not capable of producing large forged parts. For increased production it is necessary to expand its facilities.

The production plan calls for an increase in the production of forged parts being locally produced now. The current planned production quantity of 363 tons/year will have to be about twice in the future. To accomplish this it will be necessary to expand the production capacity of the existing forging shop.

The Renovation Plan includes projects to produce other forged parts locally in the future, but as they are mostly relatively large sized parts, it will not be possible to produce them with the existing facilities which are small in capacity. To cope with this situation, it will be necessary to induce the larger sized forging facilities commensurate to the forged parts being planned for future production. As the existing forging shop is small and has no room for expansion, a new one will have to be constructed.

The new forging shop will be planned to have the capacity to be able to cope with demand from other corporations to a certain extent and also to be able to export semi-finished products in the future. The objective of this project is to develop facilities for increased production as above.

##### Production Plan

The production plan for forgings is as shown in Attached Table 1-1. According to the future plan, the incremental production of forged parts which are locally produced now will be about 290 tons/year, as a result of which, the future production quantity will become about twice as large as the current level, as mentioned already.

Meanwhile, parts which will be locally produced in the future are planned to be 1,030 tons/year. Neither crank shaft for heavy vehicles nor parts for tractors and rail buses are included in the plan.

Attached Table 1-1 PRODUCTION PLAN OF FORGINGS

Description		Present Products (t/y)	Future Expansion (t/y)	Total Products (t/y)	Shop
Present Products	Light Vehicle	75.72	140.85	216.56	Existing Shop
	Heavy Vehicle	217.30	132.77	350.07	
	Agri. M/E	75.37	18.86	94.23	
	Sub-total (I)	368.39	292.47	660.86	
Products of Localization	Light Vehicle	-	175.00	175.00	New Forging Shop
	Heavy Vehicle	-	835.00	835.00	
	Spare Parts	-	20.00	20.00	
	Sub-total (II)	-	1,030.00	1,030.00	
Total		368.39	1,322.47	1,690.86	

The following figure shows the trend of yearly production plans. The parts whose production is planned for localization will begin to be produced from the mid-point of the 10 year plan, and as these parts are larger in size compared to those of heretofore, the production quantity (in terms of weight) will sharply rise as a trend as shown in Attached Figure 1-1.

In order to attain the aforesaid plan, the following must be implemented.

1) Existing Forging Shop

a) Repairs and Replacements of Existing machinery and Equipment

Existing facilities include some machinery and equipment which have become old and worn out or which have been used without adequate periodical inspection and maintenance. Those must be reconditioned. Particularly the main equipment such as air drop hammers and trimming presses need to be overhauled.

As the plan calls for coping with the increased production of forged parts which are already produced locally by fully operating the facilities of existing forging shop, it will be necessary to recondition every machinery and equipment into perfect operating condition to prevent production from being disrupted due to breakdown. Also, some of the machinery and equipment, jigs and tools which have become old and worn out must be replaced.

b) Elimination of Bottlenecks

The 3 ton air drop hammer which is being operated in three shifts records the highest usage rate in the existing forging shop now. A new 3 ton air drop hammer was recently induced but the trimming press which should also have been induced as a pair is lacking. These imbalances should be immediately corrected in order to operate these machinery and equipment normally. Also, the present capacity of compressed air supply is insufficient to operate the aforesaid new 3 ton hammer, so that two new compressors must be installed. The existing two compressors should also be overhauled and reconditioned.

The amount of compressed air required for the forging shop is as follows.

- Pressure of compressed air used : 5.5 - 7.0 kg/cm<sup>2</sup>
- Amount of compressed air required : 112 m<sup>3</sup>/min  
(when four units of hammer are operated simultaneously)
- Required pressure of compressed air each hammer:
  - 1/2 ton air drop hammer : 10 m<sup>3</sup>/min x 1 unit
  - 1 ton air drop hammer : 16 m<sup>3</sup>/min x 1 unit
  - 3 ton air drop hammer : 43 m<sup>3</sup>/min x 2 units

Furthermore, the machinery and equipment which are lacking in the facilities of the line, namely magnaflux flow detector, shot blasting machine, etc., must be induced.

c) Conveying Equipment

In the forging shop, conveying equipment are needed for conveying materials, conveying semi-finished forged parts to the next processing step and shipping of finished products, but the forging shop does not have a conveying equipment of its own. Because of this, some works are not carried out with proper timing. It is necessary to provide the forging shop with conveying equipment in order to eliminate idle time.

2) New Forging Shop

In the modernization plan, the new forging shop will primarily produce forged parts which are planned to be locally produced.

The new shop will be constructed in No.3 HI and designed to be capable of producing forged parts for heavy and light vehicles. Of the parts for heavy vehicles, crank shaft is not planned for local production, however. As crank shaft for heavy vehicles requires large scale facilities, its local production is not justifiable both in terms of investment requirement and the difficulty in acquiring necessary technology in the light of the present production plan (about 10,000 pcs/year). Even in the advanced countries, the actual situation is that this sort of crank shaft is not produced by ordinary forgeries but only by a limited number of specialized forgeries who undertake production of crank shafts for each respective vehicle manufacturer. Accordingly, products considered for local production will be rear axle shaft, big gear, knuckle arm, front axle, etc., but excluding crank shaft for heavy vehicles.

Facilities will not be separate for heavy vehicle parts and for light vehicle parts as planned by HIC but made usable for both in order to avoid duplicating investment. As the largest forged part will be front axle for heavy vehicles, facilities capable of producing products up to this size will be considered.

Forging hammer that can cope with future demand for large forgings from other public corporations in Burma will be selected.

(2) Details of the Plan

1) Existing Forging Shop

a) Reconditioning and Improvement of Existing Facilities (#4-4-1)

Existing facilities will be reconditioned so that each machine and equipment will be able to fully demonstrate its respective capacity.

1. Repairs and Overhauls of Facilities

So far, minor repairs of the forging machinery and equipment were made every time the need had arisen, but the present condition is such that the deterioration of facilities is so bad that they require overhauling.

All trimming presses (3 units) will be overhauled. Two hammers for 1/2 ton and 1 ton will be overhauled. Especially since the hammer 1 ton has cracks on the frame, it should be carefully repaired.

- Trimming press (overhaul): 3 sets  
(100Tx1, 1,300Tx1, 1,500Tx1)

The following major repair parts for overhaul will be provided for local repair work.

- . Metals (sizes will be measured and finish machining will be done locally)
- . Replacement of all valves and packings
- . Electrical accessories for the structural body of press, etc.

- Air drop hammer (overhaul): 2 sets (1/2T x 1, 1T x 1)

The following major repair parts for overhaul will be provided for local repair work.

. For 1/2T hammer ..... 1 set

- \* Ram, ram bush
- \* Guide
- \* Piston rod, ring
- \* Sow block, packings, etc.

. For 1T hammer ..... 1 set

- \* Right and left frames
- \* Guide
- \* Piston rod, ring
- \* Locker arm
- \* Accessories for motion crank, etc.

In order to secure the necessary supply of compressed air for the forging shop, existing compressors will be overhauled and made operable. Also, the crane will be completely repaired to make them trouble-free.

- Compressor (BTD type) (overhaul): 2 sets
- 3T travelling crane (repair) : 1 set

## 2. Facilities to be Replaced

Out of the three material cutting machines now held, one is not used. As this machine is of the old type for which parts cannot be supplied, it must be replaced.

Damaged trimming blades (dies) and seriously damaged forging dies which are considered unrepairable will also be replaced.

- Material cutting machine : 1 unit
- Trimming dies, forging dies: one complete assortment

## 3. Conveying Equipment

To eliminate idle time due to dissatisfactory haulage, forklift truck (2T x 1) for exclusive use of the forging shop will be induced.

- b) New Machinery, Equipment, Jigs and Tools to be Installed or Provided for Eliminating Bottlenecks (#4-2-2)

Facilities necessary for eliminating bottlenecks will be induced in order to smoothly carry out production.

- The new 3T air drop hammer which has been induced as stated previously requires a 500T trimming press and a heating furnace to comprise one complete set. The trimming press is lacking now and will have to be induced.
- Existing compressors are deficient in capacity to supply necessary compressed air to the new 3T air drop hammer, so that two sets of new 150 kW compressor will be induced.
- Tail-end processing after forging consists of shot blasting, non-destructive inspection, bending correction, heat treatment and other processes. As the existing forging shop does not have its own facilities for these processes, the facilities of the foundry and the hand tool forging shop have to be diverted to carry out these processes.

As every shop will not have any spare capacity in facilities when production is increased, magnetic flaw detector, demagnetization device and shop blasting machine will be induced for the forging shop under this project. As the existing shop building is too small to install them, a new building will have to be built.

- Dies are placed directly on the floor of the forging shop, which is detrimental to workability and quality of dies. In order to better manage the dies, a die storage shelf will be provided. This will also allow more effective use of the shop's space.
- Containers for transporting raw materials will be provided so as to improve product management.

## 2) New Forging Shop (#4-4-3)

### a) Product Item

- Forged parts for heavy vehicles;  
Knuckle arm, knuckle steering, rear axle shaft, front axle, etc.
- Forged parts for light vehicles;  
knuckle steering, rear axle shaft, front axle, etc.

For the new forging shop, facilities capable of producing forged parts for heavy and light vehicles as above will be planned. The building area of the new shop will be planned to be 2,430 m<sup>2</sup> (90m x 27m). Attached Figure 2-1 shows its approximate layout (as an example).

b) Major Facilities to be Induced and Their Functions

- Air drop hammer with a capacity of 10 tons will be induced to make it possible to produce forged parts for heavy vehicles (except crankshaft for heavy vehicles) and also large sized forgings for other corporations.
- 7" upsetter will be induced to forge rear axle shaft. This upsetter however will be too large for small sized forgings, such as small rear axle shaft B-600.
- 36" reducing roll will be induced for forging front axle and rear axle shaft, etc.
- 1,500T trimming press will be induced to remove burrs after forging.
- 1,500T forming press and 1,500T coining press will be induced for producing front axle, etc.
- Three sets of heating furnace will be induced for heating forgings for reducing roll, 10T hammer and 7" upsetter.
- Annealing furnace and tempering furnace will be induced for heat treatment.
- Shot blasting machine will be induced for tail-end processing of forged parts.
- Magnaflux flow detector and supersonic flaw detector will be induced for non-destructive inspection of forged parts.



c) Approximate Processing Steps of Forged Parts

The following table shows approximate processing steps of typical forged parts.

	Gear	Knuckle	Front Axle	Rear Axle Shaft
Heating		o	o	o
Reduce Roll		o	o	o
Heating	o		o	
Forming			o	
10T Hammer	o	o	o	o
Trim & Restrike	o	o	o	o
Heating				o
Up-Setting				o
Quench/Temper			o	o
Annealing	o		o	o
Coining	o		o	o
Shot Blasting	o	o	o	o
Magnaflux Insp.			o	o
Supersonic Insp.				o

(3) Estimated Capital Requirement

1) Required Facilities

The detailed list of machine and equipments required in the present plan is shown in Attached Table 3-1.

2) Estimated Capital Requirement

The estimated capital requirement is shown in Attached Table 3-2.

(4) Expected Effects of the Plan

The present plan consists of 1) rehabilitation plan of existing forging shop, and 2) construction plan of new forging shop.

1) Foreign Exchange Saving

a) Rehabilitation of existing forging shop

One ton of forged parts production results in 46,772 yen of foreign exchange saving. (Assumed production increase: 293 ton/year)

	Foreign Currency Required at Implementation of Plan (yen per ton)	Foreign Currency Required for Import (yen per ton)
Cost of parts	-	476,576
Raw Material Costs	297,860	-
Freight & Insurance	27,055	42,892
Sub-total	324,915	519,468
Working equipment costs	147,782	-
TOTAL	472,696	519,468

Note: The working equipment costs are only for the additional costs incurred by this plan. For detail, see Attached Table 3-3. The raw materials cost is assumed 50% of the forged parts price. The forged material cost is assumed 80% of the forged parts price.

b) Construction of new forging shop

A saving on foreign exchange from one ton of forged parts production cannot be expected due to low production output. (Assumed production: 1,030 ton/year)

	Foreign Currency Required at Implementation of Plan (yen per ton)	Foreign Currency Required for Import (yen per ton)
Cost of parts	-	476,576
Raw Material Costs	297,860	-
Freight & Insurance	27,055	42,892
Sub-total	324,915	519,468
Working equipment costs	407,476	-
TOTAL	732,391	519,468

Note: The working equipment costs are only for the additional costs incurred by this plan. For detail, see Attached Table 3-3. The raw materials cost is assumed 50% of the forged parts price. The forged material cost is assumed 80% of the forged parts price.

## 2) Production Cost Reduction

The following table compares the production cost at present and after implementing the present plan. Case 1 refers to rehabilitation plan of the existing shop, while Case 2 refers to construction of new forging shop.

	Production Costs after Implementation of the Plan		Present Production Costs
	(Case 1)	(Case 2)	
Imported CP/RM costs			
FOB price	297,860	297,860	152,900
Freight & insurance	27,055	27,055	13,800
Sub-total	324,915	324,915	166,700
Local CP/RM costs	-	-	-
Depreciation	116,041	332,816	396,200
Utility costs	27,645	485	23,300
Labor costs	16,382	4,660	13,100
Overheads	29,693	43,107	45,500
Admin. costs	29,693	43,107	45,500
Other costs	114,676	208,641	95,700
Sub-total	334,130	632,816	619,300
Mark-up, profit	-	-	-
Excise tax	-	-	-
TOTAL	659,044	957,731	786,000

Note: Actual cost is based on 1987 record with 368 tons of production. For the plans, annual production was assumed;

Case 1 661 tons/year

Case 2 1,030 tons/year.

Other costs includes the maintenance costs as follows;

Case 1 26,930

Case 2 154,660

Actual not available

3) Number of Years Required for Recovery of Foreign Capital Investment

The foreign capital investment on the present plan (Rehabilitation of existing shop) is expected to be recovered in 38 years, as shown in the following formula.

$$(\text{The number of years required}) = A / (B \times C)$$

Where,

(A) = Estimated foreign exchange required (520.5 million yen)

(B) = Foreign exchange saving per ton (46,772 yen/ton)

(C) = Annual production (293 tons/year)

4) Other Effects Anticipated

1. Increasing in production capacity of forged products
2. Securing product quality
3. Establishing basis for future export of forged parts and products

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-4(1) Build-up of Forging Capacity  
- No.3 HI: Forging Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Compressor House, etc.	Set	1
2	Imported M/E		
1	Repair and replacement of deteriorated ME		
1 1	Repair trimming press	Set	3
1 2	Repair air drop hammer	Set	2
1 3	Trimming dies & forging dies	Set	1
1 4	Repair overhead crane	Set	1
1 5	Materials cutter	Set	1
2	Repair of compressor		
2 1	overhaul BTD type compressor	Set	2
3	Improvement of shop system		
3 1	500ton trimming press	Set	1
3 2	150kw compressors	Set	2
3 3	2ton forklift	Set	1
3 4	Shelf for dies storage	Set	1
3 5	Magnaflux detector	Set	1
3 6	Shot blast M/C	Set	1
3 7	Container for RM and CP	Set	1
3 8	Miscellaneous	Lot	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-4(2) Build-up of Forging Capacity  
- No.3 HI: Forging Shop -

No	Items	Unit	No.
5	New shop for forging parts		
5 1	10ton air drop hammer	Set	1
5 2	7inch upsetter	Set	1
5 3	36"inch reduce roll	Set	1
5 4	1,500ton coining press	Set	1
5 5	Heat treatment furnace	Set	2
5 6	Miscellaneous		
5 6 1	Band saw	Set	1
5 6 2	Gas heating furnace	Set	3
5 6 3	1,500 ton trimming press	Set	1
5 6 4	Circular sawing M/C	Set	2
5 6 5	Annealing furnace	Set	1
5 6 6	Manipulator	Set	5
5 6 7	Shot blasting M/C	Set	1
5 6 8	Magnetic particle test	Set	1
5 6 9	1,500 ton coining press	Set	1
5 610	Ultrasonic flaw detector	Set	1
5 611	Dies	Set	1
5 612	20t/5t overhead-travelling crane	Set	1
5 613	Building material	Lot	1
5 614	Piping and wiring material	Lot	1
5 615	Power distribution unit	Set	1
5 616	Air compressor (720kWx1, 620kWx2)	Set	3

Attached Table 3-2: REQUIRED INVESTMENT (#4-4)  
 - (1) Existing Forging Shop -  
 (Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	47.1	25.7	72.8
2 Freight & Insurance	4.2	-	4.2
Sub-total	51.3	25.7	77.0
3 Import Duty	-	7.7	7.7
4 Unloading	-	0.8	0.8
Building Total	51.3	34.2	85.5
Bldg & Land Total	51.3	34.2	85.5
2 1 Imported M/E (FOB)	404.1	-	404.1
2 Freight & Insurance	36.3	-	36.3
Sub-total	440.4	-	440.4
3 Import Duty	-	66.1	66.1
4 Unloading	-	7.0	7.0
5 Installation Cost	-	0.0	0.0
Imported M/E Total	440.4	73.1	513.5
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	28.8	-	28.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	28.8	-	28.8
Total Investment	520.5	107.3	627.8



Attached Table 3-2: REQUIRED INVESTMENT (#4-4)  
 - (2) New Forging Shop -  
 (Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	451.4	252.0	703.4
2 Freight & Insurance	40.6	-	40.6
Sub-total	492.0	252.0	744.0
3 Import Duty	-	73.8	73.8
4 Unloading	-	7.9	7.9
Building Total	492.0	333.7	825.7
Bldg & Land Total	492.0	333.7	825.7
2 1 Imported M/E (FOB)	3591.2	-	3591.2
2 Freight & Insurance	323.1	-	323.1
Sub-total	3914.3	-	3914.3
3 Import Duty	-	587.1	587.1
4 Unloading	-	62.6	62.6
5 Installation Cost	-	1.3	1.3
Imported M/E Total	3914.3	651.0	4565.3
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	81.0	-	81.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	81.0	-	81.0
Total Investment	4487.3	984.7	5472.0

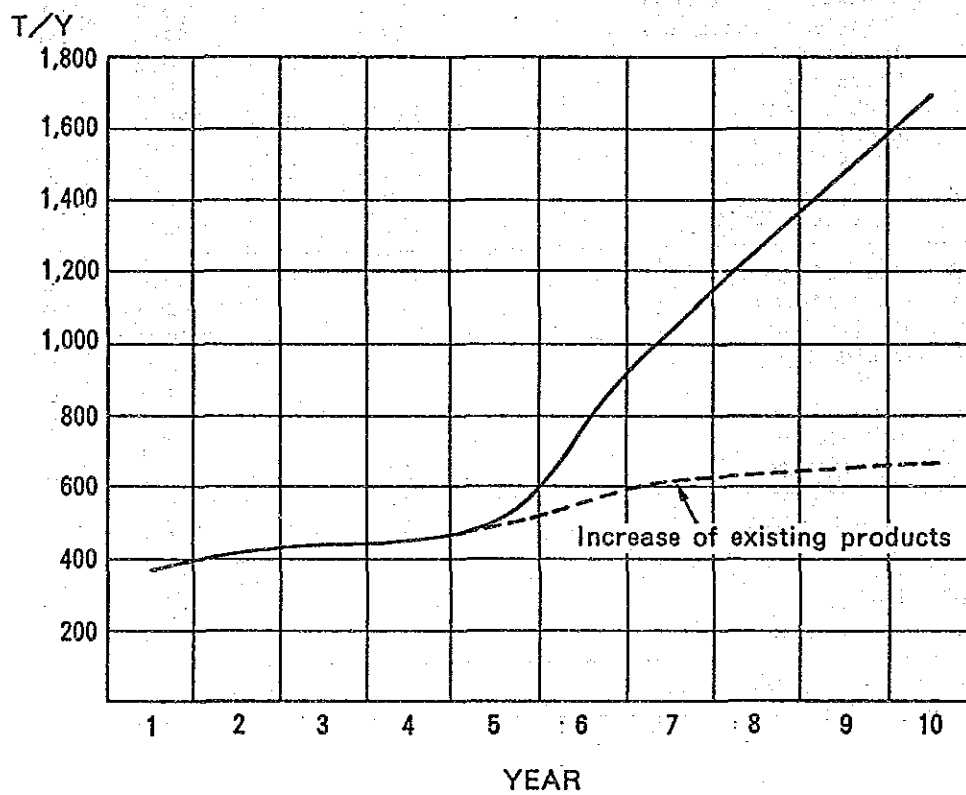
Attached Table 3-3: PRODUCTION COST STATEMENT (#4-4)  
 - (1) Existing Forging Shop -

Items	Annual Cost (million Yen)			Compo- nent
	F/C	L/C	Total	(%)
1 CP/RM				
A Imported CP/RM (FOB)	87.3	-	87.3	45
Freight & Insurance	7.9	-	7.9	4
Import Duty	-	14.3	14.3	7
Unloading	-	1.5	1.5	1
Sub-total	95.2	15.8	111.0	57
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	95.2	15.8	111.0	57
2 Utilities	0.0	8.1	8.1	4
Variable Cost	95.2	23.9	119.1	62
3 Depreciation	28.5	5.5	34.0	18
4 Amortization	0.0	-	0.0	0
5 Maintenance	14.8	3.0	17.8	9
6 Design Fee	0.0	-	0.0	0
7 Labor	-	4.8	4.8	2
8 Ovehead	-	8.7	8.7	5
9 Admin. Cost	-	8.7	8.7	5
Fixed Cost	43.3	30.7	74.0	38
Annual Cost	138.5	54.6	193.1	100
Unit P. Cost			659044.4	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			659044.4	

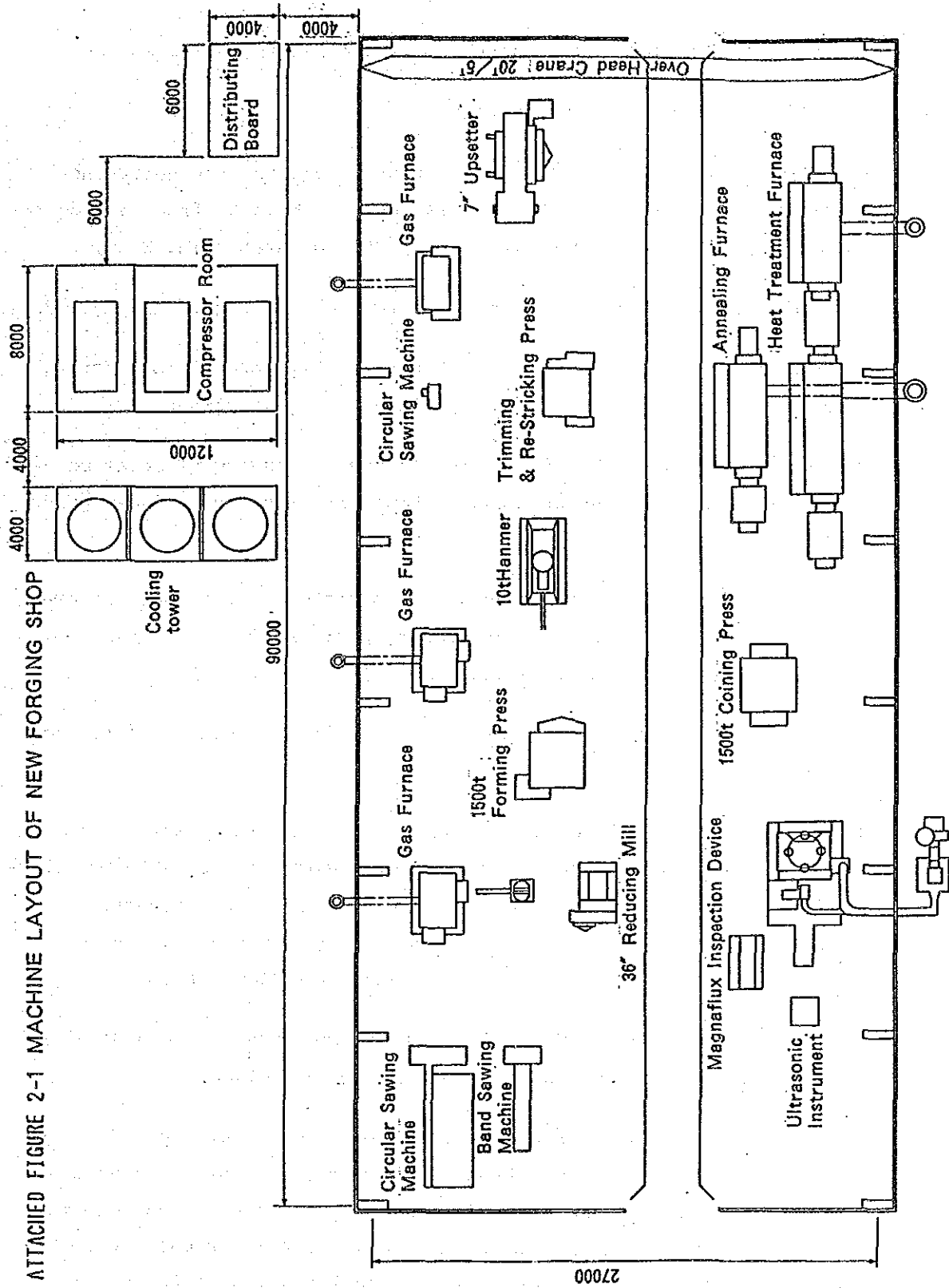
Attached Table 3-3: PRODUCTION COST STATEMENT (#4-4)  
 - (2) New Forging Shop -

Items	Annual Cost (million Yen)			Component (%)
	F/C	L/C	Total	
1 CP/RM				
A Imported CP/RM (FOB)	306.8	-	306.8	31
Freight & Insurance	27.6	-	27.6	3
Import Duty	-	50.2	50.2	5
Unloading	-	5.4	5.4	1
Sub-total	334.4	55.6	390.0	40
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	334.4	55.6	390.0	40
2 Utilities	0.0	0.5	0.5	0
Variable Cost	334.4	56.1	390.5	40
3 Depreciation	287.5	55.3	342.8	35
4 Amortization	0.0	-	0.0	0
5 Maintenance	132.2	27.1	159.3	16
6 Design Fee	0.0	-	0.0	0
7 Labor	-	4.8	4.8	0
8 Overhead	-	44.4	44.4	5
9 Admin. Cost	-	44.4	44.4	5
Fixed Cost	419.7	176.0	595.7	60
Annual Cost	754.1	232.1	986.2	100
Unit P. Cost			957475.7	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			957475.7	

Attached Figure 1-1 Trend of Forging Parts Production



ATTACHED FIGURE 2-1 MACHINE LAYOUT OF NEW FORGING SHOP



#### #4-5 Improvement of Piston and Piston Ring Production Line

- No.4 HI: Light Alloy Foundry and Piston Manufacturing Shop -

##### (1) Objectives and Outline of the Plan

All the pistons and piston rings currently used for the heavy and light vehicles production are manufactured in No.4 HI from casting to machining at Light Alloy Foundry and Piston manufacturing Shop.

The following problems are evident in the No.4 HI Light Alloy Foundry:

1. The volume of molten metal for the currently used piston casting molds are numerous and loss of melting energy is great.
2. As the casting molds are of the old style changing of metal molds and alignment of the patterns is time consuming and reduces productivity.
3. Pouring in operations for the present piston ring is done at one end of the line and from the cradle operators walk a distance of about 10 meters with a ladle.

Further, the following problems were found in the No.4 HI Piston manufacturing Shop;

1. At present the main equipment necessary to a line planification of the machine processing steps for the piston are available but these have not been arranged in their proper order. furthermore, material handling operations for such steps as plating, anti-rusting, packaging can not be arranged in a flow system.
2. Aluminum cutting scrap produced during the machine processing is not gathered up and this is a problem to be solved.

The present plan is to ensure an increase in productivity and safety through an integrated production of the piston and piston ring parts for vehicle use and general vehicle use service parts. To realize this plan installation of new foundry equipment and reduction in the volume of molten metal together with simplification of the mold aligning is to be carried out. This will better the safety of operations.

Equipment layout should be changed to further productivity and re-use of the aluminum scrap cuttings should be undertaken.

Production output including service parts is to be as follows:

Piston : approx. 160,000 per annum

Piston ring : approx. 1,300,000 per annum

The layout for the machining processes of the Piston manufacturing Shop must be re-considered and arranged to permit operational flow. Further, metal molds and jigs for the production of general market service parts must be added.

## (2) Details of the Plan

### 1) Improvement of Pouring Line Equipment of the Light Alloy Foundry

In order to increase both the safety and productivity of operations at the pouring area a rail should be installed between the pouring line and the cradle be transported to the pouring in area using a cart in order to shorten the distance of carriage of the smelting ladle.

A tilting type of cradle should be employed.

### 2) Increasing productivity of the Light Alloy Foundry

Installation of one piston casting machine of a tilting type and reduction in the number of injection nozzles together with simplification of the metal mold aligning in order to increase productivity. Preparation of one set of casting patterns for use in reducing the amount of molten metal.

### 3) Re-considering of the Machine Processing System of the Piston Manufacturing Shop for Improvements

Undertake changes in the layout of processing equipment, install specialist equipment and make an integrated production line possible through increased facilities for washing, plating, anti-rusting, and packaging. Installation of smelting equipment for the aluminum cutting scrap and re-use the cuttings in the form of aluminum ingots.

4) Production of Pistons and Piston Rings for General Vehicle Use

The product specifications are not clear but metal molds for machine processing use jig machine tools and inspection tools will be required.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving of Foreign Capital

In the case of the present plan not being implemented it will be necessary to import to make up for deficiencies. Compared to such a situation the saving on implementation in the required amount of foreign capital for production of each item will be 87 yen for pistons, 17 yen for the piston rings as follows: (However, this is with the assumption of an annual production of 100,000 pistons and 950,000 piston rings).



a) Piston

	Foreign Currency Required at Implementation of Plan (yen per piece)	Amount of Foreign Currency Required in case of Imports (yen per piece)
Cost of parts	-	746
Raw Material costs	597	-
Freight and Insurance	57	71
Sub-total	654	817
M/E costs	76	-
TOTAL	730	817

b) Piston Ring

	Foreign Currency Required at Implementation of Plan (yen per piece)	Amount of Foreign Currency Required in case of Imports (yen per piece)
Cost of parts	-	133
CP/RM Costs	106	-
Freight and Insurance	10	13
Sub-total	116	146
M/E costs	13	-
TOTAL	129	146

Notes: The working equipment costs are only for the additional costs incurred by this plan.

For details of the above items refer to the attached Table 3-3.

## 2) Reduction in Production Costs Achieved

The present annual production output of pistons is about 60,000, and 350,000 for piston rings. The production costs for the expanded production of the piston and piston rings effected with the implementation of the present plan are as follows:

	Piston	Piston Ring
Annual Increase in Production	100,000	950,000
Selling Price	1,191	717
Amount of Sales	191,100,00	681,200,000
<hr/>		
<u>Production Costs (1,000 Yen/Year)</u>		
Variable Costs	76,500	128,900
Fixed Costs	7,050	40,250
Sub-total	63,550	169,150
<hr/>		
Mark-up, profit	2,510	507
Excise tax	25,820	52,270
<hr/>		
TOTAL	111,880	226,490
<hr/>		
Cost per piece	1,119	238
<hr/>		

The official selling price for one piston at present is 1,191 yen, and 717 yen for the piston ring and it is therefore possible to lower these prices.

3) Number of Years Required for Recovery of Foreign Capital Investment

The index of investment results is calculated as follows:

$$(A) / (B) * (C)$$

(A) Required amount of foreign capital (239,600,000 yen)

(B) Amount of foreign capital saved per item:

piston 87 yen

piston ring 17 yen

(C) Annual output: piston 100,000

piston ring 950,000

giving a result of 9.6 years for the present plan.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-5 Improvement of Piston & Piston Ring Line  
No.4 HI: Light alloy foundry & Piston Mfg. Shop

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Improvement of Pistonring casting line		
1 1	Pouring line equipment	Set	1
2	Production increase in SP piston & ring		
2 1	Molds for piston & piston ring	Set	1
2 2	Holding furnace	Set	1
3 1	200kg reverberatory furnacce	Set	1
3 2	Gantry crane, monorail, etc.	Set	1
3 3	Dies	Set	1
3 4	Miscellaneous	Lot	1
4	Improvement of piston & ring machining line		
4 1	Special purpose M/C for piston oil port	Set	1
4 2	Automatic drilling M/C for piston ring	Set	1
4 3	piston ring gap checker	Set	1
4 4	Anti-rust work device for piston ring	Set	1
4 5	Cleaning M/C	Set	1
4 6	Miscellaneous	Lot	1
5	ME for SP piston & ring machining		
5 1	Tools for machining	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-5)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	205.6	-	205.6
2 Freight & Insurance	19.6	-	19.6
Sub-total	225.2	-	225.2
3 Import Duty	-	33.8	33.8
4 Unloading	-	4.5	4.5
5 Installation Cost	-	0.1	0.1
Imported M/E Total	225.2	38.4	263.6
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	14.4	-	14.4
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	14.4	-	14.4
Total Investment	239.6	38.4	278.0

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-5)

Items	Annual Cost (million Yen)			Component (%)
	F/C	L/C	Total	
1 CP/RM				
A Imported CP/RM (FOB)	160.4	-	160.4	63
Freight & Insurance	15.2	-	15.2	6
Import Duty	-	26.3	26.3	10
Unloading	-	3.5	3.5	1
Sub-total	175.6	29.8	205.4	81
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	175.6	29.8	205.4	81
2 Utilities	0.0	0.0	0.0	0
Variable Cost	175.6	29.8	205.4	81
3 Depreciation	13.5	2.5	16.0	6
4 Amortization	0.0	-	0.0	0
5 Maintenance	6.8	1.2	8.0	3
6 Design Fee	0.0	-	0.0	0
7 Labor	-	0.0	0.0	0
8 Overhead	-	11.9	11.9	5
9 Admin. Cost	-	11.4	11.4	5
Fixed Cost	20.3	27.0	47.3	19
Annual Cost	195.9	56.8	252.7	100
Unit P. Cost				
10 Mark-up				
11 Excise Tax				
Ex-fact. Cost				

#### #4-6 Improvement of Shop/Line System

- No.1 HI: Machine Shop and Heat Treatment Shop -

##### (1) Objectives and Outline of the Plan

Deterioration of the heat treatment furnace is advanced and hinders production.

For toothed gear machine processing arrangements for the setting up of the different kinds of toothed wheel are time consuming and overloading of the machine hinders production.

The present plan proposes repair and replacement of equipment as a counter measure to the above factors hindering production together with increase in productivity and removal of the hindering factors through supplementary installation of equipment.

##### (2) Details of the Plan

1. Deterioration of the alloyed steel carburiser pot and alloyed steel plate lid with brick lining of the existing carburiser equipment are both deteriorated and one of the pots is in a state beyond further use. Further, since the pot like the walls of the furnace wears periodic replacement is needed. Therefore, replacement of the pot and lid shall take place at the same time as replacement of the lead bath furnace and heating equipment.
2. Measurements of the tooth profile of the shaping cutter are normally made every 1,000 to 3,000 item lots produced and regrinding takes place but there is no regrinding machinery available. At present, there are two cutting machines which have surpassed the 7,000 item production mark and regrinding is needed. Installation of regrinding equipment in order to maintain precision of the tooth wheel processing and ensure product quality is needed.

As the regriinder, toothed wheel tester, and shaping machines are precision machinery, these should be installed in the No.1 HI machine shop and treatment shop in an air conditioned area of the heat treatment shop.

As each of the various types of toothed wheel processing are employed at present overloading including the arrangement time is too long and so in order to ensure the smooth operating of operations one extra machine should be installed.

If the factors hindering production are removed and a production system established, and operating standards rigorously observed a production capacity of 1,100 items per year can be recovered. Therefore the production increase plan of HIC for 1,700 items per year can be met by the use of 2 shifts for example.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.



Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-6 Improvement of Shop/Line System  
- No.1 HI: Machine Shop & Heat Treatment Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repair and replacement of deteriorated ME		
1 1	Carburizing pot for HT-1,2	Set	2
1 2	Furnace lid for HT-1,2	Set	2
1 3	Heating element for lead bath 15kW-2t 24kW	Set	2
2	To solve production bottleneck		
2 1	Shaving cutter regrinding machine	Set	1
2 2	Gear testing machine	Set	1
2 3	Gear shaving machine	Set	1
2 4	Air conditioning equipment	Set	1
2 5	Gear shaping machine	Set	1

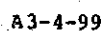
Attached Table 3-2: REQUIRED INVESTMENT (#4-6)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	279.0	-	279.0
2 Freight & Insurance	31.0	-	31.0
Sub-total	310.0	-	310.0
3 Import Duty	-	46.5	46.5
4 Unloading	-	4.3	4.3
5 Installation Cost	-	0.9	0.9
Imported M/E Total	310.0	51.7	361.7
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	3.6	-	3.6
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	3.6	-	3.6
Total Investment	313.6	51.7	365.3

Attached Figure 1-1

10th July 1988



#### #4-7 Improvement of Shop/Line System

##### - No.4 HI: Machine Shop -

#### (1) Objectives and Outline of the Plan

Of the 275 pieces of equipment presently kept in the Machine Shop there are 61 inoperative due to breakdown. Besides these there are 14 machines which, although are still in operation, show advanced signs of deterioration. The production achievement for the year of 1986 was 50% below the performance schedule target. This is thought to have been largely due to the reduction in production consequent on deterioration of equipment, and reduced precision of the jig tools, together with reduced operating rates caused by flaws in the production maintenance. Furthermore, due to a shortage of the inspection devices needed for production maintenance product quality levels are reduced and the quality of completed vehicles impaired.

This shop produces as much as 1,200 light vehicle parts by job-shop method. In addition, the area of parts produced is planned to be expanded to heavy vehicles and agricultural machineries in the future. In order to cope with such plan, it is necessary to reduce the loss in operation time and improve the quality of produced parts. However, introduction of exclusive production line for each parts to be produced is not economical requiring large amount of capital. Thus, the production of most of small-sized parts is recommended to be undertaken by the job-shop method with grade-up of the shop, while the production of major parts will be done by introducing the exclusive production line system for each parts.

In this plan, the Machining Shop will be divided into 7 sub-shops, and the shop system will be improved within each sub-shop. Each parts production will be designed to be completed in one of the 7 shops. The line balance within each sub-shop will be improved to recover the originally-set production capacity.

As the second step of the plan, exclusive production lines will be introduced for the major parts including important function parts, multi-process parts, and large-sized parts, in the course of initiation of domestic production of these parts (#4-18).

## (2) Details of the Plan

1. Of the equipment broken down, 8 machines are related to defective motor, and 8 machines out of order due to defective general repair parts such as the solenoid bulbs. Repairs by replacement of these parts are to be carried out.

Of remaining 59 pieces of equipment, 53 will be replaced except for 6 units of No.1 turret lathe which can be overhauled by HIC.

2. Since production using the existing 275 pieces of equipment is largely performed on a job shop system, increase in operating rates should be achieved while making the most of the strong points of this system. To this end the machine shop should be divided into seven sub shops and each of these standardize operating burdens and increase productivity inside the individual sub shops on the basis of a operation completion style production method. This would enable initially planned capacity levels to be regained.

In order to maintain quality levels and strengthen the inspection system, installation of a precision measurements room and transmission testing room should be carried out.

For main parts employment of operational flow methods and increase in productivity are to be aimed at. In addition, production lead time and improvement of material handling are to be planned.

The attached Figure 1-1 shows the layout after implementation of the present plan.

## (3) Estimated Capital Requirement

### 1) Required Facilities

The details of equipment and devices required in the present plan are shown in the attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

This plan formulates the basis of future development of this shop planned in #4-18.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-7(1) Improvement of shop/line system  
No.4 HI: Machine shop

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repair and replacement of deteriorated ME		
1 1	Centerless grinder	Set	1
1 2	Thread rolling M/C	Set	1
1 3	Centering M/C	Set	1
1 4	Milling M/C	Set	4
1 5	Multi spindle drilling M/C	Set	3
1 6	Miscellaneous		
1 6 1	Lathe 4'	Set	6
1 6 2	Lathe 6'	Set	4
1 6 3	No.1 turret lathe	Set	8
1 6 4	No.3 turret lathe	Set	16
1 6 5	No.4 turret lathe	Set	3
1 6 6	4' profiling lathe	Set	1
1 6 7	7' profiling lathe	Set	1
1 6 8	Upright drilling M/C	Set	4
1 6 9	Balancing M/C	Set	1
1 610	Radial drilling M/C	Set	2
1 611	Tapping M/C	Set	3
1 612	Cylindrical grinding M/C	Set	3
1 613	Gear shaping M/C	Set	2
1 614	Gear chamfering M/C	Set	1
1 615	Gear shaving M/C	Set	1
1 616	Oil groove cutting M/C	Set	1
1 617	Tool grinding M/C	Set	1
1 618	Special M/C	Set	3
1 619	High speed cutting M/C	Set	1
1 620	Gas welding M/C	Set	2
1 621	Engine performance tester	Set	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-7(2) Improvement of shop/line system  
No.4 HI: Machine shop

No	Items	Unit	No.
2	Improvement of shop/ line system		
2 1	Gear hobbing M/C	Set	1
2 2	Shaving M/C	Set	1
2 3	Radial drilling M/C	Set	2
2 4	NC turret lathe	Set	7
2 5	Coordinate measuring M/C	Set	1
2 6	Miscellaneous		
2 6 1	Upright drilling M/C	Set	3
2 6 2	Drilling M/C	Set	1
2 6 3	Horizontal milling M/C	Set	2
2 6 4	Vertical milling M/C	Set	2
2 6 5	Spline milling M/C	Set	2
2 6 6	Slotting M/C	Set	1
2 6 7	Broaching M/C	Set	1
2 6 8	Surface grinding M/C	Set	2
2 6 9	Roll forming M/C	Set	4
2 610	Centering M/C	Set	1
2 611	Press M/C	Set	2
2 612	Multi spindle drilling M/C	Set	2
2 613	Washing equipment	Set	1
2 614	Universal form measuring M/C	Set	1
2 615	Leak tester	Set	1
2 616	Transmission tester	Set	1



Attached Table 3-2: REQUIRED INVESTMENT (#4-7)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	1967.0	-	1967.0
2 Freight & Insurance	218.3	-	218.3
Sub-total	2185.3	-	2185.3
3 Import Duty	-	327.8	327.8
4 Unloading	-	30.5	30.5
5 Installation Cost	-	17.1	17.1
Imported M/E Total	2185.3	375.4	2560.7
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	45.0	-	45.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	45.0	-	45.0
Total Investment	2230.3	375.4	2605.7

#4-8 Improvement of Shop/Line System  
- No.4 HI: Heat Treatment Shop -

(1) Outline of Objectives and Planning

The present project is related to the Project #4-7.

Since at present the cyanic waste water treatment equipment is out of order carburisation by salt bath is not possible and as substitute gas and solid carburising equipment is used. This tends to increase the occurrence of rejects and impairs product quality.

Corrosion of the degreasing vat, fan cover of the carburiser furnace, mixing equipment, etc., is serious and heat loss during operation is great. Sooner or later these will be beyond use.

There are inadequacies in the dissolving of the salts used for the high temperature tempering furnace and irregularities in the vibrations of the central shaft to the cutting machine.

The present plan proposes to realize an increase in production by removing the above impediments to productivity through repairs and replacement of the equipment mentioned above.

(2) Details of the Plan

Renovation of the waste water treatment facilities is to be achieved by replacement of the plumbing.

The de-greasing vat is to have the tank replaced by an anti-corrosive type one and repair and replacements of the mixing device are to take place.

The salt chemical solution irregularities to be solved by repair of the thermostat and the cutting machine to be repaired by replacement of the bearing, oil seal and flange set.

(3) Estimated Capital Requirement

1) Required Facilities

The details of machine and equipments required in the plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

This plan with #4-8 is the basis for the plan #4-18.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-8 Rehabilitation of worn out ME  
No.4 HI: Heat treatment shop

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Replacement/repair of M/E		
1 1	Degreasing tank	Set	1
1 2	Repair, high speed specimen cutter	Set	1
1 3	Repair, tempering bath (high temperature)	Set	1
1 4	Repair, salt bath furnace	Set	1
1 5	Repair, cyanitic waste water treatment equipment	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-8)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	3.9	-	3.9
2 Freight & Insurance	0.4	-	0.4
Sub-total	4.3	-	4.3
3 Import Duty	-	0.6	0.6
4 Unloading	-	0.1	0.1
5 Installation Cost	-	0.0	0.0
Imported M/E Total	4.3	0.7	5.0
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	1.8	-	1.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	1.8	-	1.8
Total Investment	6.1	0.7	6.8

#### #4-9 Improvement of Shop/Line System

##### - No.4 HI: Diesel Engine Shop -

#### (1) Objectives and Outline of the Plan

The current processing production line for diesel engines is basically a flow production type but a large amount of general purpose equipment is employed. However, since a large number of processing is of a shared nature with other parts processing the processing time between operations is not standardized and this hinders production.

- There are numerous electric failures of the high frequency quenching equipment.
- For product quality it is essential that cutting scraps, sand, dust, etc., be kept out.
- The present plan aims at the removal of these hindering factors to production by the repair and replacement of equipment and supplementary provision of equipment which will ensure an increase in productivity.

Details of changes are shown in the Attached Figure 1-1.

Maintenance and improvement of product quality is the most important activity for improving production. Testing of the precision in arrangements for process changing, checking for rejects due to overuse of machine tools, storage maintenance of processed finished parts, assembled completed parts and parts in progress are important and vital responsibilities of the shop supervisors.

#### (2) Details of the Plan

- 1) Defective insulation of the high frequency transformer of the high frequency quencher for crankshaft use results in burn damage to the coil and one high frequency transformer must be replaced.
- 2) Drilling operations on the cylinder block line employ several general purpose machines and operating efficacy is low. Merging of present operations must be effected so that specialization of the equipment facilities is realized.

- Expand facilities of the heavily worked upright milling machine.
  - In order to remove scrap trimmings, sand, etc., installation of a high pressure cleaning machine is required to ensure improvement in product quality.
- 3) For the same reason the drilling operations of the cylinder head line are to be specialized.
  - 4) The super finishing operations of the cylinder head line are at present done by hand but as the operational load is large these should be mechanized.
    - The air microscope device needed for measurements of the journal of the crankshaft and pin is not functioning and needs replacement.
    - In order to lighten the burden on the upright milling machines for shared use of the crankshaft and cam shaft an addition of one new machine is required.
    - As the crank pin grinder is loaded too high an addition of one set of this machine is needed.
  - 5) In order to lighten the burden on the upright milling machine for shared use of the timing gear case and clutch housing an addition of one new machine is planned.
  - 6) In order to lighten the burden on the Hobbing machine for shared use of the cam shaft and ring gear an addition of one new machine is planned.

Increase in the conveyance equipment for use between processing stages.

The factors hindering production must be removed and the system organized, and operational standards, etc., rigorously followed, and a production equipment capacity of 1,200 items per year recovered. HIC can therefore respond to an increased production plan for 1,900 items annually by employing 2 shifts for example.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

If the present plan achieves the investment needed for the increase of production of 380 DS engines then the production costs for one such DS Engine will amount to 242,632 yen (refer to the Attached Table 3-3, however, these figures are for the additional equipment costs only).

Such a cost is expected to be lower than the present production costs and so the present investment can be expected to result in a reduction of production costs.



Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-9 Improvement of Shop/Line System  
- No.4 HI: Diesel Engine Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Repair of induction hardening equipment		
1 1	Trnasformer of induction hardening equipment	Set	1
2	Block cylinder line		
2 1	Special drilling machine (BB-1) w/jig and tool	Set	1
2 2	Special drilling machine (BB-2) w/jig and tool	Set	1
2 3	Special drilling machine (BB-3) w/jig and tool	Set	1
2 4	Special drilling machine (BB-4) w/jig and tool	Set	1
2 5	Vertical milling machine w/jig and tool	Set	1
2 6	Washing equipment	Set	1
2 7	Materials handling equipment	Set	1
3	Head cylinder line		
3 1	Multi spindle drilling machine (BH-1) w/jig and tool	Set	1
3 2	Multi spindle drilling machine (BH-2) w/jig and tool	Set	1
3 3	NC drilling machine (BH-3) w/jig and tool	Set	1
4	Crnak shaft line		
4 1	Super finishing machine w/tool	Set	1
4 2	Vertical milling machine w/jig and tool	Set	1
4 3	Air micrometer w/tool	Set	1
4 4	Materials handling equipment	Set	1
4 5	Cylindrical grinding machine	Set	1
5	T/G case, C/L housing line		
5 1	Vertical milling machine	Set	1
6	Cam shaft line		
6 1	Gear hobbing machine w/jig	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-9)

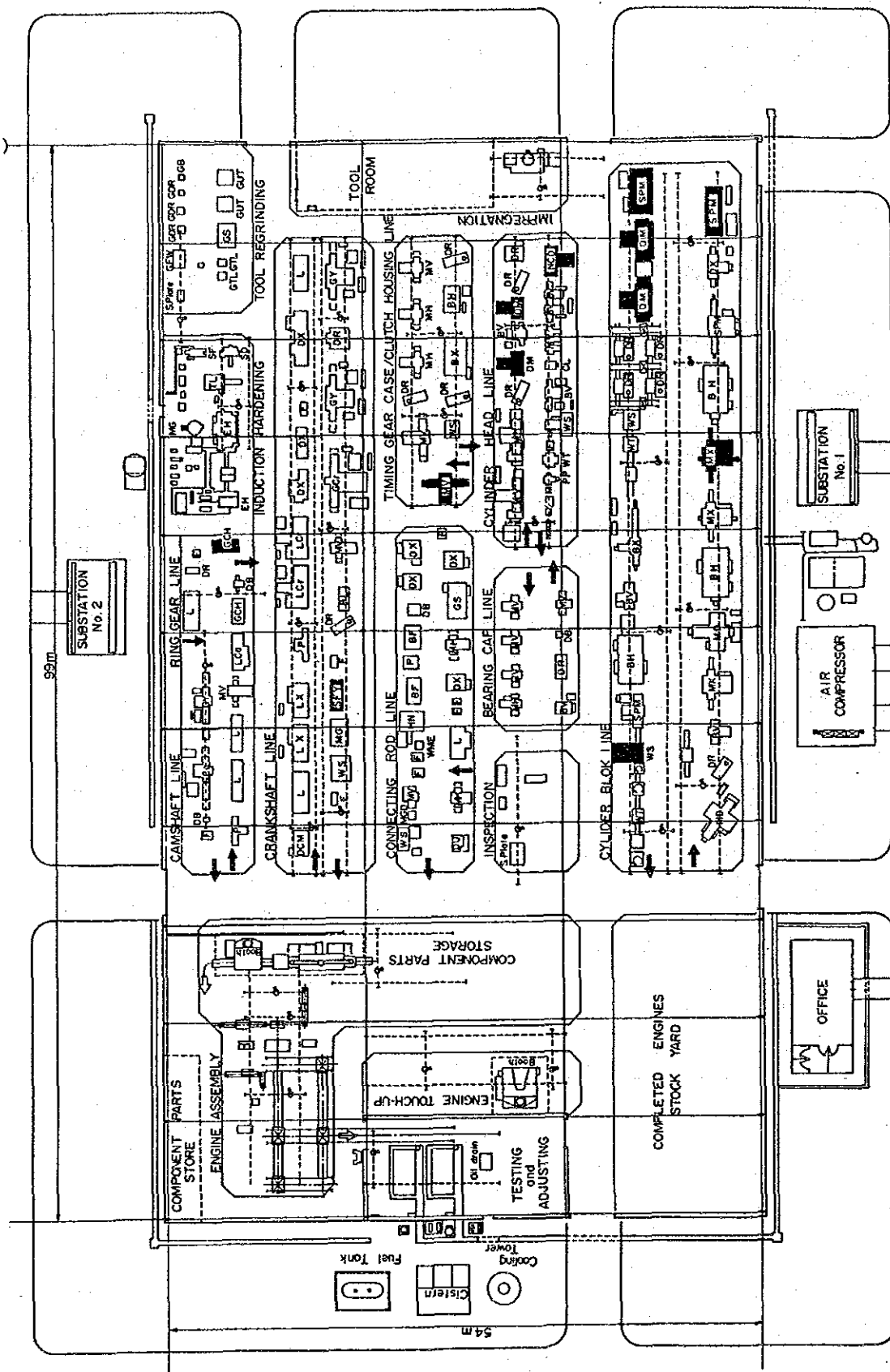
(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	751.8	-	751.8
2 Freight & Insurance	83.4	-	83.4
Sub-total	835.2	-	835.2
3 Import Duty	-	125.3	125.3
4 Unloading	-	11.7	11.7
5 Installation Cost	-	2.1	2.1
Imported M/E Total	835.2	139.1	974.3
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	28.8	-	28.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	28.8	-	28.8
Total Investment	864.0	139.1	1003.1

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-9)

Items	Annual Cost (million Yen)			Component (%)
	F/C	L/C	Total	
1 CP/RM				
A Imported CP/RM (FOB)	1.3	-	1.3	1
Freight & Insurance	0.1	-	0.1	0
Import Duty	-	0.2	0.2	0
Unloading	-	0.0	0.0	0
Sub-total	1.4	0.2	1.6	2
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	1.4	0.2	1.6	2
2 Utilities	0.0	0.7	0.7	1
Variable Cost	1.4	0.9	2.3	2
3 Depreciation	50.1	8.4	58.5	63
4 Amortization	0.0	-	0.0	0
5 Maintenance	25.1	4.2	29.3	32
6 Design Fee	0.1	-	0.1	0
7 Labor	-	0.4	0.4	0
8 Overhead	-	1.2	1.2	1
9 Admin. Cost	-	0.4	0.4	0
Fixed Cost	75.3	14.6	89.9	98
Annual Cost	76.7	15.5	92.2	100
Unit P. Cost			242631.5	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			242631.5	

Attached Figure 1-1 No.4 HI DS70 ENGINE PLANT



#### #4-10 Cylinder Production

- No.3 HI: Foundry (Centrifugal) and No.4 HI: Machine Shop -

##### (1) Objectives and Outline of the Plan

Changeover to the local production of the cylinder liners for the light vehicle lines has already been made at Foundry in No.3 HI using shell mold method. Casted crude for the agricultural machinery lines are imported and then machine processing is carried out in the No.3 HI. Those for the heavy vehicle lines are all dependent on imports of the full quota of completed products.

A system of increasing production level is needed when the cylinder liner production is implemented. Cylinder liner is a relatively mass-produced product, therefore, the A-line is to be employed for the production of it. However, the A-line has few margin in production capacity as there are renovation plans for manufacturing parts of heavy vehicles, agricultural machinery, small-sized machine tools, motor and products for export in future. Therefore, a foundry specially planned for the cylinder liners manufacturing is needed.

The present plan is to save the foreign exchange on imported goods by the installation of production lines for cylinder liners for heavy vehicle and agricultural machinery use. The lines will range from casting of blanks through machine processing down to the production of completed goods. To this end the No.3 HI shop have its buildings expanded and metal plate centrifugal equipment with good productivity be installed for the casting and supply of blanks to the various HI, where machine processing will take place. Production output including that of servicing goods is to be 70,000 items per annum.

A technical service ensuring the training for installation of equipment, testing, operational methods, verification of quality control and equipment maintenance, etc., is required.

(2) Details of the Plan

1) Casted Blanks Production Line

An expansion of building facilities in No.3 HI of approximately 1,152 square meters is to be effected and installation of integrated metal mold centrifugal casting equipment including a melting shop is to be carried out for the production of blanks. (Refer to Attached Figure 2-1.)

In order to promptly identify defects and flaws in the cast blanks analytical equipment is to be installed together with measuring devices and inspection jigs. A full range of integrated inspection equipment for the blanks to include an x-ray spectrometer for analysis of the chemical composition is to be installed. further, this inspection equipment is to be used to supplement existing equipment in the No.3 HI.

A rough machining facility to machine the cast blank is installed as the cast blank is delivered to machine shops after rough machining. A small-scaled maintenance shop for maintenance of working equipment and jigs is also installed.

2) Machine Processing Production Line

The machined parts for agricultural machinery processed in the foundry are machine finished and assembled in the AME Shop of No.3 HI. Those for the heavy and light vehicles are to have a new special processing line for shared use of the light and heavy vehicles installed in the Machine Shop of No.4 HI. The finished parts for the heavy vehicles to be sent to No.4 HI Diesel Engine shop and those for the light vehicles to be supplied to the engine assembly line in the Machine shop for assembling.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving of foreign Exchange

In the case of the present plan not being implemented it will be necessary to import the amount to cover future expanded production and that part for the general market. Comparison of the amount of foreign exchange required is made with this situation.

a) In the event of only machine processing taking place:

Those for agricultural machinery use are already machined in No.3 HI, and the new cylinder liner production envisaged in the present plan is 3,120 pieces per year for the light vehicle use part (for T-2000 only) and 8,580 pieces per year for the heavy vehicle use part (7,410 for TE and 1,170 for BX). A saving of foreign exchange of 500 yen per one part can be expected as follows:

	Foreign Exchange Required at Implementation of Plan (yen per piece)	Amount of Foreign Exchange Required at Present (yen per piece)
Cost of Parts	-	20,400
Raw Material Costs	16,300	-
Freight and Insurance	1,800	2,300
Sub-total	18,100	22,700
Working Equipment Costs	4,100	-
TOTAL	22,200	22,700

Note: The working equipment costs are only for the additional costs incurred by this plan. For details of the above costs refer to the Attached Table 3-3. The unit cost is the average weighted by the volumes of parts for the heavy vehicle and light vehicle use.

b) In the event of casting and machining taking place:

Production output as follows (pieces per year):

Light vehicles parts	7,800
Heavy vehicles parts	12,870
Agricultural machinery parts	10,530
Tractors parts HIC's use	5,200
for market	7,800
Other spare parts for market	25,800
Total	70,000



	Foreign Exchange Required at Implementation of Plan (yen per piece)	Amount of Foreign Exchange Required at Present (yen per piece)
Cost of Parts	-	15,900
Raw Material Costs	8,000	-
Freight and Insurance	900	1,800
Sub-total	8,900	17,700
Working Equipment Costs	1,800	-
TOTAL	10,700	17,700

Note: The working equipment costs are only for the additional costs incurred by this plan. For details of the above items refer to the Attached Table 3-3. The sales price for spare parts is the average of unit price for the heavy vehicle and light vehicle use items. Further, the unit cost of the table above shows the weighted average for all items.

A saving on foreign exchange of 7,000 yen can be anticipated to result.

## 2) Number of Years Required for Recovery of Foreign Exchange Investment

If the index for investment results is taken to be,

$$(A) / (B) \times (C)$$

where:

(A) = Required amount of foreign exchange (613,200,000 yen)

(B) = Amount of foreign exchange saved per item (500 yen)

(C) = Annual Output (11,700)

giving a result of 104.8 years for the present plan (machining)

$$(A) / (B) \times (C)$$

where:

(A) = Required amount of foreign exchange (1,626,900,000 yen)

(B) = Amount of foreign exchange saved per item (7,000 yen)

(C) = Annual Output (70,000)

giving a result of 3.3 years for the present plan (casting and machining)

### 3) Other Effects Anticipated

Through introduction of the centrifugal forging equipment it will be possible to produce casting blanks for other public corporations and for export.

### (5) Recommendations of the Implementation of the Plan

It is necessary to acquire technical expertise for the introduction of centrifugal forging and this will require a certain time. Therefore, machining processes for the cylinder liner should be carried out first and the domestic production of casting blanks proceeded with after.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-10(1) Cylinder Liner Production  
No.3 HI: #Foundry (Centrifugal) and No.4 HI: Machine Shop

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	M/E and materials for production facility		
1 1	Foundry		
1 1 1	Overhead travelling crane (cap. 5ton, span 11m)	Set	2
1 1 2	Hi-frequency induction melting furnace:0.5tx300kW	Set	1
1 1 3	Centrifugal casting machine:double station type(KSS-1000)	Set	2
1 1 4	Metal mold (3x2pcs) spare metal mold(3x2pcs)	Set	12
1 1 5	Shot blasting machine:Skew roller type	Set	1
1 1 6	Low-frequency induction holding furnace:1.0tx250kW	Set	2
1 1 7	Pipe cutting device	Set	2
1 1 8	Abrasive wheel:max. cutting dia. 150mm	Set	100
1 1 9	Preheater for metal mold	Set	1
1 110	Cooling system for melting and holding furnace	Set	1
1 111	Dust collector (type:bag filter):cap. 370Nm <sup>3</sup> /min	Set	1
1 112	Casting cooling lane and dust hood	Set	2
1 113	Ladle (capacity:1ton)	Set	1
1 114	Ladle (capacity:500kg)	Set	2
1 115	Platform scale (capacity:1ton)	Set	1
1 116	Platform scale (capacity:100kg)	Set	2
1 117	Scale spring balance (capacity:4kg)	Set	2
1 118	Hydraulic scale (capacity:3ton)	Set	1
1 119	Burner for ladle preheating	Set	2
1 120	Steel bag, steel container	Set	10
1 121	Hand pallet truck	Set	5
1 122	Tachometer	Set	1
1 123	Digital thermometer	Set	1
1 124	Stop watch	Set	2
1 125	Thickness gauge for coating	Set	2
1 126	Coating material (10ton)	Set	1
1 127	Secondary piping material	Lot	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-10 (2) Cylinder Liner Production  
No.3 HI: #Foundry (Centrifugal) and No.4 HI: Machine Shop

No	Items	Unit	No.
1 2	Machining shop		
1 2 1	Monorail hoist type suspension crane:cap. 3ton span:11m	Set	1
1 2 2	Vertical rough boring machine (double head type)	Set	2
1 2 3	Automatic turning machine (first rough cutting)	Set	3
1 2 4	Automatic turning machine (second rough cutting)	Set	1
1 2 5	Jig and measuring tool	Set	1
1 3	Inspection instruments		
1 3 1	Rockwell hardness tester (b-scale)	Set	1
1 3 2	Immersion thermometer (thermo couple 100pcs)	Set	2
1 3 2	CE meter (shell cup 100pcs)	Set	2
1 3 2	Optical pyrometer	Set	2
1 3 3	X-ray spectro analyzer	Set	1
1 3 3	Carbon analyzer with balance	Set	1
1 3 3	Sample cutter	Set	1
1 3 4	Specimen polishing device	Set	1
1 3 4	Metallurgical microscope with camera	Set	1
1 3 4	Developing & printing device for photo	Set	1
1 3 4	Chemical balance	Set	1
1 3 4	Wooden working table	Set	2
1 3 4	Electric bench grinder	Set	1
1 3 4	Abrasive paper	Sheet	100
1 3 5	Equipment for machining inspection	Lot	1
1 4	Maintenance shop		
1 4 1	Bench drilling machine	Set	1
1 4 2	Electric bench grinder (double head type)	Set	1
1 4 3	Electric arc welder	Set	1
1 4 4	Abrasive cut-off machine	Set	1
1 4 5	Gas cutting device	Set	1
1 4 6	Surface plate	Set	1
1 4 7	Parallel bench vice	Set	1
1 4 8	Electric testing instrument	Set	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-10 (3) Cylinder Liner Production  
No.3 HI: #Foundry (Centrifugal) and No.4 HI: Machine Shop

No	Items	Unit	No.
1 5	Utility		
1 5 1	High tension receiving panel	Set	1
1 5 2	Transformer	Set	1
1 5 3	Power feeder panel and breaker switch	Set	2
1 6	Building and foundation materials (24x48m)		
1 6 1	Steel structure	Set	1
1 6 2	Siding and roofing materials: slate, brick and mortar	Set	1
1 6 3	Steel door and window sush	Set	1
1 6 4	Glass and putty	Set	1
1 6 5	Gutter and rain proof materials	Set	1
1 6 6	Roof fan with motor	Set	5
1 6 7	Air conditioner for laboratory	Set	1
1 7	Other machines & equipment	Lot	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-10 (4) Cylinder Liner Production  
No.3 HI: #Foundry (Centrifugal) and No.4 HI: Machine Shop

No	Items	Unit	No.
2	Construction of machining line		
2 1	Horizontal fine boring M/C	Set	1
2 2	Vertical fine boring M/C	Set	1
2 3	NC lathe	Set	1
2 4	Special type horizontal fine boring M/C	Set	1
2 5	Honing M/C	Set	1
2 6	Miscellaneous		
2 6 1	Single purpose M/C	Set	2
2 6 2	Horizontal milling M/C	Set	1
2 6 3	Washing equipment	Set	1
2 6 4	Leakage tester	Set	1
3	Local M/E		
4	Others		
A	License Fee	Set	
B	Eng Fee	MM	
C	Software	Set	
D	Interest During Const.	Mth	

Attached Table 3-2: REQUIRED INVESTMENT (#4-10)

Case 1: Machining only

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	481.0	-	481.0
2 Freight & Insurance	53.4	-	53.4
Sub-total	534.4	-	534.4
3 Import Duty	-	80.2	80.2
4 Unloading	-	7.5	7.5
5 Installation Cost	-	10.4	10.4
Imported M/E Total	534.4	98.1	632.5
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	78.8	-	78.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	78.8	-	78.8
Total Investment	613.2	98.1	711.3

Attached Table 3-2: REQUIRED INVESTMENT (#4-10)  
Case 2: Casting & Machining  
(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	98.0	98.6	196.6
2 Freight & Insurance	10.9	-	10.9
Sub-total	108.9	98.6	207.5
3 Import Duty	-	16.3	16.3
4 Unloading	-	1.5	1.5
Building Total	108.9	116.4	225.3
Bldg & Land Total	108.9	116.4	225.3
2 1 Imported M/E (FOB)	1173.0	-	1173.0
2 Freight & Insurance	130.2	-	130.2
Sub-total	1303.2	-	1303.2
3 Import Duty	-	195.5	195.5
4 Unloading	-	18.2	18.2
5 Installation Cost	-	10.4	10.4
Imported M/E Total	1303.2	224.1	1527.3
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	154.8	-	154.8
C Software	60.0	-	60.0
D Interest	0.0	-	0.0
Other Costs Total	214.8	-	214.8
Total Investment	1626.9	340.5	1967.4



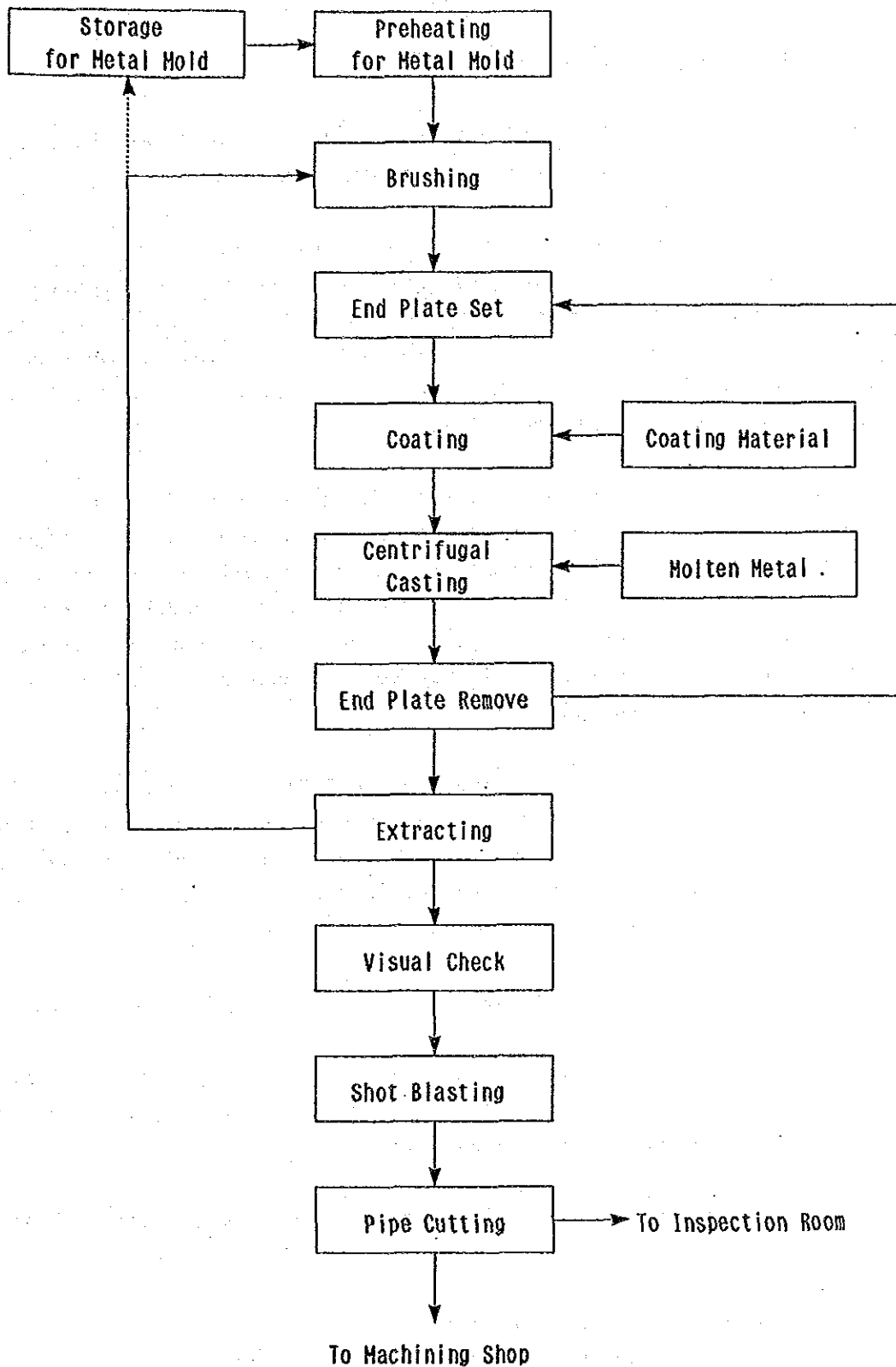
Attached Table 3-3: PRODUCTION COST STATEMENT (#4-10)  
Case 1: Machining Only

Items	Annual Cost (million Yen)			Component (%)
	F/C	L/C	Total	
1 CP/RM				
A Imported CP/RM (FOB)	190.6	-	190.6	60
Freight & Insurance	21.2	-	21.2	7
Import Duty	-	31.8	31.8	10
Unloading	-	3.0	3.0	1
Sub-total	211.8	34.8	246.6	77
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	211.8	34.8	246.6	77
2 Utilities	0.0	8.9	8.9	3
Variable Cost	211.8	43.7	255.5	80
3 Depreciation	32.1	6.1	38.2	12
4 Amortization	0.0	-	0.0	0
5 Maintenance	16.0	2.9	18.9	6
6 Design Fee	0.3	-	0.3	0
7 Labor	-	0.6	0.6	0
8 Overhead	-	4.1	4.1	1
9 Admin. Cost	-	1.3	1.3	0
Fixed Cost	48.4	15.0	63.4	20
Annual Cost	260.2	58.7	318.9	100
Unit P. Cost			27256.4	
10 Mark-up			817.7	
11 Excise Tax			8422.2	
Ex-fact. Cost			36496.3	

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-10)  
Case 2: Casting & Machining

Items	Annual Cost (million Yen)			Compo- nent
	F/C	L/C	Total	(%)
1 CP/RM				
A Imported CP/RM (FOB)	560.9	-	560.9	62
Freight & Insurance	62.3	-	62.3	7
Import Duty	-	93.5	93.5	10
Unloading	-	8.7	8.7	1
Sub-total	623.2	102.2	725.4	80
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	623.2	102.2	725.4	80
2 Utilities	0.0	11.9	11.9	1
Variable Cost	623.2	114.1	737.3	81
3 Depreciation	82.6	17.5	100.1	11
4 Amortization	0.0	-	0.0	0
5 Maintenance	42.4	9.7	52.1	6
6 Design Fee	0.9	-	0.9	0
7 Labor	-	4.4	4.4	0
8 Overhead	-	11.8	11.8	1
9 Admin. Cost	-	3.6	3.6	0
Fixed Cost	125.9	47.0	172.9	19
Annual Cost	749.1	161.1	910.2	100
Unit P. Cost			13002.9	
10 Mark-up			390.1	
11 Excise Tax			4017.9	
Ex-fact. Cost			17410.9	

Attached Figure 2-1 PRODUCTION PROCESS OF CYLINDER LINER  
BY CENTRIFUGAL CASTING



#4-11 Bolt and Nut Production  
- No.1 HI: Bolt & Nut Shop -

(1) Objectives and Outline of the Plan

Part of the current bolt and nut consumption of HIC is met with in shop production but the major part depends on imports.

The in shop production is based on the specifications of the manufactured products of each of the individual HIs and are produced in the various related machine shops to meet these. Thus, in the No.1 HI they are mainly produced for vehicle use with specialist equipment and in the other HIs cutting work processing is done using turret lathes and productivity is extremely low.

The present plan proposes the streamlining and concentration of production of the various bolts and nuts used with the wide range of products produced at HIC so that the nuts and bolts are produced according to the same method and technical level. And by this to bring about an improvement of product quality and economic efficiency and aim at realizing a reduction in foreign currency spending on imports and raise technical standards.

The present production performance of No.1 HI for bolts and nuts is approximately 250,000 per month and for wood screws and others about 1,000,000 per month (Attached table 1-1). It is aimed to raise these to 2,000,000 per month for bolts and nuts and to a 2,400,000 monthly production performance for wood screws. At the same time local production of the vehicle use hub bolts, hub nuts, nuts for the U-bolts, spring washers is to be undertaken (Attached Table 1-2).

In order to implement the present plan an area of approximately 1,600 square meters on the west side of the present bolt and nut shop is to be built (refer to Attached Figure 1-1).

Inside of the expanded new buildings the following production lines are to be set up:

- 1) bolt and nut production line
- 2) hub bolt and hub nut inner production line
- 3) hub bolt, drum nut and U-bolt use nut production lines

- 4) spring washer production line
- 5) plated parts production line

U-bolt production line is installed in Leaf Spring Shop (#4-12).

The currently operating bolt and nut shop is comparatively in good condition and so the operating equipment can be arranged in the new shop and one new thread rolling machine installed and all of the old type wood screw production equipment removed and new production lines for the wood screw, tapping screw and machine screw be installed.

One set of devices needed for product quality check are to be installed.

## (2) Details of the Plan

### 1) Bolt and Nut Production Line

The bolt and nut production line is to be set up in the new building.

A new bolt former machine, threader machine and their dies are to increase the currently insufficient bolt production capacity of the M6 - M10 (55 - 95 l). Further for the M 12 - M20 (95 - 180 bl) one bolt former for the long size bolt and one threader and their dies are to be added.

For nut production lines, one nut former and one tapping machine together with their dies for the M2 - M5 are to be added. The equipment serving the M14 - M20 size items starting with the relatively new NF560 are comparatively in good condition and since the number of items produced is small there is no need for additional equipment.

Further, for the bolt inserted into the washer this can be locally produced by using the R-type bolt before threading and inserting this by hand into the washer. Preparations for the localization of the R-type and M-type should also be made.

Reamer bolt, wing bolt and other special type bolts and those of special materials are not planned for the local production.

It has been proposed to standardize the threading specifications of the whitworth, unified and metric threads in the near future and so increase in the tools for these have not been proposed.

Production capacity is approximately 700,000 per month for the 6 mm and 20 mm bolts and nuts.

The thread rolling machine currently operating in the bolt and nut shop is in very good operating condition but there is no substitute policy in the event of breakdown. Therefore, in order to assure and maintain a regular production installation of an additional thread rolling machine is proposed.

Replacement of the forming dies, threading dies and tap currently in operation. As these are important machine tools determining the precision level of products their precision should be maintained by provision of regular inspection.

A technical service to implement the training for installation of equipment, trial test runs, operational methods, verification of quality and equipment maintenance is required.

## 2) Production Line for Hub Bolt and Hub Nut Inners

At present these are totally dependent on imports. A production line for the hub bolts and hub nut inners is to be set up inside the new building annex.

The production line equipment for the hub bolt and nut liners includes the hub bolt and hub nut items for heavy vehicle use and the hub bolts for tractor use and their service parts.

The production capacity for the 16 mm-30 mm diameter screw is approximately 500,000 per month.

As heat treatment is required for the present parts an non-oxydizing type heat treatment facility is to be installed. This facility will be used for heat treatment of the tapping screws, spring washers, and particular bolts and also for U-bolts and similar items.

One set of inspection devices are to be installed for purposes of carrying out the verification of product quality after heat treatment and plating processes.

The forming and threading dies and tap are changed in accordance with the parts specifications and these are important machine tools which affect the precision quality of parts so it is necessary to check these regularly in order to maintain their precision.

A technical service to implement the training for installation of equipment, trial test runs, operational methods, verification of quality control and equipment maintenance is required.

### 3) Production line for the Hub Nut, Drum nut and U-bolt Nut

These currently rely on imports. A production line for the hub nuts, drum nuts and U-bolt nuts is to be set up in the new building annex.

The production line is to include the hub nut, drum nut for heavy vehicle use, the hub nut for tractor use and the U bolts-used for both heavy and light vehicles as well as the service parts.

Production capacity of the 16 mm to 24 mm diameter nuts is to be approximately 1,000,000 per month.

After forming machine processing of the spherical face is required for hub nuts. As the spherical face is an important quality specification it is necessary to verify the precision.

The quality check equipment to be used after plating is to be shared with that used for hub bolt production.

The forming dies and tap are changed in accordance with the parts specifications and these are important machine tools which affect the precision quality of parts so it is necessary to check these regularly in order to maintain their precision.

A technical service to implement the training for installation of equipment, trial test runs, operational methods, verification of quality control and equipment maintenance is required.

### 4) Production Line for Spring Washers

At present these are totally dependent on imports. A production line for the spring washers is to be set up inside the new building annex .

The spring washers used on all production lines of HIC are to be provided. The production capacity for the spring washers for use with the 3 mm - 24 mm diameter screws is approximately 1,700,000 per month for each machine.

As heat treatment is required for the present parts shared use of the hub bolt heat treatment is to be implemented. It is necessary to make the line flow clear so as to avoid any confusion between parts before treatment and those after treatment.

Shared use as necessary of the plating equipment and quality verifying equipment is to be implemented.

The molding tools are changed in accordance with the parts specifications and these are important machine tools which affect the precision quality of parts so it is necessary to check these regularly in order to maintain their precision.

A technical service to implement the training for installation of equipment, trial test runs, operational methods, verification of quality control and equipment maintenance is required.

#### 5). Production Line for Plating Parts

A production line for plating parts to be set up inside the new building annex. Although the plating equipment in current operation is in relatively good condition the treating performance of 150 kg daily is below the treatment capacity of 250 kg daily. The equipment for the various bolt and nut types has been increased since the initial installation and present production is of 300 kg daily.

Therefore, addition of another similar plating machine is required and the plating equipment including the present one machine and the new one are to be set up in the new building annex. At the same time installation of plating waste water treatment equipment is to take place.

Equipment for verification of plating quality is included in the hub bolt production line.



6) Tapping screw, Wood screw and Machine screw production line

There are 10 threading machines for wood screw use currently but these all suffer from severe deterioration and are beyond repair. Only 4 are operating and the cutting machines of these have extremely low productivity. It is necessary to scrap these and install new equipment which can produce the wood screws, machine screws and tapping screws inside the present bolt and nut shop.

The present production line is to provide all of the small size screws used in HIC.

The production capacity for 2 mm-8mm diameter screws of 5mm to 6 mm length is approximately 900,000 for each machine per month.

Shared use of the Heat treatment equipment of the hub bolt use equipment is to be made and shared use of the plating equipment of the bolt nut equipment is to be made. Further the quality verification devices are to be used in common.

The forming dies, and threading dies are changed in accordance with the parts specifications and these are important machine tools which affect the precision quality of parts so it is necessary to check these regularly in order to maintain their precision.

A technical service to implement the training for installation of equipment, trial test runs, operational methods ,verification of quality control and equipment maintenance is required.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving of Foreign Exchange

A saving in the required amount of foreign capital cannot be expected since the production output of the present plan is low but if the production output indicated below is more than 4,100 tons then this can be anticipated (however this is with an annual production of 650,610 kgs).

	Foreign Exchange Required at Implementation of Plan (yen per item)	Amount of Foreign Currency Required at Present (yen per item)
Cost of parts	-	169
Raw Material Costs	85	-
Freight & Insurance	10	19
Sub-total	95	188
Working equipment costs	585	-
TOTAL	680	188

Note: For details of the above items refer to the Attached Table 3-3. Also for the product price the weighted average of 1 kg of M12-24 has been employed.

Assumed Annual Production (kg. per year)	Amount of Foreign Exchange with Implementation of the Plan (yen per kg.)	Required Amount of Foreign Exchange in the Case of Importing (yen per kg.)
2,000,000	204	188
2,500,000	190	188
3,000,000	180	188

## 2) Reduction in Production Costs Achieved

A comparison of production costs for one kg at present and after the implementation of the present plan is as follows:

	Production Costs After Implementation of the Plan	Present Production Costs
Imported CP/RM costs		
FOB price	85	166
Freight & insurance	10	19
Sub-total	95	188
Local CP/RM costs	-	-
Depreciation	461	-
Utility costs	12	-
Labor costs	6	-
Overheads	11	-
Admin. costs	3	-
Other costs	250	19
Sub-total	743	19
Mark-up, profit	-	-
Excise tax	-	-
TOTAL	834	207

As the production output of the present proposal is low neither a saving of foreign capital nor a reduction in production costs can be anticipated. If either a considerable expansion of the assumed production output is carried out or a selection for local production of the bolt nut varieties whose substitution with locally produced items would have a relatively large effect is made then the present plan would be possible (refer to Attached Table 3-4).

3) Other Expected Effects

Implementation of this plan enables other industries with a shortage of bolt and nut to expand their production.

Attached Table 1-1. EXISTING PRODUCTION CAPACITY OF BOLT &amp; NUT IN HIC

As of Feb., 1988

Type		Tale Length (mm)	Machines	Machine Capacity pcs/min	Production Capacity of H I C	
					pcs/8Hr	pcs/Mon.
HEX. BOLT	M3, M4, M5	3~35	Header H-15	120	7,000	140,000
			Slotter S-15	30	6,000	120,000
			Threader TR-14	300	5,000	100,000
	M6, M8, M10	16~55	Header K-30	65	6,000	120,000
			Trimmer R-30	80	5,000	100,000
			Threader TR-30	80	4,000	80,000
	M12, M14 M16, M18	22~95	Header BN-5	60	5,000	100,000
			Trimmer BN-6	40	4,000	80,000
			Pointer BN-7	30	3,200	64,000
			Threader BN-8	40	4,000	80,000
HEX. NUT	M3, M4, M5		Former NF20	80	7,000	140,000
			Tapping I-5-2/2	40	8,000	160,000
	M6, M8, M10		Former NF-30	70	5,000	100,000
			Tapping I-5-1/2	30	7,000	140,000
			" MGA512a	40	7,000	140,000
	M12, M14 M16, M18 M20		Former NF560	60	5,000	100,000
			Tapping BN12	30	7,000	140,000
			" GMK	30	7,000	140,000
			" BM	30	7,000	140,000
RIVET	$\phi 3$	4~26	Riveling M/C	100	10,000	200,000
	$\phi 4, \phi 5$	6~50	"	80	8,000	160,000
	$\phi 6, \phi 7, \phi 8$	12~50	"	80	8,000	160,000

Note : The boxed figures indicate the critical production capacity for each bolt/nut type.

Attached Table 1-2 No.1 HI: Bolt and Nut MANUFACTURING SHOP PLAN OF FOR EQUIPMENT INSTALLATION

SIZE	H2	H3	M4	M5	M6	M8	H10	M12	M14	M16	M18	M20	M22	M24	H30
Hex. BOLT	HEADER		H-15 (140,000pcs/H)			K-30 (120,000pcs/H)			BN-5 (100,000pcs/H)						
	TRIMMER		S-15 (120,000pcs/H)			R-30 (100,000pcs/H)			BN-6 (80,000pcs/H)						
	THREADER		TR14 (100,000pcs/H)			TR30 (80,000pcs/H)			BN-7 BN-8 (64,000pcs/H)						
	FORMER		NF20 (140,000pcs/H)			NF30 (100,000pcs/H)			NF560 (100,000pcs/H)						
Hex. BOLT	TAPPER		I-5-2/2 (160,000pcs/H)			I-5-1/2 (140,000pcs/H)			BN12 3MK BH (140,000pcs/H)						
	FORMER					L-55-90 1,100,000pcs/H			L-95-180 600,000pcs/H				L.V. HUB BOLT	*	
	THREADER					1,800,000pcs/H			500,000pcs/H						
	FORMER					600,000pcs/H									
Hex. BOLT	THREADER					1,200,000pcs/H									
	FORMER					900,000pcs/H									
	TAPPER					650,000pcs/H									
	BOLT FORMER					HUB NUT INNER HUB BOLT							470,000pcs/H	L- 200	
Hex. BOLT	NUT FORMER					H.V. & L.V. U-BOLT NUT							1,000,000pcs/H		
						H.V. & L.V. HUB NUT									
						H.V. & L.V. HUB NUT									
						HUB NUT NUT, HUB BOLT									

\* Assignment of machines for the indicated hub bolt and hub nuts production.

Legend: K-30 (120,000pcs/H) H/C No. Actual Production

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-11(1) Bolt, Nut & Spring Washer Production  
 - No.1 HI: Bolt, Nut Shop -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Building (1600m2)	Set	
2	Imported M/E		
1	Renvt'n&replcm't of worn out ME for bolt&nut shop (No.1 HI)		
1 1	Plating equipment & waste treatment	Lot	1
1 2	Miscellaneous	Lot	1
2	To solve the production bottleneck		
2 1	Thread rolling machine TR15A	Set	1
2 2	Thread rolling die 155mmDx60 M16xP2.0,M20xP1.5,M20xP2.5	Set	3
3	Bolt and nut manufacturing ME		
3 1	M6-M10 bolt forming		
3 1 1	Bolt former:M6-M10 55-90L(S330L)	Set	1
3 1 2	Wire stand (RS-H-30)	Set	1
3 1 3	Three step transformer	Set	1
3 1 4	Oil cleaner	Set	1
3 1 5	Quick change system	Set	1
3 1 6	Spare parts	Lot	1
3 2	Dies, R type		
3 2 1	M6P1.0, M8P1.25, M10P1.25, P1.5	Set	4
3 2 2	1/4, 20T, 28T, 5/16-18T, 24T, 3/8-16T, 24T	Set	6
3 2 3	Common tools (spacer etc.)	Lot	1
3 2 4	Spare dies	Lot	1
3 3 1	Dies, M type (M6 P1.0 10L,12L,14L,16L,20L,25L,30L,40L,etc.)	Set	33
3 4	M12-M20 bolt forming		
3 4 1	Bolt former:M12-M20 95-180L (S360)	Set	1
3 4 2	Wire reformer (MWS-H-60)	Set	1
3 4 3	Wire Stand (RSH-40)	Set	1
3 4 4	Three step transformer	Set	1
3 4 5	Oil cleaner	Set	1
3 4 6	Quick change system	Set	1
3 4 7	Spare parts	Lot	1
3 5	Forming dies, R type		
3 5 1	M12 P1.25, P1.5, P1.75, M14 P1.5, P2.0, M16 P1.5, P2.0, etc.	Set	10
3 5 2	7/16-14T, 20T, 1/2-13T, 5/8-11T	Set	4
3 5 3	Common tools (spacer etc.)	Lot	1
3 5 4	Spare dies	Lot	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-11 (2) Bolt, Nut & Spring Washer Production  
 - No.1 HI: Bolt, nut shop -

No	Items	Unit	No.
3 6 1	Forming dies, M type:M12 P1.25, P1.75 20L,25L,30L,35L,etc.	Set	86
3 7	M6-M10 threading		
3 7 1	Bolt threader:M6-M10 55-90L (SSR30)	Set	1
3 7 2	Threading dies:M6 P1.0, M8 P1.25, M10 P1.25, P1.5	Set	4
3 7 3	1/4-20T, 28T, 5/16-18T, 24T, 3/8-16T, 24T	Set	6
3 8	M12-M20 threading		
3 8 1	Bolt threader:M12-M20 95-180L (SSR70)	Set	1
3 8 2	Threading dies:M12 P1.25,P1.5,P1.75,M14 P1.5,P2.0,etc.	Set	11
3 8 3	Threading dies:7/16-14T, 20T, 1/2-13T, 5/8-11T	Set	4
3 9	Nut forming		
3 9 1	Nut former:M2-M5 (NF515)	Set	1
3 9 2	Wire stand (RS-H-30)	Set	1
3 9 3	Three step transformer	Set	1
3 9 4	Oil cleaner	Set	1
3 9 5	Quick change system	Set	1
3 9 6	Spare parts	Lot	1
3 9 7	Forming dies:M2 P0.25, M3 P0.5, M4 P0.7, M5 P0.8	Set	4
3 9 8	Spare dies	Lot	1
310	M2-M5 nut tapping		
310 1	Nut tapper:M2-M5 (super-1)	Set	1
310 2	Tapping tools:M2 P0.25, M3 P0.5, M4 P0.7, M5 P0.8	Set	4
311	Nut forming		
311 1	Nut former:M6-M12 (NF540)	Set	1
311 2	Wire stand	Set	1
311 3	Three step transformer	Set	1
311 4	Oil cleaner	Set	1
311 5	Quick change system	Set	1
311 6	Spare parts	Lot	1
311 7	Forming dies:M6P1.0,M8P1.25,M10P1.25,P1.5,M12P1.25,P1.5,etc.	Set	9
311 8	Spare dies	Lot	1



Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-11 (3) Bolt, Nut & Spring Washer Production  
- No.1 HI: Bolt, nut shop -

No	Items	Unit	No.
312	M6-M12 nut tapping		
312 1	Nut tapper:M6-M12 (super-4)	Set	1
312 2	Tapping tools:M6 Pl.0,M8 Pl.25,M10 Pl.25,Pl.5,M12 Pl.25,etc.	Set	9
313	Nylon caulking line		
313 1	Nylon caulking m/c for MAZDA X2000 hub nut	Set	1
313 2	Accessories	Lot	1
314 1	Tools for rear body bolt (m/c BP490):M12-2 items	Set	1
314 2	Tools for rear body bolt (m/c BP490):M10-6 items	Set	1
315	Miscellaneous	Lot	1
4	Hub bolt and hub nut inner manufacturing equipment		
4 1	Forming line		
4 1 1	Forming machine (BP-490)	Set	1
4 1 2	Forming tools (inner-1 item, hub bolt-2 items)	Set	3
4 2	Heat treatment line		
4 2 1	Continuance hardening & tempering equipment (un-oxidation)	Set	1
4 2 2	Gas generator	Set	1
4 2 3	Gas plant	Set	1
4 2 4	Gas vaporizer	Set	1
4 2 5	CO2 analyzer	Set	1
4 3	Testing equipment		
4 3 1	Hardness tester (H12.M-3)	Set	1
4 3 2	Micro scope	Set	1
4 3 3	Magneflux inspect. equip. (NQ-40T)	Set	1
4 3 4	Micro cutter	Set	1
4 3 5	Micro press (plastic mold)	Set	1
4 3 6	Belt sander	Set	2
4 3 7	Disc grinder	Set	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-11 (4) Bolt, Nut & Spring Washer Production  
- No.1 HI: Bolt, nut shop -

No	Items	Unit	No.
4 4	Machine tools		
4 4 1	Single lathe	Set	3
4 4 2	Single lathe (out side)	Set	1
4 4 3	Thread rolling M/C (TR15A)	Set	1
4 4 4	Thread rolling M/C dies	Set	4
4 4 5	Tapping machine	Set	1
4 5	Quality checking equipment		
4 5 1	Film thickness meter	Set	1
4 5 2	Hardness tester	Set	1
4 6	Miscellaneous	Lot	1
5	Hub nut manufacturing equipment		
5 1	Lathe		
5 1 1	Single lathe (FS)	Set	3
5 1 2	Spare parts & tools	Lot	1
5 1 3	Testing equipment	Set	1
5 1 4	Parts feeder	Set	3
5 2	Nut tapping		
5 2 1	Automatic tapper	Set	3
5 2 2	Spare parts & tools	Lot	1
5 2 3	Testing equipment	Set	1
5 3	Nut tap grinding		
5 3 1	GB-3 tap grinder	Set	1
5 3 2	Spare tools	Lot	1
5 4	Miscellaneous	Lot	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-11 (5) Bolt, Nut & Spring Washer Production  
- No.1 HI: Bolt, nut shop -

No	Items	Unit	No.
6	Hub nut, drum nut and u-bolt nut manufacturing equipment		
6 1	Nuts manufacturing equipment		
6 1 1	Hot nut former (HNP-80)	Set	1
6 1 2	Accessories	Lot	1
6 1 3	Forming dies:hub nut (HV and LV),drum nut,U-bolt nut,etc.	Set	13
6 1 4	Spare tools	Lot	1
6 1 5	Electric heater (600kW)	Set	1
6 1 6	Piping equipment of water cooler	Lot	1
6 2	Miscellaneous	Lot	1
7	Tapping, wood & machine screw manufacturing equipment		
7 1	Forming M/C (screw former)		
7 1 1	M2-M3 5-40L (No.0)	Set	1
7 1 2	M4-M5 6-50L (No.1)	Set	1
7 1 3	M6-M8 8-60L (No.2)	Set	1
7 2	Forming dies	Set	141
7 3	Threading M/C (screw threader)		
7 3 1	M2-M3 (THI-4R)	Set	1
7 3 2	M4-M5 (THI-6R)	Set	1
7 3 3	M6-M10 (THI-10R)	Set	1
7 4	Threading dies	Set	109
7 5	Slotting M/C No.1	Set	1
7 6	Slotting M/C No.2	Set	1
7 7	Tools for slotting M/C	Lot	1
7 8	Miscellaneous	Lot	1
8	Spring washer manufacturing equipment		
8 1	Vertical molding machine 3mmD-5mmD	Set	1
8 2	Vertical molding machine 6mmD-12mmD	Set	1
8 3	Vertical molding machine 14mmD-24mmD	Set	1
8 4	Coiling machine 3mmD-3.5mmD	Set	1
8 5	Cutting machine 3mmD-3.5mmD	Set	1
8 6	Coiling & cutting machine 4mmD-5mmD	Set	1
8 7	Coiling & cutting machine 6mmD-10mmD	Set	1
8 8	Coiling & cutting machine 12mmD-16mmD	Set	1
8 9	Coiling & cutting machine 18mmD-24mmD	Set	1
810	Inspection equipment	Lot	1
811	Raw material for machine test	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-11)

(Unit: million yen)

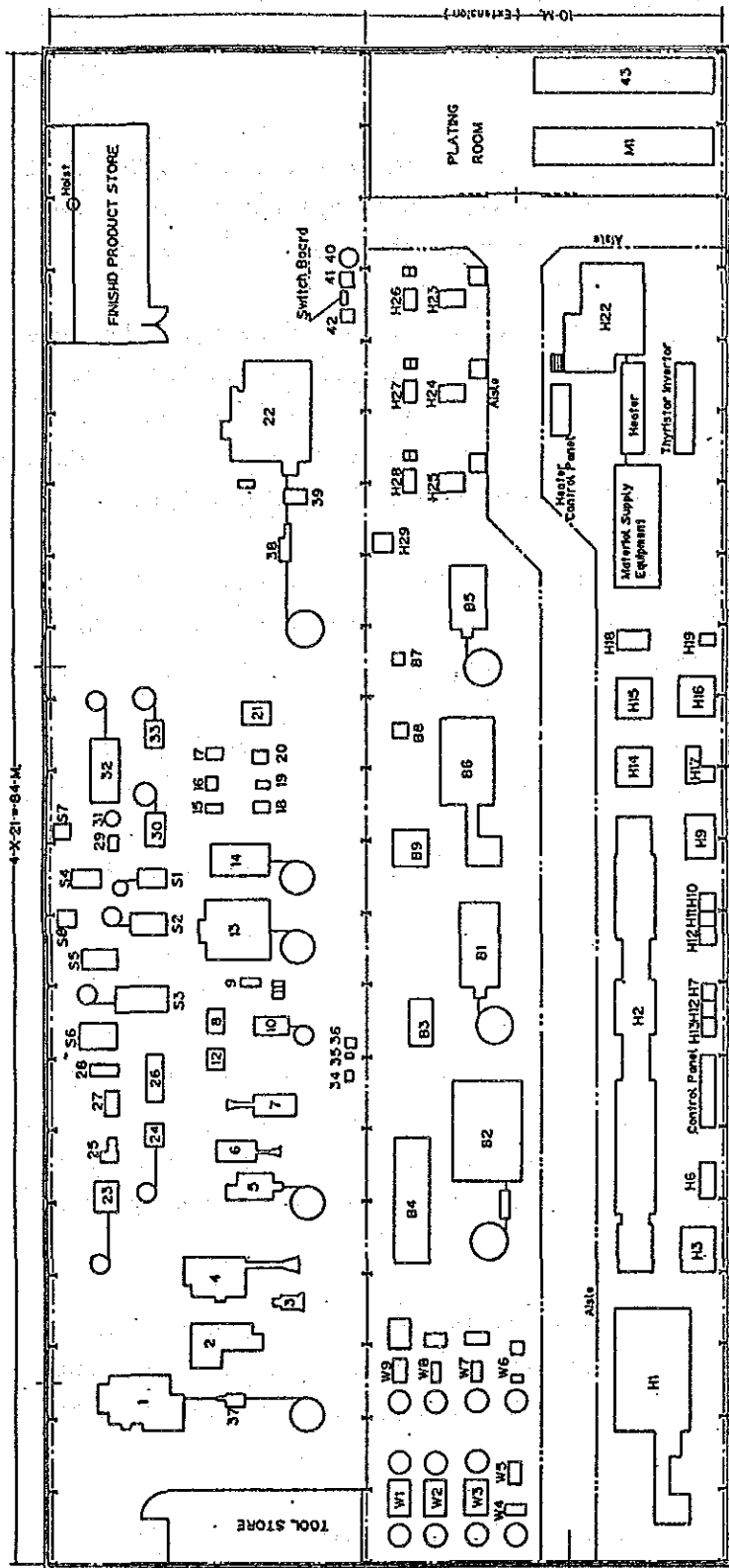
Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	92.2	129.0	221.2
2 Freight & Insurance	10.2	-	10.2
Sub-total	102.4	129.0	231.4
3 Import Duty	-	15.4	15.4
4 Unloading	-	1.4	1.4
Building Total	102.4	145.8	248.2
Bldg & Land Total	102.4	145.8	248.2
2 1 Imported M/E (FOB)	3729.6	-	3729.6
2 Freight & Insurance	414.0	-	414.0
Sub-total	4143.6	-	4143.6
3 Import Duty	-	621.5	621.5
4 Unloading	-	58.0	58.0
5 Installation Cost	-	16.4	16.4
Imported M/E Total	4143.6	695.9	4839.5
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	82.8	-	82.8
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	82.8	-	82.8
Total Investment	4328.8	841.7	5170.5

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-11)

Items	Annual Cost (million Yen)			Compo- nent
	F/C	L/C	Total	(%)
1 CP/RM				
A Imported CP/RM (FOB)	55.3	-	55.3	10
Freight & Insurance	6.1	-	6.1	1
Import Duty	-	9.2	9.2	2
Unloading	-	0.9	0.9	0
Sub-total	61.4	10.1	71.5	13
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	61.4	10.1	71.5	13
2 Utilities	0.0	7.9	7.9	1
Variable Cost	61.4	18.0	79.4	15
3 Depreciation	252.7	47.0	299.7	55
4 Amortization	0.0	-	0.0	0
5 Maintenance	127.4	24.7	152.1	28
6 Design Fee	0.5	-	0.5	0
7 Labor	-	4.2	4.2	1
8 Overhead	-	7.1	7.1	1
9 Admin. Cost	-	2.2	2.2	0
Fixed Cost	380.6	85.2	465.8	85
Annual Cost	442.0	103.2	545.2	100
Unit P. Cost			838.0	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			838.0	



Attached Figure 1-1 ADDITIONAL MACHINE LAYOUT OF BOLT AND NUT SHOP



NOTE: \* : NEW MACHINE

SR. NO.	MACHINE NAME	MODEL	SR. NO.	MACHINE NAME	MODEL	SR. NO.	MACHINE NAME	MODEL	SR. NO.	MACHINE NAME	MODEL	SR. NO.	MACHINE NAME	MODEL
1	BOLT SECTION	BN-5	21	TAPPING M/C	GA-8051	41	TRANSFORMER	-	H20	FILM THICKNESS METER (OFFICE)	-	B6	NUT FORMER M6-M12	NF-540
2	HEADER	BN-6	22	NUT FORMER	NF-560	42	PLATING EQUIPMENT	-	H21	HARDNESS TESTER (OFFICE)	-	B7	NUT TAPPER M2-M5	SUPER-1
3	TRIMMER	BN-7	23	NAIL SECTION	-	43	PLATING EQUIPMENT	-	H22	HOT NUT FORMER	NF-60	B8	NUT TAPPER M6-M12	SUPER-4
4	THREAD ROLLING M/C	BN-8	24	NAIL MAKING M/C	NA-0209	44	HUB BOLT & NUT SECTION	-	H23	HOT NUT FORMER	NF-60	B9	NYLON CAULKING M/C	-
5	HEADER	K-30	25	NAIL MAKING M/C	NA-0434	45	H1 FORMING MACHINE	BP-490	H24	24-24 SINGLE LATH	FS	W1	SPRING WASHER SECTION	-
6	TRIMMER	R-30	26	TUMBLING BARREL	-	46	H2 HEAT TREATMENT EQUIP.	-	H25	24-24 AUTOMATIC TAPPER	OKLL	W2	VERTICAL MOLDING M/C	43-0-50
7	THREAD ROLLING M/C	TR-30	27	MULTI PURPOSE LATH	59123	47	H3 GAS GENERATOR	-	H26	TAP GRINDER	GB-3	W3	VERTICAL MOLDING M/C	45-0-120
8	THREAD ROLLING M/C	TR-15	28	SINGLE PURPOSE LATH	49250	48	H4 GAS PLANT	-	H27	* TAPPING WOOD & MACHINE SCREW SECTION	-	W4	COLING MACHINE	43-0-24.0
9	THREAD ROLLING M/C	TR-14	29	UP-RIGHT DRILLING M/C	YUD-540	49	H5 GAS VAPORIZER	-	H28	* FORMING MACHINE	NO.0	W5	CUTTING MACHINE	43-0-35
10	HEADER	H-15	30	RIVET SECTION	-	50	H6 CO2 ANALYZER	-	H29	FORMING MACHINE	NO.2	W6	AUTO. COILING & CUTTING M/C	44-0-50
11	SLOTING MACHINE	S-15	31	TUMBLING BARREL	-	51	H7 HARDNESS TESTER	-	H30	THREADING MACHINE	TH-4R	W7	AUTO. COILING & CUTTING M/C	45-0-10.0
12	THREAD ROLLING M/C	TRISA	32	HEADING BARREL	-	52	H8 MICRO SCOP	-	H31	THREADING MACHINE	TH-6R	W8	AUTO. COILING & CUTTING M/C	42-0-16.0
13	NUT SECTION	NF-30	33	HEADING MACHIN	H-300	53	H9 MAGNAFLUX TESTING EQ.	-	H32	THREADING MACHINE	TH-10R	W9	AUTO. COILING & CUTTING M/C	45-0-24.0
14	NUT FORMER	NF-20	34	HEADING MACHIN	H-301	54	H10 MICRO CUTTER	-	H33	SLOTING MACHINE	NO.1	W10	MISCELLANEOUS EQUIPMENT	-
15	TAPPING M/C	-	35	HEADING MACHIN	H-299	55	H11 MICRO PRESS	-	H34	BOLT AND NUT SECTION	-	M1	PLATING EQUIPMENT	-
16	TAPPING M/C	TR-18	36	GRINDING MACHINE	-	56	H12 BELT SANDER	-	H35	BOLT FORMER M6-M12	S330L			
17	TAPPING M/C	BN-12	37	GRINDING MACHINE	-	57	H13 SINGLE LATH	STS-2	H36	BOLT FORMER M12-M20	S360			
18	TAPPING M/C	-	38	WIRE STRAIGHTNER	-	58	H14 SINGLE LATH	STS-2	H37	BOLT FORMER M12-M20	S360			
19	CHAMFERING M/C	-	39	HEATER	-	59	H15 SINGLE LATH	STS-3	H38	BOLT FORMER M12-M20	S360			
20	TAPPING M/C	BN-2950	40	DRYER	-	60	H16 CENTERESS GRINDER	TH-GRND-1	H39	BOLT FORMER M12-M20	S360			
							H17 CENTERESS GRINDER	TH-GRND-1	H40	BOLT FORMER M12-M20	S360			
							H18 THREAD ROLLING M/C	TRISA	H41	BOLT FORMER M12-M20	S360			
							H19 TAPPING MACHINE	KTV-3	H42	BOLT FORMER M12-M20	S360			
							H20 TAPPING MACHINE	KTV-3	H43	BOLT FORMER M12-M20	S360			

#### #4-12 U-Bolt Production

- No.1 HI: Leaf Spring Shop -

##### (1) Outline of Objectives and Planning

At present, there is a total dependence on imports for the U-bolts of the heavy and T2000 vehicles use. Others for the light vehicle use are already locally produced in the machine shop of the No.4 HI.

Eight U-bolts are necessary for each vehicle, in the case of the heavy and T2000 vehicles, and as these are particular parts for the various models their production increases and decreases in proportion to production output of vehicles. Therefore, it is desirable that local production including that for the service parts be undertaken.

The present plan aims at the local production of all the U-bolts used for heavy and T2000 vehicles and aims at saving on foreign exchange and the improvement of technical expertise.

The production schedule for 1998 including service parts is to be approximately 25,000 items per annum.

A new U-bolt production line is to be installed in order to realise the present plan.

##### (2) Details of the Plan

The new U-bolt production line shall be set up in the No.1 HI Leaf Spring Shop. The layout is shown in the Attached Figure 1-1. It shall produce items for both heavy and light vehicle use and also the service parts. The productive capacity is to be approximately 40,000 per month.

Heat treatment for the U-bolt moldings is to be done either with the newly installed non oxidising equipment of the No.1 HI Bolt and Nut Shop or by share using the heat treatment shop also installed in the No.1 HI Machine Shop.

Product quality verification after the heat treatment is to be carried out using the testing equipment accessory to the heat treatment equipment and results recorded.



As the heat treatment equipment is to be shared the flows of the different machined parts are to be clearly distinguished and to be transported between the lines without mingling or confusion.

As the forming dies and straightening dies differ for each of the vehicle models these are to be changed in accordance with the parts specifications. Further since these are important working tools which effect the precision of the parts resulting testing at the time of changing must be carried out an precision confirmed.

A technical service to implement the training needed for installation of equipment, trial test running, operational methods, verification of equality control and equipment maintenance is required.

### (3) Estimated Capital Requirement

#### 1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

#### 2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

### (4) Expected Effects of the Plan

#### 1) Saving of Foreign Exchange

The amount of foreign exchange saved on the production of one item is 9 yen (however this is with an annual production of 34,840 items):

	Foreign Exchange Required at Implementation of Plan (yen per item)	Amount of Foreign Exchange Required at Present (yen per item)
Cost of parts	-	902
Raw Material Costs	451	-
Freight & Insurance	48	100
Sub-total	499	1,002
Working equipment costs	494	-
TOTAL	993	1,002

Note: The working equipment costs are only for the additional costs incurred by this plan. For details of the above items refer to the Attached Table 3-3. The weighted average price of the U-bolts to be produced under the present proposal was used as the unit price of the finished product.

## 2) Reduction in Production Costs Achieved

A comparison of production costs for one item at present and after the implementation of the present plan is as follows:

(Unit: yen per item)

	Production Costs After Implementation of the Plan	Present Production Costs
Imported CP/RM costs		
FOB price	451	902
Freight & insurance	48	100
Sub-total	499	1,002
Local CP/RM costs	-	-
Depreciation	387	-
Utility costs	20	-
Labor costs	20	-
Overheads	17	-
Admin. costs	6	-
Other costs	273	100
Sub-total	723	100
Mark-up, profit	-	-
Excise tax	-	-
TOTAL	1,223	1,102

A reduction of production costs cannot be expected to result because of the low production output of the present plan.

3) Number of Years Required for Recovery of Foreign Exchange Investment

If the index for investment results is taken to be,

$$(A) / (B) \times (C)$$

Where,

(A) = Required amount of foreign exchange (207,700,000 yen)

(B) = Amount of foreign exchange saved per item (9 yen)

(C) = Output (34,840 items)

giving a result of 662 years for the present plan.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-12  
U-bolt manufacturing equipment

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Raw material stand	Set	1
2	Raw material shelf	Set	1
3	Material cutting machine	Set	1
4	Chamfering machine	Set	2
5	Draw forming machine	Set	1
6	Thread rolling machine (R20A)	Set	1
7	Heating furnace (gas)	Set	1
8	Induction furnace	Set	1
9	Friction press	Set	1
10	Hydraulic press	Set	1
11	Punching press	Set	1
12	U-parts carrier	Set	2
13	Shot blast equipment	Set	1
14	Reforming press 60 ton	Set	2
15	Dip painting equipment	Set	1
16	Parts rack	Set	4
17	Hand carrier special	Set	10
18	Miscellaneous	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-12)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	172.4	-	172.4
2 Freight & Insurance	19.1	-	19.1
Sub-total	191.5	-	191.5
3 Import Duty	-	28.7	28.7
4 Unloading	-	2.7	2.7
5 Installation Cost	-	2.3	2.3
Imported M/E Total	191.5	33.7	225.2
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	16.2	-	16.2
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	16.2	-	16.2
Total Investment	207.7	33.7	241.4

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-12)

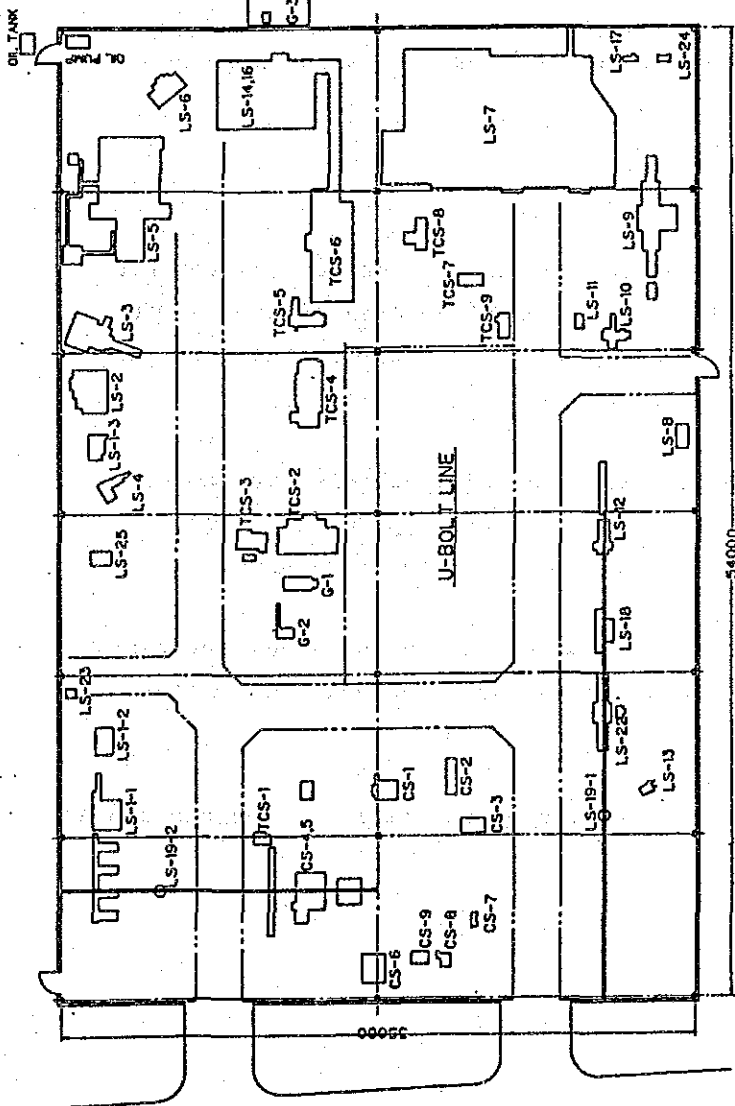
Items	Annual Cost (million Yen)			Component (%)
	F/C	L/C	Total	
1 CP/RM				
A Imported CP/RM (FOB)	15.7	-	15.7	37
Freight & Insurance	1.7	-	1.7	4
Import Duty	-	2.6	2.6	6
Unloading	-	0.2	0.2	0
Sub-total	17.4	2.8	20.2	47
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	17.4	2.8	20.2	47
2 Utilities	0.0	0.7	0.7	2
Variable Cost	17.4	3.5	20.9	49
3 Depreciation	11.5	2.0	13.5	32
4 Amortization	0.0	-	0.0	0
5 Maintenance	5.7	1.0	6.7	16
6 Design Fee	0.0	-	0.0	0
7 Labor	-	0.7	0.7	2
8 Overhead	-	0.6	0.6	1
9 Admin. Cost	-	0.2	0.2	0
Fixed Cost	17.2	4.5	21.7	51
Annual Cost	34.6	8.0	42.6	100
Unit P. Cost			1222.7	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			1222.7	

# MACHINES OF SPRING SHOP.

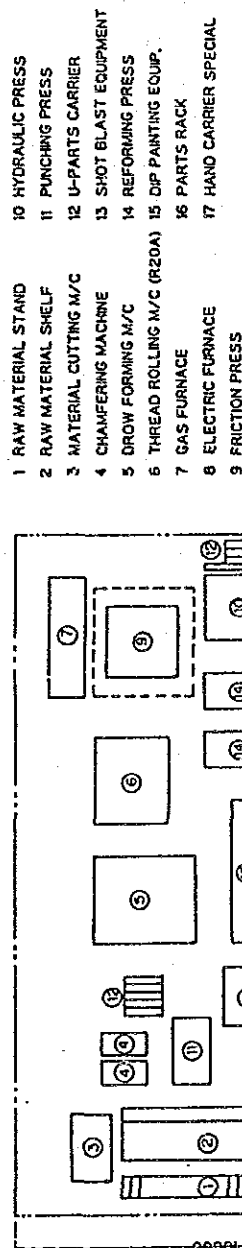
LEAF SPRING		COIL SPRING	
LS-1-1	POWER PRESS	EP-12	CS-1
LS-1-2	POWER PRESS	PPF 50	CS-2
LS-1-3	POWER PRESS	PPF 50	CS-3
LS-2	HEATING FURNACE	SPECIAL	CS-4.5
LS-3	EYE FORMING M/C	AL 125	CS-6
LS-4	END FORMING M/C	LM 100	CS-7
LS-5	HEATING FURNACE	SPECIAL	CS-8
LS-6	CURVING ROLL	MC 13	CS-9
LS-7	TEMPERING FURNACE	SPECIAL	
LS-8	FRICTION PRESS	50AF-2	
G-1	HEATING FURNACE		
G-2	EYE FORMING M/C		
LS-9	SHOT PEENING	SCB-14F-1	TCS-1
LS-10	EYE GRINDER	LG 110	TCS-2
LS-11	UPRIGHT DRILLING M/C	YD2-54	TCS-3
LS-12	HYDRAULIC PRESS	LA-5	TCS-4
LS-13	AIRLESS PAINTING EQUIP.	AOP-	TCS-5
LS-14,16	QUENCHING BATH	LOC-160	TCS-6
LS-17	HARDNESS TESTER	MAB-1	TCS-7
LS-18	SETTING MACHINE	L-20A	TCS-8
LS-19-1	ELECTRIC HOIST	Y/2M-T	TCS-9
LS-19-2	ELECTRIC HOIST	1M-T	
LS-22	AMSLER LOAD TESTER	MU30LSR	
LS-23	BENCH DRILLING M/C	AFD-410	
LS-24	BENCH GRINDER	BCA	
LS-25	FORMING MACHINE	MOSS-C	
G-3	HEAT EXCHANGER		

## COIL SPRING FOR LIGHT VEHICLES

TCS-1	FRICTION SAWING M/C	HSC-1615
TCS-2	HEATING FURNACE	SPECIAL
TCS-3	TAPERROLLING M/C	SHT-125-3
TCS-4	HEATING FURNACE	SPECIAL
TCS-5	COILING M/C	SH-30A
TCS-6	QUENCHING BATH	LOB-080-1
TCS-7	SETTING MACHINE	B-3A
TCS-8	AUTOMATIC GRINDER	SG-4558
TCS-9	LOAD TESTING M/C	HB-300



DETAIL OF U-BOLT LINE. Production Capacity: HV 2200 Vph / Z Yph  
SV 3500 Vph / Z Yph



Attached Figure 1-1  
U-BOLT LINE LAYOUT OF SPRING SHOP

#4-13 Rear Axle Housing Production - Machining  
- No.1 HI: Rear Axle Housing Manufacturing Shop -

(1) Objectives and Outline of the Plan

The existing rear axle housing is import dependent and takes the form of single piece completed parts in the case of light vehicles and of rear axle assembly in the case of heavy vehicles.

The present plan proposes the improvement of technical expertise and cutting of the foreign currency currently expended on imports by construction of a large press shop and promotion of local production of the various parts including local production of the rear axle housing.

To this end a new building with an area of some 4,050 square meters is to be constructed and a shared production line to be installed inside.

The productive capacity including that of service parts is to be approximately 4,700 items per year.

(2) Details of the Plan

Removal of the warehouse located to the north side of the vehicle assembly shop of No.1 HI and construction of an area of some 4,050 square meters for use as a machine processing shop for the rear axle housing. The layout is shown in Attached Figure 1-1.

The rear axle housing for both heavy and light vehicles are to be press formed in the new press shop and to be supplied as rough materials welded to the body in its state before processing.

The installation of shared production lines for the accessory parts welding lines and machine processing for both the heavy and light vehicles.

The present part is vital to the safety of the finished vehicle and as



it consists of welded press parts efficient welding is essential.

The same working equipment for the heavy and for light vehicles will be employed but since processing of the details differs it will be necessary to establish operational standards and ensure these are followed.

A technical service to implement the training needed for installation of equipment, trial test runs, operational methods, confirmation of quality and equipment maintenance is required.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving of Foreign Exchange

In the event of the present plan not being implemented then imports will occur. In comparison to the required amount of foreign exchange for imports the present plan can be expected to result in a saving of foreign exchange by an increase in production to a level of 10,000 items per year (however this is with an annual production of 7,400 at present).

	Foreign Exchange Required at Implementation of Plan (yen per item)	Amount of Foreign Exchange Required at Present (yen per item)
Cost of parts	-	13,390
Raw Material Costs	10,700	-
Freight & Insurance	1,200	1,486
Sub-total	11,900	14,876
Working equipment costs	46,200	-
TOTAL	58,100	14,876

Note: The working equipment costs are only for the additional costs incurred by this plan. For details of the above items refer to the Attached Table 3-3.  
Price of blanks are taken as 80% of product price.  
Also the weighted average price of the prices of rear axle housing for the various vehicle types of HIC products was used as the finished product price.

## 2) Reduction in Production Costs Achieved

A comparison of production costs for one item at present and after the implementation of the present plan is as follows:

(Unit: yen per item)

	Production Costs After Implementation of the Plan	Present Production Costs
Imported CP/RM costs		
FOB price	10,700	13,390
Freight & insurance	1,200	1,486
Sub-total	11,900	14,876
Local CP/RM costs	-	-
Depreciation	40,447	-
Utility costs	1,511	-
Labor costs	723	-
Overheads	1,021	-
Admin. costs	319	-
Other costs	23,298	5,950
Sub-total	67,319	5,950
Mark-up, profit	-	-
Excise tax	-	-
TOTAL	79,219	20,826

Therefore, the present plan cannot be expected to result in a reduction of production costs because the annual production level is low.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-13(1) Rear Axle Housing Production  
 - No.1 HI: # Rear Axle Housing Manufacturing Shop -

No	ED	Items	Unit	No.
1		Bldg & Land		
A		Land		
B		Matrl's for building (steel structure, steel fittling, etc.) Lot		1
2		Imported M/E		
1		Machining group for housing TE42103-1350, BX42103-2230, LV		
1 1		Special milling machine and tool	Set	1
1 2		Grinder w/jig and tool	Set	1
1 3		Special coining machine	Set	1
1 4		Gas cutting special machine	Set	1
1 5		Gas cutting special machine	Set	1
1 6		Special boring machine and tool	Set	1
1 7		Drilling special machine and tool	Set	1
1 8		Semi automatic welding machine and jig	Set	1
1 9		Automatic welding machine	Set	1
110		Automatic welding machine	Set	1
111		Oil hydraulic press	Set	1
112		Semi automatic welding machine and jig	Set	1
113		Semi automatic welding machine and jig	Set	1
114		Vertical machining w/jig and tool	Set	1
115		Special boring machine and tool	Set	1
116		Vertical machining w/jig and tool	Set	1
117		High pressure washing equipment	Set	1
118		Induction furnace	Set	1
119		Oil hydraulic press	Set	1
120		Induction furnace and jig	Set	1
121		Automatic welding machine	Set	1
122		NC lathe	Set	1
123		Leak tester	Set	1
124		Semi automatic welding machine and jig	Set	1
125		Superheater and jig	Set	1
126		Semi automatic welding machine and jig	Set	1
127		Superheater	Set	1
128		Washing equipment	Set	1
129		Materials handling equipment	Lot	1
130		Miscellaneous	Lot	1
131		Arc welding machine	Set	2

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-13(2) Rear Axle Housing Production  
- No.1 HI: # Rear Axle Housing Manufacturing Shop -

No	Items	Unit	No.
132	Lathe	Set	1
133	Bench drilling machine	Set	2
134	Pipe cutting machine	Set	1
135	Spot welding machine	Set	1
136	Tapping machine	Set	1
137	Jigs for machine and equipment	Set	1
138	Painting booth	Set	1
139	Materials handling equipment	Lot	1
140	Miscellaneous	Lot	1
2	Machining group for tube rear axle:TE42115-1130,BX42115-1420		
2 1	Centering machine and tool	Set	1
2 2	NC lathe and tool	Set	1
2 3	Induction hardening equipment and tool	Set	1
2 4	Boring machine and tool	Set	1
2 5	Cylindrical grinding machine and tool	Set	1
2 6	Horizontal machining w/jig and tool	Set	1
2 7	Cylindrical grinding machine and tool	Set	1
2 8	Magnaflux equipment	Set	1
2 9	Washing equipment	Set	1
210	Miscellaneous	Lot	1
3	Building for new machine shop		
3 1	Auxiliary facilities (Air compressor, piping matrl's, etc.)	Lot	1
3 2	Miscellaneous	Lot	1
3 3	Electric materials	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-13)

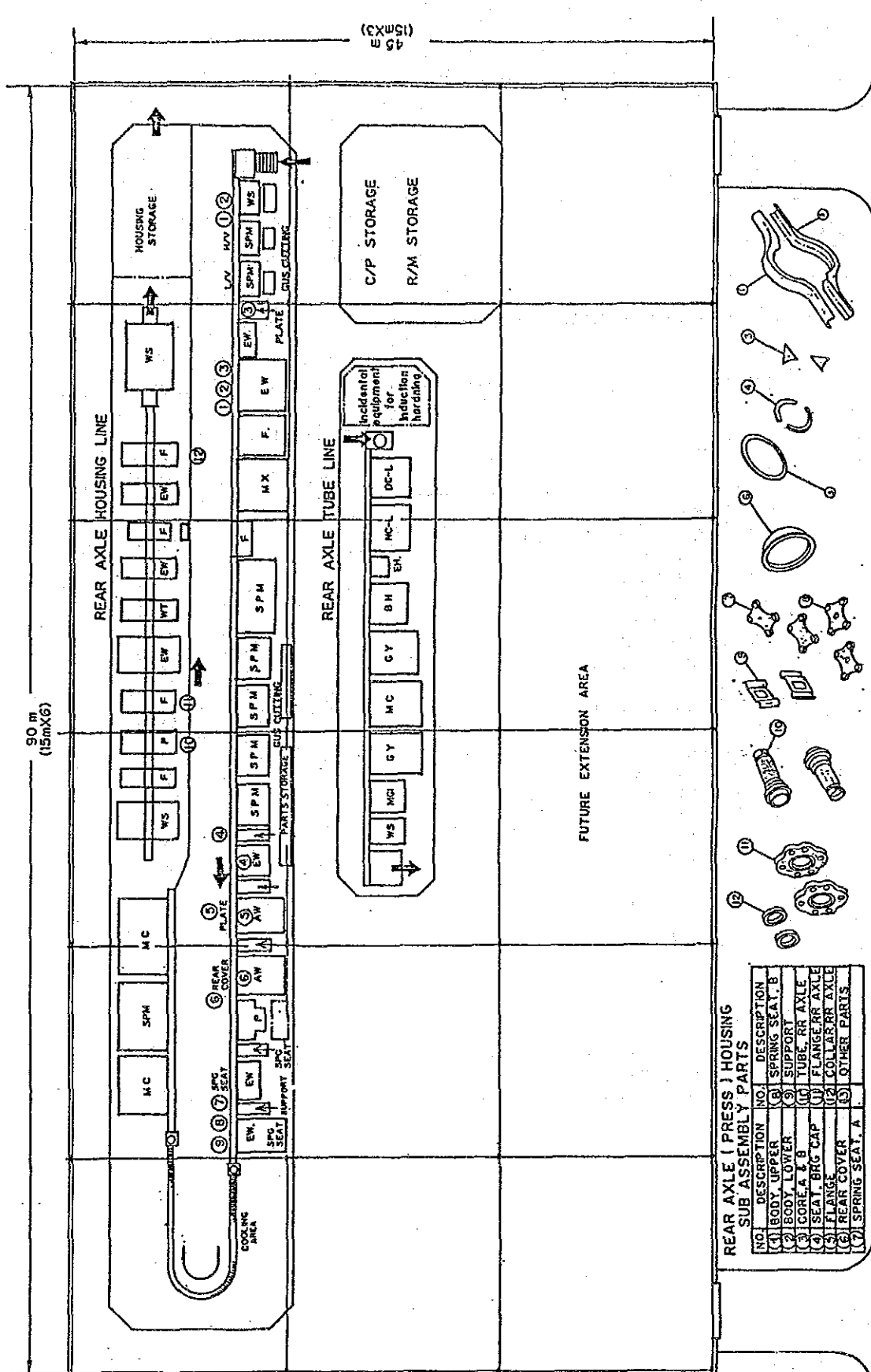
(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	820.4	433.4	1253.8
2 Freight & Insurance	91.1	-	91.1
Sub-total	911.5	433.4	1344.9
3 Import Duty	-	136.7	136.7
4 Unloading	-	12.8	12.8
Building Total	911.5	582.9	1494.4
Bldg & Land Total	911.5	582.9	1494.4
2 1 Imported M/E (FOB)	1528.1	-	1528.1
2 Freight & Insurance	169.6	-	169.6
Sub-total	1697.7	-	1697.7
3 Import Duty	-	254.7	254.7
4 Unloading	-	23.8	23.8
5 Installation Cost	-	8.2	8.2
Imported M/E Total	1697.7	286.7	1984.4
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	34.2	-	34.2
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	34.2	-	34.2
Total Investment	2643.4	869.6	3513.0

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-13)

Items	Annual Cost (million Yen)			Component (%)
	F/C	L/C	Total	
1 CP/RM				
A Imported CP/RM (FOB)	50.3	-	50.3	14
Freight & Insurance	5.6	-	5.6	2
Import Duty	-	8.4	8.4	2
Unloading	-	0.8	0.8	0
Sub-total	55.9	9.2	65.1	17
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	55.9	9.2	65.1	17
2 Utilities	0.0	7.1	7.1	2
Variable Cost	55.9	16.3	72.2	19
3 Depreciation	138.4	51.7	190.1	51
4 Amortization	0.0	-	0.0	0
5 Maintenance	78.3	21.6	99.9	27
6 Design Fee	0.4	-	0.4	0
7 Labor	-	3.4	3.4	1
8 Overhead	-	4.8	4.8	1
9 Admin. Cost	-	1.5	1.5	0
Fixed Cost	217.1	83.0	300.1	81
Annual Cost	273.0	99.3	372.3	100
Unit P. Cost			79212.8	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			79212.8	

Attached Figure 1-1 NO.1 HI NEW MACHINE SHOP LAYOUT





#4-14    Production of Radiator  
      - No.1 HI: Press Shop No.2 -

(1) Objectives and Outline of the Plan

Currently total dependence is on the import of completed parts for both the heavy and light vehicles.

The present plan aims at improving technical expertise and saving on foreign exchange expended by installation of production facilities to form a car radiator production line for common use of the heavy and light vehicles.

This integrated production equipment is to be installed in the No.1 HI Press Shop No.2.

The productive capacity is to be approximately 5,750 items per year including service parts.

(2) Details of the Plan

A production line for radiator component parts is to be installed in one span on the east side of the No.1 HI Press Shop No.2.

The press parts of the radiator component parts are to be produced in the Press Shop No.2

It is necessary to confirm quality of the product, blocking of the radiator tube, performance of welding and their strength in order to ensure the cooling efficiency of the radiator.

A technical service to implement the training needed for the installation of equipment, trial test runs, operational methods, confirmation of quality, and equipment maintenance is needed.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

## 2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

### (4) Expected Effects of the Plan

#### 1) Saving of Foreign Exchange

In the event of the present plan not being implemented the entire quantity will have to be imported. By increasing the annual planned production up to 12,250 radiators, the saving on the required amount of foreign exchange can be expected (however this is with an annual production of 5,750 radiators).

	Foreign Exchange Required at Implementation of Plan (yen per unit)	Amount of Foreign Exchange Required at Present (yen per unit)
Cost of parts	-	23,488
Raw Material Costs	18,783	-
Freight & Insurance	2,087	2,607
Sub-total	20,870	26,095
Working equipment costs	11,130	-
TOTAL	32,000	26,095

Note: The working equipment costs are only for the additional costs incurred by this plan. For details of the above items refer to the Attached Table 3-3. Raw material cost is assumed 80% of cost of parts. Also the weighted average price of the prices of radiator for the various vehicle types of HIC products was used as the finished product price.

2) Reduction in Production Costs Achieved

A comparison of production costs for one item at present and after the implementation of the present plan is as follows:

	(Unit: yen per unit)	
	Production Costs After Implementation of the Plan	Present Production Costs
Imported CP/RM costs		
FOB price	18,783	23,488
Freight & insurance	2,087	2,607
Sub-total	20,870	26,095
Local CP/RM costs	-	-
Depreciation	9,896	-
Utility costs	417	-
Labor costs	383	-
Overheads	522	-
Admin. costs	157	-
Other costs	7,791	10,438
Sub-total	19,165	10,438
Mark-up, profit	-	-
Excise tax	-	-
TOTAL	40,035	36,533

Therefore, because of the low production output of the present plan a reduction in production costs cannot be anticipated.

(5) Recommendation on Implementation of the Plan

A large amount of technical expertise is included in the production of radiators, and so a pre-requisite for the present plan is the agreement for technical transfer of this expertise.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-14 Construction of Radiator Production  
- No.1 HI: Press Shop No. 2 -

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	ME for production of radiator for automobile		
1 1	Tube mill w/cutting machine	Set	1
1 2	Projector	Set	1
1 3	Fin forming machine	Set	1
1 4	Core assembly device	Set	2
1 5	Pneumatic press (tube plate insert device)	Set	1
1 6	Baking furnace w/flux bath	Set	1
1 7	Dip soldering equipment	Set	1
1 8	Inspection device	Set	1
1 9	Tank soldering device by manual	Set	1
110	Support soldering device by manual	Set	3
111	Leak testing equipment	Set	3
112	Washing tank	Set	1
113	Furnace #1	Set	1
114	Painting booth	Set	1
115	Furnace #2	Set	1
116	General tools & inspection device	Set	1
117	Parts pretreatment equipments	Set	1
118	Soldering-torch w/regulator	Set	1
119	Dies for stamping parts	Set	1
120	Tempering furnace	Set	1
121	Gas vaporizer equipment	Set	1
122	Waste water treatment	Set	1
123	Wiring	Lot	1
124	Piping	Lot	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-14)

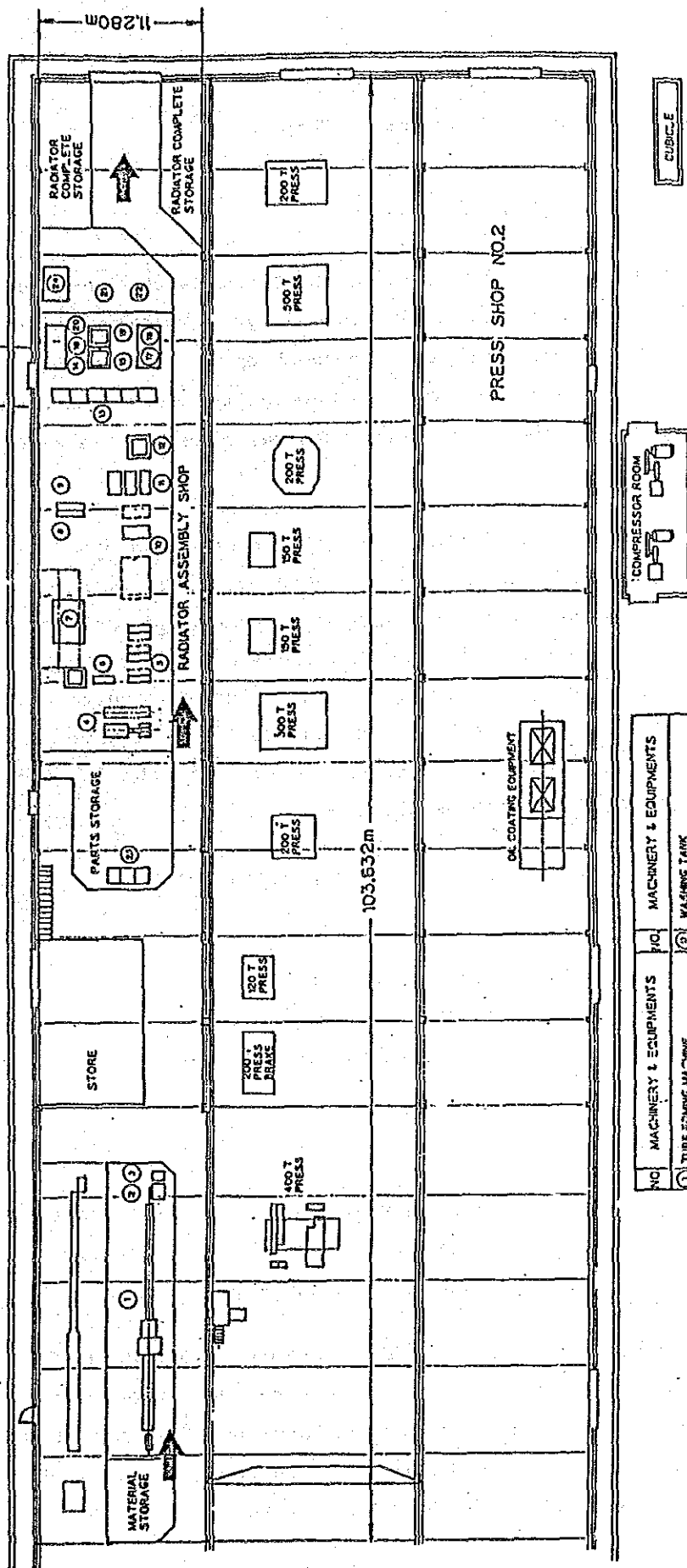
(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	638.2	-	638.2
2 Freight & Insurance	70.8	-	70.8
Sub-total	709.0	-	709.0
3 Import Duty	-	106.4	106.4
4 Unloading	-	9.9	9.9
5 Installation Cost	-	3.8	3.8
Imported M/E Total	709.0	120.1	829.1
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	21.6	-	21.6
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	21.6	-	21.6
Total Investment	730.6	120.1	850.7

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-14)

Items	Annual Cost (million Yen)			Component
	F/C	L/C	Total	(%)
1 CP/RM				
A Imported CP/RM (FOB)	108.0	-	108.0	47
Freight & Insurance	12.0	-	12.0	5
Import Duty	-	18.0	18.0	8
Unloading	-	1.7	1.7	1
Sub-total	120.0	19.7	139.7	61
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	120.0	19.7	139.7	61
2 Utilities	0.0	2.4	2.4	1
Variable Cost	120.0	22.1	142.1	62
3 Depreciation	42.5	14.4	56.9	25
4 Amortization	0.0	-	0.0	0
5 Maintenance	21.3	3.6	24.9	11
6 Design Fee	0.2	-	0.2	0
7 Labor	-	2.2	2.2	1
8 Overhead	-	3.0	3.0	1
9 Admin. Cost	-	0.9	0.9	0
Fixed Cost	64.0	24.1	88.1	38
Annual Cost	184.0	46.2	230.2	100
Unit P. Cost			40034.8	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			40034.8	

Attached Figure 1-1 RADIATOR ASSEMBLY SHOP  
(NO.1 H PRESS SHOP NO.2)



NO.	MACHINERY & EQUIPMENTS	NO.	MACHINERY & EQUIPMENTS
1	TUBE FORMING MACHINE	11	WASHING TANK
2	TUBE CUTTING MACHINE	12	FURNACE NO.1
3	PROJECTOR	13	LEAK TEST NO.2 EQUIPMENT
4	FIN FORMING MACHINE	14	FURNACE NO.3
5	CORE-ASSY DEVICE	15	PARTING BOOTH
6	PNEUMATIC PRESS WITH TUBE PLATE INSERT DEVICE	16	FURNACE NO.2
7	CORE BAKING EQUIPMENT	17	LEAK TEST NO.3 EQUIPMENT
8	TUBE PLATE DIP SOLDERING EQUIP.	18	FURNACE NO.1
9	INSPECTION DEVICE	19	ACCESSORIES FITTING TOOLS
10	SOLDERING OF TANK FITTING PARTS	20	FINAL INSPECTION DEVICE
11	SOLDERING OF TANK PLATE AND	21	PARTS PRETREATMENT EQUIPMENT
12	SOLDERING OF TANK & SUPPORT	22	TEMPERING FURNACE
13	LEAK TEST NO.1 & REPAIRING EQUIP.		

#### #4-15 Bevel Gear Production

- No.1 HI: Machine and Heat Treatment Shop -

##### (1) Objectives and Outline of the Plan

At present bevel gear for light vehicles, B600 and X2000, has been produced locally. For the heavy vehicles and agricultural machinery reliance is on imports for completed component parts. As tooth cutting trials have already been carried out for the drive pinion and ring gear for heavy vehicles, relevant technical expertise is already available.

The present plan aims at the installation of a processing production line for bevel gears to be used by heavy vehicles, light vehicles and agricultural machineries. With this project, integrated local production is aimed at starting from forging materials at No.3 HI up to machining and completion. The saving of foreign capital currently expended on imports and improvement of technical levels can be expected. To this end installation of necessary equipment is to be carried out in the No.1 HI Machine Shop.

The production capacity including that for service parts is to be as follows:

drive pinion gear	6,200 pieces each
differential side gear	12,400 pieces per year
differential pinion	19,600 pieces per year

##### (2) Details of the Plan

Installation in the Gear Machining Shop of No.1 HI of an integrated processing production line for the bevel gear related items is planned. The layout plan is shown in Attached Figure 1-1.

Forged blanks supplied from the No.3 HI undergo the following machine processing; blank processing, cutting processing, heat treatment, grinding, lapping, test of working surface lapping. They are then supplied in turn to the No.4 HI Machine Shop in the case of light vehicle related parts, and to the No.1 HI Differential Carrier



Assembly Shop in the former painting shop in the case of heavy vehicle parts, for assembly.

After the working surface lapping processing the drive pinion and ring gear have always been handled as one integrated set and assembled into differential carrier. This is a vital process order to the assurance of the strength and durability of the bevel gear. Therefore, conveyance boxes are required which allow the transportation of the pinion and ring gear as individual sets.

A technical service ensuring the training for installation of equipment, trial testing, operational methods, verification of quality control and equipment maintenance, etc., is required for realizing the above headings.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving of Foreign Capital

If the present plan is not implemented then bevel gears for the heavy vehicles and agricultural machinery will have to be imported. A saving on the amount of foreign exchange required cannot be executed to result compared with required foreign exchange for the parts import, at the present level of annual production. (Planned production is 44,400 pieces/year. However, the bevel gears for light vehicles have already been produced domestically, and 18,000 pieces for heavy vehicles and agricultural machineries above are the gears newly produced. Thus, in the following calculation, the annual production

number of the gears, which burdens the costs incurred from the project, is assumed 18,000 pieces per year.)

	Foreign Exchange Required at Implementation of Plan (yen per piece)	Amount of Foreign Exchange Required at Present (yen per piece)
Cost of parts	-	5,540
Raw Material Costs	2,772	-
Freight & Insurance	306	609
Sub-total	3,078	6,149
Working equipment costs	5,572	-
TOTAL	8,650	6,149

Note: The working equipment costs are only for the additional costs incurred by this plan. For details of the above items refer to the Attached Table 3-3.

The machining material price was assumed 50% of product piece. The product price is the average price of piston pin weighted by production quantity of various vehicles.

The foreign exchange saving effect can be expected to result when the annual production exceeds 33,000 pieces.

## 2) Reduction in Production Costs Achieved

A comparison of production costs for one item at present and after the implementation of the present plan is as follows:

(Unit: yen per piece)

	Production Costs After Implementation of the Plan	Present Production Costs
Imported CP/RM costs		
FOB price	2,770	5,540
Freight & insurance	305	609
Sub-total	3,075	6,149
Local CP/RM costs	-	-
Depreciation	4,339	-
Utility costs	17	-
Labor costs	50	-
Overheads	117	-
Admin. costs	33	-
Other costs	2,483	2,446
Sub-total	7,039	2,446
Mark-up, profit	-	-
Excise tax	-	-
TOTAL	10,114	8,595

The reduction of production cost cannot be expected unless the annual production exceeds 25,000 pieces.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-15 Bevel gear production  
No.1 HI: M/C & H/Tr shop

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Gleason hypoid gear generator	Set	1
2	Gleason hypoid tester	Set	1
3	Copying lathe	Set	1
4	External cylindrical grinding M/C	Set	1
5	Internal cylindrical grinding M/C	Set	1
6	Miscellaneous		
6 1	Drive pinion		
6 1 1	Centering M/C	Set	1
6 1 2	Profiling lathe	Set	2
6 1 3	Gear hobbing M/C	Set	1
6 1 4	Roll forming M/C	Set	1
6 1 5	Profiling grinding M/C	Set	1
6 1 6	Drilling M/C	Set	1
6 2	Ring gear		
6 2 1	Profiling lathe	Set	2
6 2 2	Single purpose M/C	Set	1
6 2 3	Drilling tapping M/C	Set	1
6 2 4	Drilling M/C	Set	1
6 3	Side gear pinion		
6 3 1	Profiling lathe	Set	2
6 3 2	Single purpose M/C	Set	2
6 3 3	Broaching M/C	Set	1
6 3 4	No.6 gear testing M/C	Set	1
6 3 5	Cylindrical grinding M/C	Set	1
6 3 6	Internal grinding M/C	Set	2

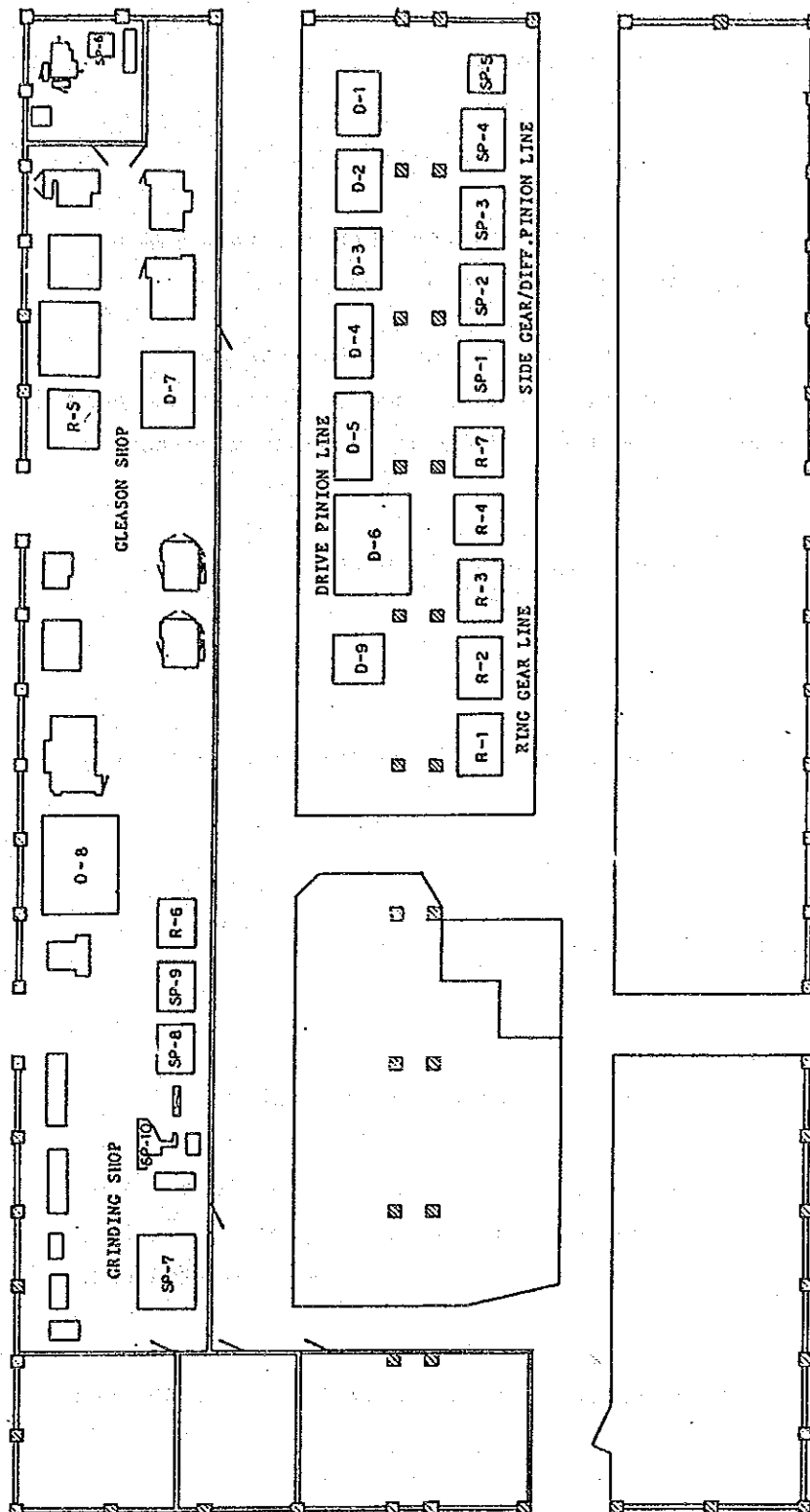
Attached Table 3-2: REQUIRED INVESTMENT (#4-15)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	1001.0	-	1001.0
2 Freight & Insurance	111.1	-	111.1
Sub-total	1112.1	-	1112.1
3 Import Duty	-	166.8	166.8
4 Unloading	-	15.5	15.5
5 Installation Cost	-	4.3	4.3
Imported M/E Total	1112.1	186.6	1298.7
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	16.2	-	16.2
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	16.2	-	16.2
Total Investment	1128.3	186.6	1314.9

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-15)

Items	Annual Cost (million Yen)			Component
	F/C	L/C	Total	(%)
1 CP/RM				
A Imported CP/RM (FOB)	49.9	-	49.9	27
Freight & Insurance	5.5	-	5.5	3
Import Duty	-	8.3	8.3	4
Unloading	-	0.8	0.8	0
Sub-total	55.4	9.1	64.5	35
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	55.4	9.1	64.5	35
2 Utilities	0.0	0.3	0.3	0
Variable Cost	55.4	9.4	64.8	35
3 Depreciation	66.7	11.4	78.1	42
4 Amortization	0.0	-	0.0	0
5 Maintenance	33.4	5.6	39.0	21
6 Design Fee	0.2	-	0.2	0
7 Labor	-	0.9	0.9	0
8 Overhead	-	2.4	2.4	1
9 Admin. Cost	-	0.7	0.7	0
Fixed Cost	100.3	21.0	121.3	65
Annual Cost	155.7	30.4	186.1	100
Unit P. Cost			10338.9	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			10338.9	



Attached Figure 1-1  
LAYOUT OF BEVEL GEAR  
MACHINING SHOP - NO.1 HI

NO.	TYPE	NOMENCLATURE	NO.	TYPE	NOMENCLATURE
1	21	MILING & GRINDING M.C.	21	SP-3	PROACHING M.C.
2	22	PROFILE LATHE	22	22-9	S. TESTING M.C.
3	23	ROLLING M.C.	23	23-1	CYLINDRICAL GRINDING M.C.
4	24	PROFILE GRINDING M.C.	24	24-1	INTERNAL GRINDING M.C.
5	25	PROFILE GRINDING M.C.	25	25-1	CYLINDRICAL GRINDING M.C.
6	26	HYPOID GENERATOR M.C.	26	26-1	
7	27	HYPOID GENERATOR M.C.	27	27-1	
8	28	CYLINDRICAL GRINDING M.C.	28	28-1	
9	29	DRILLING M.C.	29	29-1	
10	30	PROFILE LATHE	30	30-1	
11	31	CENTER LATHE	31	31-1	
12	32	DRILLING & TAPPING M.C.	32	32-1	
13	33	HYPOID TESTER M.C.	33	33-1	
14	34	INTERNAL GRINDING M.C.	34	34-1	
15	35	DRILLING M.C.	35	35-1	
16	36	PROFILE LATHE	36	36-1	
17	37	CENTER LATHE	37	37-1	
18	38		38	38-1	
19	39		39	39-1	
20	40		40	40-1	

#### #4-16 Differential Carrier Production

- No.1 HI Machine and Heat Treatment Shop -

##### (1) Objectives and Outline of the Plan

At present the rear axle assembly of the differential carrier for the heavy vehicle lines is completely dependent on imports.

The present plan envisages the local production of the various component parts of the rear axle assembly for the heavy vehicles and aims to increase technical expertise and save foreign exchange diverted to imports of the assembly.

Local production of the following components is planned as part of these improvements:

1. differential carrier
2. differential cage, retainer, nut, differential cap, collar and flange
3. differential case
4. differential carrier assembly
5. wheel hub

To this end the old light vehicle use painting shop located at No.1 HI should be remodeled and the processing equipment for the above parts installed here. However since unevenness of the floor surface would have a detrimental effect on machinery and so impair product quality a concrete floor of more than 250 mm thickness should be remodeled prior to installation.

Productive capacity including servicing parts is to be for 1,500 items per annum.



## (2) Details of the Plan

The above mentioned parts processing equipment shall be installed in the remodeled former light vehicles painting shop which is divided by equipment category into separate sections. Attached Figure 1-1 indicates the layout of the new shop.

### 1) Differential Carrier Production Line

Cast blanks molded in the No.3 HI Foundry are supplied and after parts processing is carried out. The parts processed in this shop are then supplied to in shop assembly line.

Included in the processing machinery equipment in the shop are NC machine and a machining center. Since one machine is capable of handling several operation processes. This has the advantage of reducing the number of machines and the surface area needed but as these involve electronic technology it is necessary to undertake every endeavor to ensure the maintenance of the equipment. In order to operate the equipment regularly it is proposed that a service contract be made with the equipment manufacturers.

As final processing is done to the product as one piece with the differential cap in the attached position after processing these are supplied for in shop assembly with the cap still attached.

A technical service ensuring the training for installation of equipment, testing, operational methods, verification of quality control and equipment maintenance etc. is required.

### 2) Production Line for the Differential Gauge and Five Other Items

Cast blanks processed in the Foundry of No.3 HI are supplied and after machine processing has been carried out the finished processed parts are then supplied for in shop assembly. However, the differential cap is supplied to the processing of the differential carrier.

As machine processing for 6 parts takes place on a job shop method in the present processing section it is necessary to see to the effective integration of the operating processes which form the basis of the machine processing for the various individual parts.

By use of an NC machine and machining center the performance of several operations with one machine and stability of product quality must be ensured. As with the previous heading a necessary precondition for the use of the machining center is the provision of a technical service ensuring the training for installation of equipment, testing, operational methods, verification of quality control and equipment maintenance etc.

### 3) Differential Case Production Line

Casted blanks manufactured in the No.3 HI Foundry are supplied and after machine processing the finished processed parts are supplied for in shop assembly processes.

Use of a NC machine and machining center which allows performance of several operational processes using one machine in order to ensure stability of product quality. This involves the same remarks made previously concerning the use of the NC machine and Machining Center.

The differential case is constructed to divide into a right and left half and these are individually processed and then processing of the entire part done and joining marks inscribed. When the entire processing has been done the parts must be handled thereafter as sets.

A technical service ensuring the training for installation of equipment, testing, operational methods, verification of quality control and equipment maintenance etc. is required.

### 4) Differential Carrier Assembly Production Line

The various parts processed in the different sections of this shop are assembled together with the bevel gears processed in the No.1 HI gear machining shop and the imported parts.

Attachment of the drive pinion and ring gear must be done precisely with the assembly jigs and operations are based on data of the contact lapping of the working surface.

Therefore the constant provision for maintenance checks on the assembly jigs and measuring devices is required.

The completely assembled differential carrier is supplied to the axle and transmission assembly shop of No.1 HI and care is required during conveyance since the ring gear is jutting out in an exposed position.

A technical service ensuring the training for installation of equipment, testing, operational methods, verification of quality control and equipment maintenance etc. is required.

#### 5) Wheel Hub Production Line

The cast blanks manufactured at the No.3 HI Foundry are supplied and after machine processing is done the finished processed parts are supplied to the No.1 HI axle and transmission assembly shop.

Use of the NC Machine and Machining center which allows one machine to carry out a number of operations to ensure stability of product quality is the same as in the above heading.

A technical service ensuring the training for installation of equipment, trial testing, operational methods, verification of quality control and equipment maintenance etc. is required.

#### (3) Estimated Capital Requirement

##### 1) Necessary Equipment and Devices

The details of equipment and devices required in the present plan are shown in the attached Table 3-1.

##### 2) Estimated Capital Required

The estimated amount of capital required is shown in the attached Table 3-2.

(4) Results Achieved by the Implementation of the Present Plan

1) Saving of Foreign Exchange

In the event of the present plan not being implemented then the differential carrier for the heavy vehicles will have to be imported. In comparison to such a situation the saving on foreign capital achieved by the production of one item is 7,600 yen (on the assumption of an annual production of 1,500 units).

	Foreign Exchange Required at Implementation of Plan (yen per unit)	Amount of Foreign Exchange Required at Present (yen per unit)
Cost of parts	-	100,000
Raw Material Costs	13,533	-
Freight & Insurance	1,533	11,000
Sub-total	15,067	111,000
Working equipment costs	88,333	-
TOTAL	103,400	111,000

Note: The working equipment costs are only for the additional costs incurred by this plan. For details of the above items refer to the Attached Table 3-3.

Cost of parts is the average weighted by the volumes of differential carrier for TE-21 and BX-402.

2) Reduction in Production Costs Achieved

A comparison of import/production costs for one unit at present and after the implementation of the present plan is as follows:

(Unit: yen per item)

	Production Costs After Implementation of the Plan	Present Production Costs
Imported CP/RM costs		
FOB price	13,533	100,000
Freight & insurance	1,533	11,000
Sub-total	15,067	111,000
Local CP/RM costs	-	-
Depreciation	58,800	-
Utility costs	1,533	-
Labor costs	800	-
Overheads	1,600	-
Admin. costs	533	-
Other costs	47,200	15,500
Sub-total	110,467	15,500
Mark-up, profit	-	-
Excise tax	-	-
TOTAL	125,533	126,500

Therefore, a reduction in costs of 967 yen for each item can be achieved with the present plan.

3) Number of Years Required for Recovery of Foreign Exchange Investment

The index of investment results is calculated as follows:

$$(\text{Number of years required}) = A / (B \times C)$$

Where,

(A) = Required amount of foreign exchange (1,528,100,000 yen)

(B) = Amount of foreign exchange saved (7,600 yen/item)

(C) = Annual output (1,500 items/year)

The required year for this plan is 134 years.

4) Other Results Anticipated

Through the introduction of the NC Machine and machining center response to the needs of model changes will be easier hereafter. Further, the acquisition of the technology for running the NC Machining Center will serve as a foundation for the development of machine processing hereafter.

(5) Recommendations on Implementation of the Plan

Since the introduction of a machining center is included in this plan sufficient consideration of an after sale service is needed. It is essential that a service contract be drawn up with the machine manufacturer.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-16(1)  
ME for wheel hub and differential carrier production

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Diff. carrier (41111-1130, 41101-1040)		
1 1	Vertical NC lathe and tool	Set	1
1 2	Vertical machining center w/jig and tool	Set	1
1 3	Vertical machining center w/jig and tool	Set	1
1 4	Jig and tool for BRG cap assembly	Set	1
1 5	Horizontal machining center w/jig and tool	Set	1
1 6	Washing equipment	Set	1
1 7	Materials handling equipment	Lot	1
1 8	Miscellaneous	Lot	1
2	Diff. cage, diff. cap, etc.		
2 1	NC lathe and tool	Set	1
2 2	NC lathe and tool	Set	1
2 3	Vertical machining center w/jig and tool	Set	1
2 4	Jig and tool for vertical machining center	Set	1
2 5	Vertical machining center w/jig and tool	Set	1
2 6	Vertical NC lathe w/jig and tool	Set	1
2 7	Induction hardening equipment	Set	1
2 8	Cylindrical grinding machine w/jig and tool	Set	1
2 9	Miscellaneous	Lot	1
3	Diff. case (41311-1110, 41312-1030)		
3 1	Vertical NC lathe and jig	Set	1
3 2	Vertical NC lathe and jig	Set	1
3 3	Vertical machining center w/jig and tool	Set	1
3 4	Vertical machining center w/jig and tool	Set	1
3 5	Jig and tool for assembly	Set	1
3 6	Horizontal machining center w/jig and tool	Set	1
3 7	Jig and tool for dis-assembly	Set	1
3 8	Washing equipment	Set	1
3 9	Miscellaneous	Lot	1

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-16(2)  
ME for wheel hub and differential carrier production

No	Items	Unit	No.
4	Diff. assembly		
4 1	Washing equipment	Set	1
4 2	Dis assembly tool for BRG cap	Set	1
4 3	Oil hydraulic press and jig	Set	1
4 4	Oil hydraulic press and jig	Set	1
4 5	Tightening tool	Lot	1
4 6	Assembly jig	Set	1
4 7	Materials handling equipment	Lot	1
4 8	Miscellaneous	Lot	1
5	Wheel hub		
5 1	Turning NC lathe w/jig and tool	Set	2
5 2	Turning NC lathe w/jig and tool	Set	1
5 3	Vertical machining center w/jig and tool	Set	3
5 4	Balancing machine w/jig and tool	Set	1
5 5	Miscellaneous	Lot	1



Attached Table 3-2: REQUIRED INVESTMENT (#4-16)

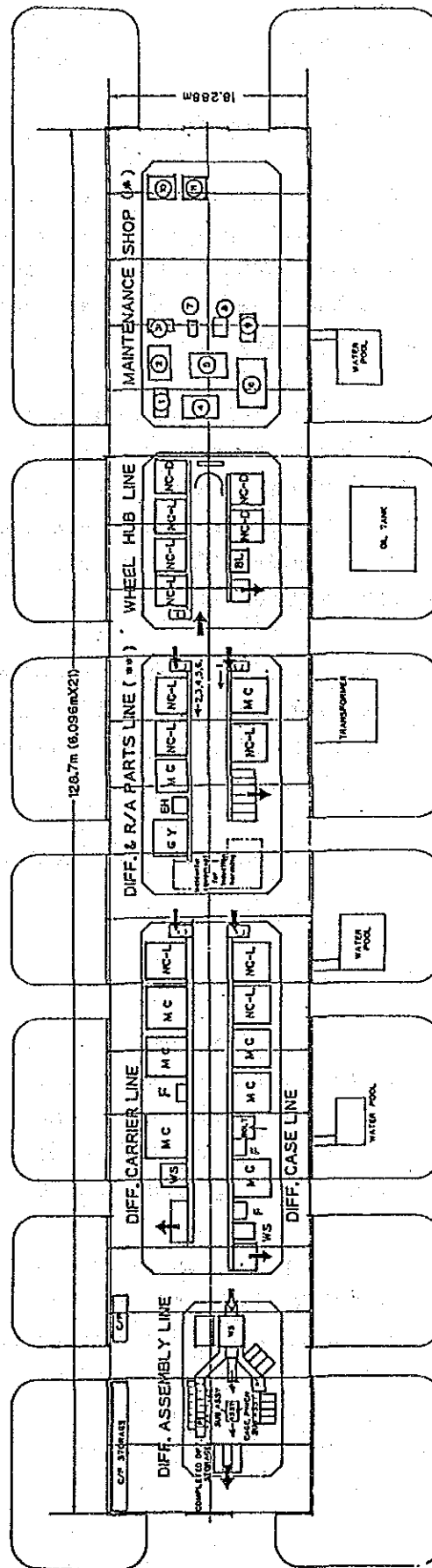
(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	0.0	0.0	0.0
2 Freight & Insurance	0.0	-	0.0
Sub-total	0.0	0.0	0.0
3 Import Duty	-	0.0	0.0
4 Unloading	-	0.0	0.0
Building Total	0.0	0.0	0.0
Bldg & Land Total	0.0	0.0	0.0
2 1 Imported M/E (FOB)	1323.6	-	1323.6
2 Freight & Insurance	146.9	-	146.9
Sub-total	1470.5	-	1470.5
3 Import Duty	-	220.6	220.6
4 Unloading	-	20.6	20.6
5 Installation Cost	-	7.5	7.5
Imported M/E Total	1470.5	248.7	1719.2
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	57.6	-	57.6
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	57.6	-	57.6
Total Investment	1528.1	248.7	1776.8

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-16)

Items	Annual Cost (million Yen)			Compo- nent
	F/C	L/C	Total	(%)
1 CP/RM				
A Imported CP/RM (FOB)	20.3	-	20.3	11
Freight & Insurance	2.3	-	2.3	1
Import Duty	-	3.4	3.4	2
Unloading	-	0.3	0.3	0
Sub-total	22.6	3.7	26.3	14
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	22.6	3.7	26.3	14
2 Utilities	0.0	2.3	2.3	1
Variable Cost	22.6	6.0	28.6	15
3 Depreciation	88.2	15.3	103.5	55
4 Amortization	0.0	-	0.0	0
5 Maintenance	44.1	7.5	51.6	27
6 Design Fee	0.2	-	0.2	0
7 Labor	-	1.2	1.2	1
8 Overhead	-	2.4	2.4	1
9 Admin. Cost	-	0.8	0.8	0
Fixed Cost	132.5	27.2	159.7	85
Annual Cost	155.1	33.2	188.3	100
Unit P. Cost			125533.3	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			125533.3	

Attached Figure 1-1 NO.1 H I MACHINE SHOP  
( OLD MAZDA PAINTING SHOP )



(#)

- LEGEND:
- ① LATHE
  - ② UNIVERSAL MILLING MACHINE
  - ③ CYLINDRICAL GRINDING MACHINE
  - ④ INTERNAL GRINDING MACHINE
  - ⑤ SURFACE GRINDING MACHINE
  - ⑥ SPINDLE GRINDING MACHINE
  - ⑦ SLOT DRILLING MACHINE
  - ⑧ HIGH SPEED CUTTING MACHINE
  - ⑨ SQUARE SHEAR
  - ⑩ MISCELLANEOUS

- PROCESSING ORDER
1. DIFF. CAP --- M C --- NC-L
2. CAGE --- NC-L --- NC-L --- M C
3. NUT --- NC-L
4. RETAINER --- NC-L --- NC-L --- M C
- R/A PARTS
5. FLANGE --- NC-L --- NC-L --- M C
6. COLLAR --- NC-L --- NC-L --- M C --- G Y

Mark	Machines (Equipment) Name
BL	Blanching machine
EM	Induction hardening equipment
[F]	Finishing
GY	Cylindrical grinding machine
MC	Machining center
NC-L	NC Drilling machine
NC-L	NC Vertical or Horizontal lathe
P	Press
WS	Washing equipment

#4-17 Piston Pin Production  
-No.4 HI: Machine Shop-

(1) Outline and Objectives of the Plan

At present the machine processing and heat treatment for the piston pins of light vehicles take place in the No. 4 HI, and technology for the production has been accumulated in the shop. The full quota of piston pins for the heavy vehicles and agricultural machinery are imported as completed parts.

The present plan aims at saving on foreign capital assets used for imports and improving technical expertise by the changeover to local production of all of the piston pins used for the various types of engine. To this end the installation in the machine shop of No. 4 HI of the specialist processing line for shared production of the various types of piston pin is planned.

In order to meet the needs for expansion of the heat treatment capacity an area of some 156 square meters in the No. 4 HI Heat Treatment Shop shall be added and one line of gas carburizing equipment newly installed.

Production capacity is planned for an annual output of 90,000 items per annum.

(2) Details of the Plan

The specialist processing line for shared use of the various piston pin types is to be installed in the No. 4 HI machine shop. At present, the piston pin processing equipment for the light vehicles is shared for use of other light vehicle parts and therefore the installation of an extra integrated line is proposed.

As the heat treatment capacity is to be expanded, the present single gas carburizer currently also used for other product use also will prove insufficient. Therefore, an expansion of heat treatment facilities by an area of some 156 square meters in the No. 4 HI Heat Treatment Shop is proposed and installation there of one line of single gas carburizing equipment planned.

Since precision processed parts are involved exclusive containers for transportation and conveyance are needed.

A technical service ensuring the training for installation of equipment, trial testing, operational methods, verification of quality control and equipment maintenance, etc., is required.

(3) Estimated Capital Requirement

1) Required Facilities

The details of equipment and devices required in the present plan are shown in the Attached Table 3-1.

2) Estimated Capital Requirement

The estimated amount of capital required is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving of Foreign Capital

In the event of the present plan not being implemented imports will occur. The required foreign exchange with implementation of the project is more than that without the project in terms of unit foreign exchange requirement per piece of piston pin produced. However, the required capital for the project includes that of heat treatment facilities, which will be used also for production increase of 2000cc engine and transmission. Therefore, the required foreign exchange cost will be smaller than that calculated here, and foreign exchange saving effect may be expected. (Annual production was assumed 90,000 pieces.)

	Foreign Exchange Required at Implementation of Plan (yen per piece)	Amount of Foreign Exchange Required at Present (yen per piece)
Cost of parts	-	1,747
Raw Material Costs	1,397	-
Freight & Insurance	155	194
Sub-total	1,552	1,941
Working equipment costs	566	-
TOTAL	2,118	1,941

Note: The working equipment costs are only for the additional costs incurred by this plan. For detail, see Attached Table 3-3. The machining material price was assumed 80% of product piece. The product price is the average price of piston pin weighted by production quantity of various vehicles.

## 2) Production Cost Reduction

A comparison of production costs for one piece at present and after the implementation of the present plan is as follows:

	Production Costs After Implementation of the Plan	Present Production Costs
Imported CP/RM costs		
FOB price	1,397	1,747
Freight & insurance	155	194
Sub-total	1,552	1,941
Local CP/RM costs	-	-
Depreciation	450	-
Utility costs	2	-
Labor costs	7	-
Overheads	33	-
Admin. costs	10	-
Other costs	474	776
Sub-total	977	776
Mark-up, profit	-	-
Excise tax	-	-
TOTAL	2,529	2,717

Implementation of this plan is expected to result in the production cost reduction.

### 3) Other Expected Effects

Implementation of this plan enable HIC to supply piston pin to the ordinary spare parts market, where the parts supply has not been available.



Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 4-17 Piston pin production  
No.4 HI: Machine shop

No	Items	Unit	No.
1	Bldg & Land		
A	Land		
B	Bldg		
2	Imported M/E		
1	Construction of machining line		
1 1	NC lathe	Set	2
1 2	External cylindrical grinding M/C	Set	1
1 3	External super finishing M/C	Set	1
1 4	Gas carburizing M/C	Set	2
1 5	Miscellaneous	Set	5
2 1	Alkali washing vat	Set	1
2 2	Hardening oil vat	Set	1
2 3	Tempering furnace	Set	1
2 4	Shot blasting M/C	Set	1
2 5	Cutting M/C	Set	1

Attached Table 3-2: REQUIRED INVESTMENT (#4-17)

(Unit: million yen)

Items	Investment		
	Foreign	Local	Total
1 Bldg & Land			
A Land	-	0.0	0.0
B 1 Building	25.0	10.1	35.1
2 Freight & Insurance	2.8	-	2.8
Sub-total	27.8	10.1	37.9
3 Import Duty	-	4.2	4.2
4 Unloading	-	0.4	0.4
Building Total	27.8	14.7	42.5
Bldg & Land Total	27.8	14.7	42.5
2 1 Imported M/E (FOB)	470.0	-	470.0
2 Freight & Insurance	52.2	-	52.2
Sub-total	522.2	-	522.2
3 Import Duty	-	78.3	78.3
4 Unloading	-	7.3	7.3
5 Installation Cost	-	3.9	3.9
Imported M/E Total	522.2	89.5	611.7
3 Local M/E	-	0.0	0.0
4 Other Costs			
A License Fee	0.0	-	0.0
B Eng Fee	27.0	-	27.0
C Software	0.0	-	0.0
D Interest	0.0	-	0.0
Other Costs Total	27.0	-	27.0
Total Investment	577.0	104.2	681.2

Attached Table 3-3: PRODUCTION COST STATEMENT (#4-17)

Items	Annual Cost (million Yen)			Component
	F/C	L/C	Total	(%)
1 CP/RM				
A Imported CP/RM (FOB)	125.7	-	125.7	55
Freight & Insurance	14.0	-	14.0	6
Import Duty	-	21.0	21.0	9
Unloading	-	2.0	2.0	1
Sub-total	139.7	23.0	162.7	71
B Local CP/RM	-	0.0	0.0	0
CP/RM Total	139.7	23.0	162.7	71
2 Utilities	0.0	0.2	0.2	0
Variable Cost	139.7	23.2	162.9	72
3 Depreciation	34.2	6.3	40.5	18
4 Amortization	0.0	-	0.0	0
5 Maintenance	16.5	3.0	19.5	9
6 Design Fee	0.2	-	0.2	0
7 Labor	-	0.6	0.6	0
8 Overhead	-	3.0	3.0	1
9 Admin. Cost	-	0.9	0.9	0
Fixed Cost	50.9	13.8	64.7	28
Annual Cost	190.6	37.0	227.6	100
Unit P. Cost			2528.9	
10 Mark-up			0.0	
11 Excise Tax			0.0	
Ex-fact. Cost			2528.9	