#6-1 Fuel Conversion of Furnace
- No.1 HI, No.3 HI, No.4 HI -

(1) Objectives and Outline of the Plan

1) Objectives of the plan

HIC is manufacturing such products as heavy vehicles, light vehicles, agricultural machinery, electric products and the like, and furnaces of various kinds such as heating furnaces, melting furnaces, heat treatment furnaces, drying furnaces, etc., are used in the manufacturing process of the said products. Fuel oil and Diesel oil are used as main heat sources of these furnaces, with methanol being used as temporary alternative fuel in some furnaces. Natural gas is used as fuel in No.2 HI. The supply of fuel oil in Burma is becoming tight in view of its quantitative shortage, and it is becoming necessary to use alternative fuel of some kind. Methanol is being used as alternative fuel in part of the furnaces as mentioned above, but it must be remembered that too much hope can not be placed on the future availability of this kind of fuel because it is being used as fuel of automotive vehicles mixed with gasoline and furthermore it must be exported as a collateral to the aid for construction of the methanol production plant. LPG, electricity and natural gas are considered as the possible alternatives at present to substitute fuel oil and Diesel oil. These alternative fuels have merits and demerits in view of substitution, and the natural gas seems to be the best choice in view of such factors as the lowest fuel cost, minimum remodeling costs of the furnace facilities, and stable supply of fuel in the long-term, etc. (Source: MOC)

In view of the above this plan is to establish the system to use natural gas as alternative fuel.

2) Outline of the plan

No main pipeline of natural gas is available at the vicinity of the each HI. It is assumed in this plan that MOC is to construct branch pipelines from the main pipelines to the border of the site of each HI. This plan includes the construction of pipes within the plant

site, remodeling the furnace facilities and other required measures, alone.

The demand for natural gas in each HI is outlined in the followings.

Unit: $10^3$ $Nm^3$/year

| | Current demand | Medium-range demand | Demand in the final stage of the plan |
|---|---|---|---|
| No.1 HI | 514 | 711 | 1,028 |
| No.3 HI | 880 | 2,612 | 4,344 |
| No.4 HI | 503 | 838 | 1,131 |
| TOTAL | 1,897 | 4,161 | 6,503 |

The implementation of the followings is required to realize this plan.

1) Installation of branch pipes from the existing natural gas main pipelines to each HI by MOC. In this connection the plan of HIC to use natural gas must be submitted to MOC in advance so that the branch pipeline laying work can be completed within the required deadline. The main pipeline is located closely in the case of No.1 HI, but construction of branch pipelines with 20- to 30-mile length is necessary for No.3 HI and No.4 HI.

2) Construction of pipings by HIC from the branch pipeline at the border of HI site to each furnace facility.

3) Remodeling of each furnace to make it possible to use natural gas. Burners for gas and ancillary facilities must be installed because the conventional fuel oil burners can not be used. In addition, remodeling in the combustion port and other parts of the furnace is required. The number of furnaces to be remodeled in each HI are as follows:

   No.1 HI: 9 furnaces
   No.3 HI: 28 furnaces
   No.4 HI: 13 furnaces

3) Comparative study of alternative fuel

LPG, electricity and natural gas are the possible alternative fuels taken into consideration in the plan for fuel conversion, and the merits and demerits of these alternative fuels are examined in the followings.

a) Electricity as heat source

- Resistance heating (direct heating and indirect heating) system or induction heating system can be adopted when electricity is used as heat source. Irrespective of the heating system an entirely different type of furnace is required when using electricity as heat source.

- The workpiece to be heated must have uniform cross section for induction heating to be practicable. Such being the case, induction heating can not be used for reheating because the shape of the workpiece is changed when it is submitted to forging and other kinds of plastic working processes.

  Furthermore, induction heating is not cost-effective in the case of small-lot production because the required facilities are very expensive.

- When considering the adoption of resistance heating (indirect heating) it must be remembered that heating furnaces for forging require very high temperatures (1,230°C to 1,300°C) and as a matter of fact no resistance heater is capable to operate such hot temperature.

- In such applications a annealing furnaces, in which the operating temperature falls under 1,000°C, the use of resistance heaters is practicable in some furnaces. It must be remembered, however, that resistance heaters are expendables and it is necessary to keep a stock of spare parts always at hand.

- Since quick heating is not practicable when using resistance heaters, this system is not practicable when such conditions are required. Furthermore, when the furnace is cool power must be

turned on to preheat the furnace several hours before starting full-scale operation in order to raise the furnace up to a given temperature.

- The cost per Kcal of calorific power is more expensive compared with LPG and NG. Although the energy cost of electricity (Kyat/Year) is cheaper compared with LPG heating thanks to the better heating efficiency, the electric heating alternative is not expected to bring about sufficient merits to offset the depreciation cost of the heating furnace facilities it requires anew. The cost gap widens further compared with the natural gas heating alternative.

b) LPG as heating source

- Part of the existing furnace bodies must be remodeled, but anyway the LPG alternative has the merit of making it possible to divert most of the existing facilities. It must be remembered, however, that such combustion equipment as burners and the like, blowers and other ancillary equipment, control units, etc., must be installed anew to cope with LPG.

- Such outdoor facilities as service tanks, vaporizers, pipings to each furnaces, etc., are required in each HI to secure the supply of LPG.

- Such physical distribution system as tank lorries scheduling, etc. is required to transport LPG on schedule to each HI.

- Proper safety control system must be established to prevent explosion accidents.

- The cost per Kcal of calorific power is cheaper compared with electricity, but the fuel cost (Kyat/Year) itself is more expensive than electricity due to lower heat utilization efficiency.

c) Natural gas (NG) as heat source

- Part of the existing furnace bodies must be remodeled as in the case of the LPG heating alternative, but anyway it has the merit of allowing the diversion of most of the existing facilities.

However, such equipment as burners, blowers, valves, solenoid valves and other ancillary facilities, control units, etc., must be installed anew.

- Since main pipelines of natural gas are not available at the vicinity of each HI, branch pipelines must be laid from the main pipelines to each plant sites. The branch pipeline laying work must be taken charge by the MOC.

- It is necessary to lay piping from the branch pipe to the each furnaces.

- It is necessary to establish a safety control system in handling of gas.

- The cost per Kcal of calorific power is substantially cheaper compared with electricity and LPG. In the case of No.1 HI it is approximately 1/6 of LPG and in the case of No.3 HI/No.4 HI it is of the order of 1/3 of LPG. Although the heat efficiency of natural gas is lower than electricity as in the case of LPG, the fuel cost (Kyat/Year) is substantially cheaper compared with LPG and electricity.

d) Comparison of the cost of the various alternatives

Comparison of electricity, LPG and natural gas in terms of unit calorific power is shown in the following table.

Unit: Kyat/$10^3$ Kcal

| | |
|---|---|
| Fuel oil | 0.149 |
| Electricity | 0.233 |
| LPG | 0.182 |
| NG | 0.033 (No.1 HI) |
| | 0.062 (No.3 HI/No.4 HI) |

Electricity is the most expensive alternative in terms of cost per calorific power, followed by LPG and NG. The cheapest alternative is NG, which costs 1/5 to 1/6 of LPG.

The following data are used to calculate the aforementioned costs.

| | Calorific power | Price |
|---|---|---|
| Fuel oil | 9,300 Kcal/L | 1,386 Kyat/L |
| Electricity | 860 Kcal/KWH | 0.2 Kyat/KWH |
| LPG | 11,000 Kcal/KG | 2.0 Kyat/KG |
| NG | 900 Btu/ft3 | 7.5 Kyat/1000 ft3 (No.1 HI) |
| | | 14.0 Kyat/1000 ft3 (No.3 HI/ No.4 HI) |

Sources:

- The costs of fuel oil, LPG and electricity are based on data obtained from No.4 HI.
- The cost of NG is based on data obtained from MOC.
- The calorific power of NG is based on data obtained from MOC.
- The calorific powers of fuel oil, electricity and LPG are ordinary values.

The annual running cost model applicable when operating one furnace by using the aforementioned fuels is shown in the following table.

Unit: Kyat/year

| | |
|---|---|
| Fuel oil | 128,039 |
| Electricity | 104,115 |
| LPG | 156,396 |
| NG | 28,358 (No.1 HI) |
| | 53,278 (No.3 HI/No.4 HI) |

As can be seen, the most expensive annual running cost is required when using LPG, and the cheapest annual running cost is required when using NG. The cost of NG is of the order of 1/5 to 1/3 compared with LPG and of the order of 1/4 to 1/2 compared with electricity.

The conditions assumed for the said calculations are shown in the followings.

- Heating furnace : 50 L/H (assuming fuel oil as a base)
- Operating time : 7 H/day x 22 days/month x 12 months/year (annual operating time)
- Rectification coefficient:

The following rectification coefficients are used.

Fuel oil, LPG, NG: 1.0
Electricity : 0.52

e) Conclusion about the use of alternative fuel

The adoption of natural gas as alternative fuel is regarded as the most appropriate choice in view of its cheap energy cost, the possibility of using the existing facilities with minor modifications, and the stable availability of fuel in the future. The branch pipelines accessing each HI will be installed by MOC based on the relevant plan to be submitted by HIC. Natural gas is already supplied to a cement plant located nearby, and the quantity required by HIC is expected to be supplied stably in the future. Such being the case, the use of natural gas as alternative fuel is assumed in the plan described in the followings.

(3) Details of the Plan

a) HIC must submit to MOC the application to lay the branch pipeline accessing each HI. The distance from the places where the existing main pipelines locate to each HI are shown below. The pipe diameters shown in the followings are merely for the sake of reference and require further examination before the plan implementation.

No.1 HI: THAMAIN - KABA AYE (Approximately 5 miles)
Approximately 6" diamter pipe
No.4 HI: MYAN - HTONBO (Approximately 35 miles)
Approximately 10" diameter pipe
No.5 HI: HTONBO - NYAUNG CHI DAUK (Approximately 25 miles)
Approximately 10" diameter pipe

No.3 HI: NYAUNG CHI DAUK - SINDE (Approximately 21 miles)
Approximately 10" diameter pipe

b) Natural gas supplying conditions

- Supplying pressure: 610 PSI (Equivalent to approximately 42 $kg/cm^2$)
- Composition of the natural gas: Methane ($CH_4$) 92%
- Heat value: 900 to 1,000 $BTU/ft^3$ (Equivalent to approximately 8,000 to 8,900 $Kcal/m^3$)

Remodeling of the various furnace facilities and installation of the piping in the sites of each HI must be examined by taking into consideration the said conditions.

c) Conditions to use natural gas

- The heat value of natural gas should be set at 8,000 $Kcal/m^3$ when modifying the combustion equipment.
- Natural gas should be used as fuel of such equipment as heating furnaces, heat treatment furnaces, aluminum melting furnaces, etc.
- The fuel gas pressure should be of the order of 0.1 to 0.3 $kg/cm^3$ when burning it at each furnaces.
- The consumption of natural gas is mentioned prealready in the section (1) "Objectives and Outline of the Plan". The annual consumption is calculated using the formula; (max. $Nm^3$ x 0.6) x 7H/day x 22 days/month x 12 months.
(The consumption of furnace in the new forging shop will be discussed separately.)

d) Remodeling of the Furnace Facilities and Piping of each HI

- No.1 HI

i) Remodeling Furnace Facilities

Replacement of the burners, valves, solenoid valves, blowers and other ancillary equipment is required in the each furnace.

| | Number of furnaces | Total consumption/H $Nm^3/H$ (max) | Pressure ($kg/cm^2$) | Shop |
|---|---|---|---|---|
| . Heating furnace for leaf spring forming (LS-2) | 1 | 124 | 0.1 to 0.3 | Leaf spring shop |
| . Continuous hardening furnace (LS-5) | 1 | 64 | " | " |
| . Continuous tempering furnace (LS-7) | 1 | 33 | " | " |
| . Heating furnace for spring forming (TSC-2) | 1 | 92 | " | " |
| . Coil spring heating furnace (TSC-4) | 1 | 20 | " | " |
| . Heating furnace (G-1) | 1 | 13 | " | " |
| . Quenching salt bath (CS-4, 5) | 1 | 29 | " | " |
| . Heating furnace for hardening (HT-9) | 1 | 56 | " | Machine/heat treatment shop |
| . Annealing furnace (HT-10) | 1 | 33 | " | " |
| Total | 9 furnaces | 464 $Nm^3/H$ (Total of all furnaces) | | |

ii) Piping and Ancillary Facilities in the Plant Site

- Pipes and laying materials 1 set
- Surge tank and ancillary facilities 1 set

An example of piping line is shown in Attached Figure 2-1.

No.3 HI

i) Remodeling of each furnace

| | Number of furnaces | Total $Nm^3/H$ (max) | Pressure ($kg/cm^2$) | Shop |
|---|---|---|---|---|
| . Annealing furnace foundry | 1 | 120 | 0.1 to 0.3 | Foundry |
| . Ladle drier | 4 | 16 | " | Foundry |
| . Sand drier | 1 | 73 | " | Sand storage yard |
| . Sand heater | 1 | 40 | " | Coated sand shop |
| . Heating furnace for forging | 4 | 253 | " | Light vehicles forging shop |
| . Rotary heating furnace (for Mamootie forging) | 3 | 51 | " | Mamootie forging shop |
| . Reheating furnace (for Mamootie forging) | 3 | 42 | " | Mamootie forging shop |
| . Heating furnace for forging (hand tools) | 7 | 35 | " | Hand tool forging shop |
| . Annealing furnace | 1 | 68 | " | Hand tool forging shop |
| . Carburizing furnace | 2 | 24 | " | Combined heat treatment shop |
| . Normalizing furnace | 1 | 72 | " | Combined heat treatment shop |
| Total | 28 | 794 $Nm^3/H$ | | |

The construction of a new forging shop (for domestic production of large-sized forgings for vehicles) is being planned at No.3 HI, and the heating furnaces, heat treatment furnaces and the like required in this connection are mentioned in the followings.

| | Number of furnaces | Total $Nm^3/H$ (max) | Pressure ($kg/m^2$) |
|---|---|---|---|
| Heating furnace | 3 | 2,000 | 0.1 to 0.3 |
| Annealing furnace | 1 | 130 | " |
| Hardening and tempering furnace | 1 | 200 | " |
| Total | 5 | 2,330 $Nm^3/H$ | |

There are 9 more furnaces besides the aforementioned ones in No.3 HI, but they are excluded from the remodeling list because they are either idle of practically inoperative.

ii) Pipings and Ancillary Facilities in the Plant Sites

- Pipes and laying materials 1 set
- Surge tanks and ancillary facilities 1 set

An example of piping line is shown in Attached Figure 2-2.

- No.4 HI

i) Furnace Remodeling

| | Number of furnaces | Total $Nm^3/H$ (max) | Pressure ($kg/cm^2$) | Shop |
|---|---|---|---|---|
| . Reverberatory furnace (80 kg/H) | 2 | 100 | 0.1 | Light alloy foundry |
| . Reverberatory furnace (200 kg/H) | 1 | 50 | " | Light alloy foundry |
| . Reverberatory furnace (300 kg/H) | 1 | 38 | " | Light alloy foundry |
| . Dewatering & drying furnace | 1 | 50 | " | Painting shop |
| . Drying furnace for light vehicles | 1 | 88 | " | Painting shop |
| . Drying furnace for microbus | 1 | 38 | " | Painting shop |
| . Burner for pho-steam | 3 | 24 | " | Painting shop |
| . Boiler for soft water equipment | 1 | 40 | " | Heat treatment shop |
| . Solution carburizing furnace | 1 | 13 | " | Heat treatment shop |
| . Heating furnace (salt bath) | 1 | 13 | " | Heat treatment shop |
| Total | 13 | 454 $Nm^3/H$ | | |

In addition, one reverberatory furnace will be additionally installed as a new furnace (natural gas furnace) in the light alloy foundry to increase the manufacture of pistons. Also, one putty drying furnace will be newly installed in the heat treatment shop. These specifications are as follows:

| | Number of furnaces | Total $Nm^3/H$ (max) | Pressure ($kg/cm^2$) | Shop |
|---|---|---|---|---|
| . Reverberatory furnace | 1 | 50 | 0.1 | Light alloy foundry |
| . Putty drying furnace | 1 | 25 | 0.1 | Painting shop |

ii) Piping and Ancillary Facilities in the Plant Site

- Pipes and laying materials 1 set
- Surge tanks and ancillary facilities 1 set

An example of piping line is shown in Attached Figure 2-3.

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Requirement

The estimated amount of capital required is shown in Attached Table 3-2. The annual cost incurred from the fuel conversion is shown in Attached Table 3-3.

(4) Expected Effects of the Plan

The required capital of the facilities for the fuel conversion is million yen annually, whereas the expected annual cost reduction from the conversion is 29.2 million yen. Thus, the conversion results in 22 million yen of cost increase annually.

(5) Recommendation on Implementation of the Plan

In addition to the fact that the implementation of the present plan results in annual cost increase, it requires 525.3 million yens of foreign exchange.

The fuel consumption by HIC is minor and the impact from the fuel conversion by HIC is in significant in terms of national fuel consumption in Burma. Therefore, it is recommended that HIC should continue to use the present fuel until the furnace becomes worn out and requires renewal. At that time, the necessity and viability of the conversion should be re-examined duely taking into account the MOC's natural gas supply plan.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 6-1(1) Conversion of Heating System of Furnace from Oil NG
- No.1, No.3 & No.4 HIs -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Spring shop (No.1 HI) | | |
| 1 1 | Heating furnace LS-2 | Set | 1 |
| 1 2 | Heating furnace LS-5 | Set | 1 |
| 1 3 | Tempering furnace LS-7 | Set | 1 |
| 1 4 | Heating furnace G-1 | Set | 1 |
| 1 5 | Heating furnace TCS-2 | Set | 1 |
| 1 6 | Heating furnace TCS-4 | Set | 1 |
| 1 7 | Salt bath CS4,5 | Set | 1 |
| 2 | Heat treatment shop (No.1 HI) | | |
| 2 1 | Hardening furnace HT-9 | Set | 1 |
| 2 2 | Annealing furnace HT-10 | Set | 1 |
| 3 | Pipeline in factory (No.1 HI) | Set | 1 |
| 4 | No.3 HI | | |
| 4 1 | Burner,safety device&burner control device for oil furnace:A | | |
| 4 1 1 | Foundry:stress relief furnace | Set | 1 |
| 4 1 2 | Foundry:ladle dryer | Set | 4 |
| 4 1 3 | Store for sand:sand dryer | Set | 1 |
| 4 1 4 | Coated sand shop:sand heater | Set | 1 |
| 4 1 5 | Forging shop:heating furnace | Set | 4 |
| 4 2 | Burner,safety device&burner control device for oil furnace:B | | |
| 4 2 1 | Mamootie forging:full rotary furnace | Set | 3 |
| 4 2 2 | Momootie forging:re-heating furnace | Set | 3 |
| 4 2 3 | Hand tool forging:heating furnace | Set | 7 |
| 4 2 4 | Hand tool forging:annealing furnace | Set | 1 |
| 4 2 5 | Heat treatment shop:pit type furnace | Set | 2 |
| 4 2 6 | Heat treatment shop:light oil furnace | Set | 1 |
| 4 3 | Pipeline in factory (No.3 HI) | | |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 6-1(2) Conversion of Heating System of Furnace from Oil NG
- No.1, No.3 & No.4 HIs -

| No | Items | Unit | No. |
|---|---|---|---|
| 5 | Light Alloy Foundry (No.4 HI) | | |
| 5 1 | 80kg/h reverberatory furnace | Set | 2 |
| 5 2 | 200kg/h reverberatory furnace | Set | 1 |
| 3 | 300kg/h reverberatory furnace | Set | 1 |
| 6 | Heat treatment shop (No.4 HI) | | |
| 6 1 | Boiler | Set | 1 |
| 6 2 | Liquid caburizing furnace | Set | 1 |
| 6 3 | Salt heating furnace | Set | 1 |
| 7 | Painting shop (No.4 HI) | | |
| 7 1 | Burner for drying oven | Set | 1 |
| 7 2 | Burner for paint baking furnace | Set | 2 |
| 7 3 | Burner for phosphating device | Set | 3 |
| 7 4 | Piping & wiring material in shop | Set | 1 |
| 7 5 | Pipeline in factory (No.4 HI) | Set | 1 |
| 7 5 1 | Outdoor gas piping & emergency stop valve | Lot | 1 |
| 7 5 2 | Materials for gas piping | Lot | 1 |
| 7 5 3 | Materials for pipe support | Lot | 1 |
| 7 5 4 | Gas surge tank | Set | 1 |

Attached Table 3-2: REQUIRED INVESTMENT (#6-1)

(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) | 427.2 | - | 427.2 |
| 2 | Freight & Insurance | 40.5 | - | 40.5 |
| | Sub-total | 467.7 | - | 467.7 |
| 3 | Import Duty | - | 70.2 | 70.2 |
| 4 | Unloading | - | 9.3 | 9.3 |
| 5 | Installation Cost | - | 0.4 | 0.4 |
| | Imported M/E Total | 467.7 | 79.9 | 547.6 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 0.0 | - | 0.0 |
| B | Eng Fee | 41.4 | - | 41.4 |
| C | Software | 16.2 | - | 16.2 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 57.6 | - | 57.6 |
| | Total Investment | 525.3 | 79.9 | 605.2 |

Attached Table 3-3: ANNUAL COST INCREASE (#6-1)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 0.0 | - | 0.0 | - |
| | Freight & Insurance | 0.0 | - | 0.0 | - |
| | Import Duty | - | 0.0 | 0.0 | - |
| | Unloading | - | 0.0 | 0.0 | - |
| | Sub-total | 0.0 | 0.0 | 0.0 | - |
| B | Local CP/RM | - | -29.2 | -29.2 | - |
| | CP/RM Total | 0.0 | -29.2 | -29.2 | - |
| 2 | Utilities | 0.0 | 0.0 | 0.0 | - |
| | Variable Cost | 0.0 | -29.2 | -29.2 | - |
| 3 | Depreciation | 28.0 | 4.8 | 32.8 | - |
| 4 | Amortization | 0.0 | - | 0.0 | - |
| 5 | Maintenance | 14.0 | 2.4 | 16.4 | - |
| 6 | Design Fee | 0.0 | - | 0.0 | - |
| 7 | Labor | - | 0.0 | 0.0 | - |
| 8 | Ovehead | - | 1.0 | 1.0 | - |
| 9 | Admin.Cost | - | 1.0 | 1.0 | - |
| | Fixed Cost | 42.0 | 9.2 | 51.2 | - |
| | Annual Cost | 42.0 | -20.0 | 22.0 | - |
| | Unit P.Cost | | | | |
| 10 | Mark-up | | | | |
| 11 | Excise Tax | | | | |
| | Ex-fact.Cost | | | | |

Notes: *1 Change in annual fuel costs of all the furnaces in question, caused by conversion from fuel oil to NG, based on the following assumptions:

- Maximum use of NG:

| | |
|---|---|
| No.1 HI | 464 $Nm^3/H$ |
| No.3 HI | 794 $Nm^3/H$ |
| No.4 HI | 454 $Nm^3/H$ |
| Total | 1,712 $Nm^3/H$ |

- Annual consumption of NG:

| | |
|---|---|
| No.1 HI | 514.5 x $10^3$ $Nm^3$ (4,116 mil kcal) |
| No.3 & No.4 HI | 1,383.8 x $10^3$ $Nm^3$ (11,070 mil kcal) |
| | at capacity utilization 60% |
| | operation 7 hours/day |
| | 22 days/month |

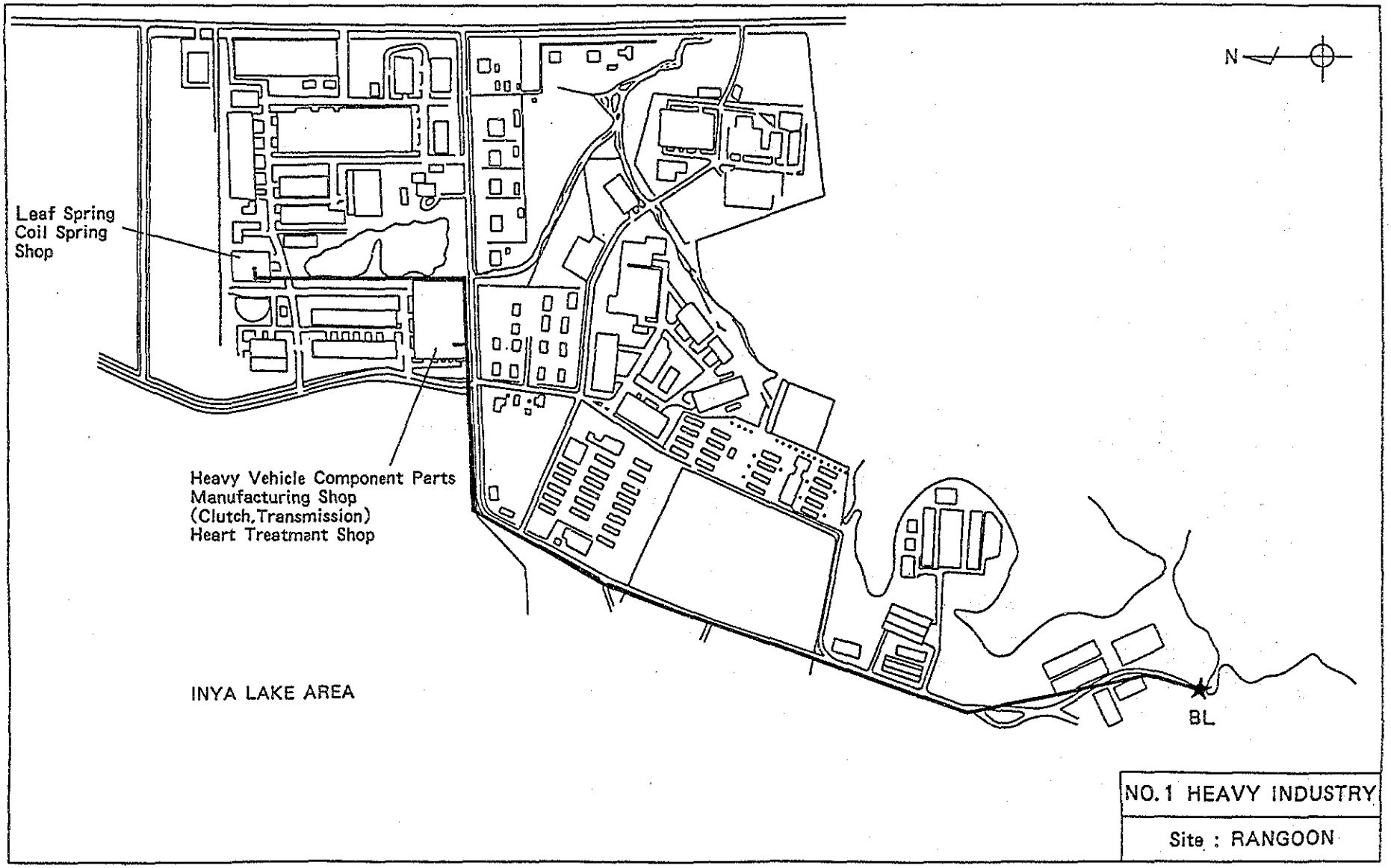
- Unit costs:

| | |
|---|---|
| Cost of fuel oil | 0.149 Kyat/$10^3$ kcal |
| Cost of NG at No.1 HI | 0.033 Kyat/$10^3$ kcal |
| No.3 & No.4 HI | 0.062 Kyat/$10^3$ kcal |

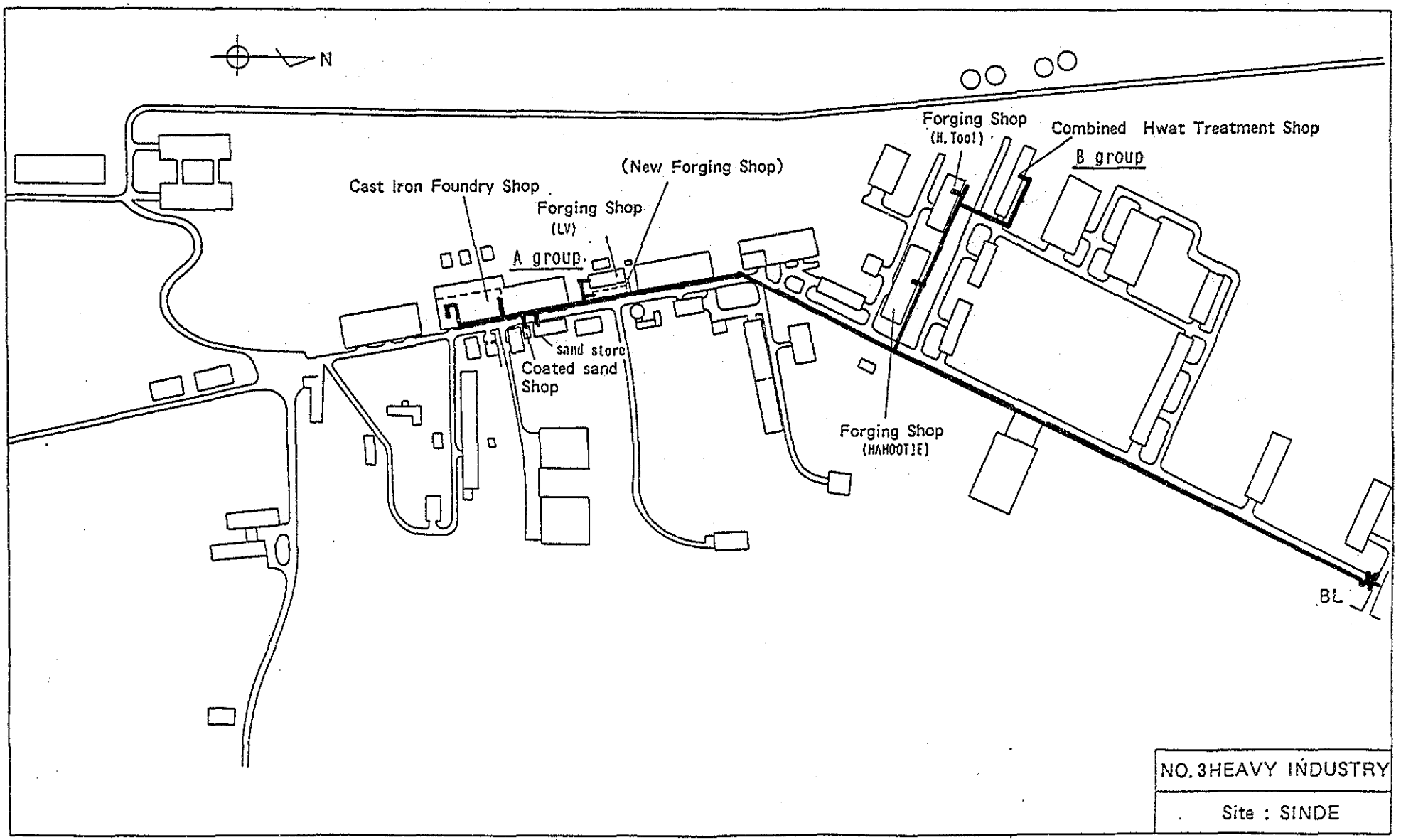
- Annual cost saving:

| | No.1 HI | No.3/4 HI |
|---|---|---|
| Per $10^3$ kcal | 0.116 Kyat | 0.087 Kyat |
| Annual | 477.5 '000 Kyat | 963.1 '000 Kyat |

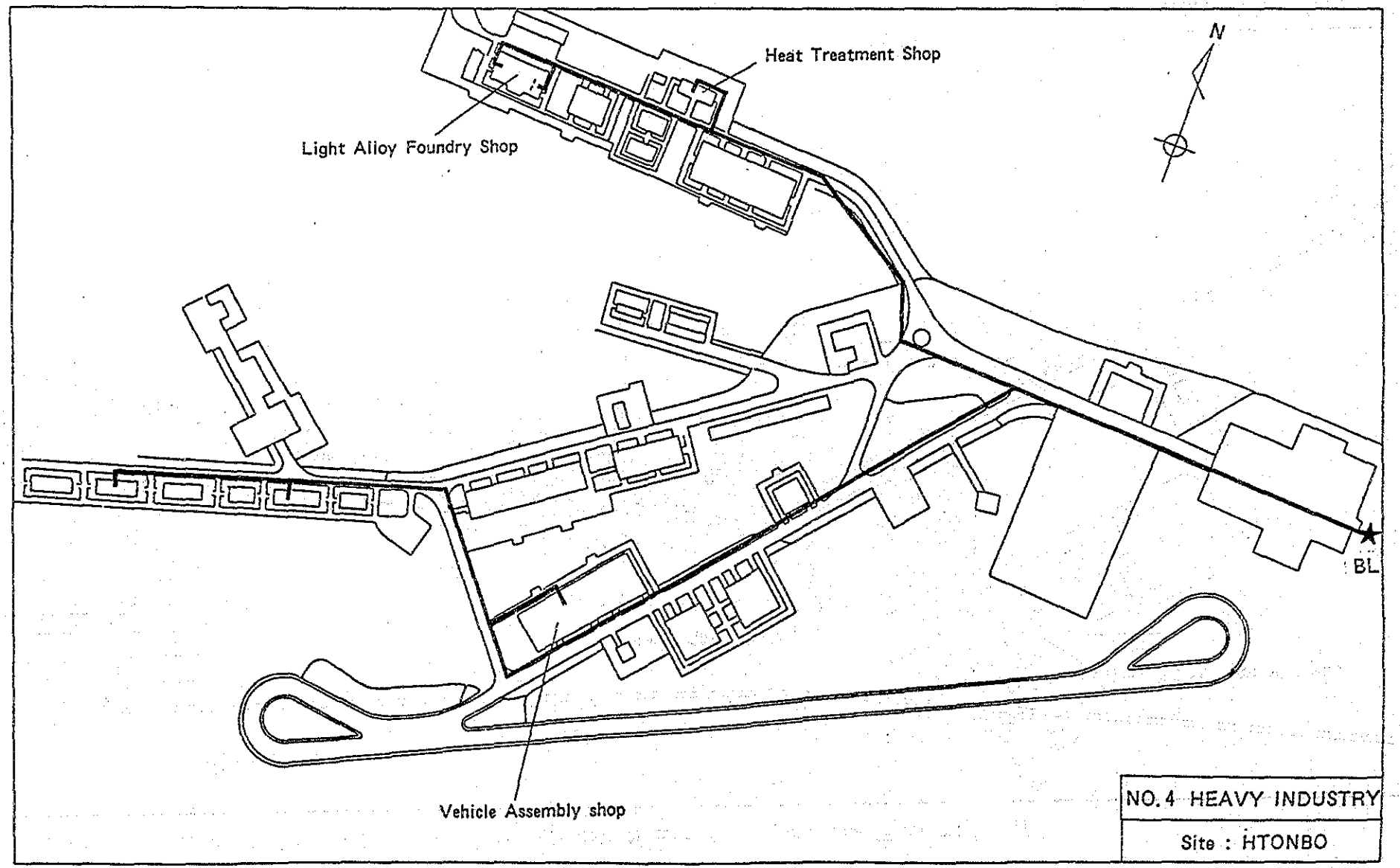
Attached Figure 2-1 NO.1 HI (Ranngoon) Natural Gas Piping Line (Example)



Attached Figure 2-2 NO.3 HI (Sinde) Natural Gas Piping Line (Example)



Attached Figure 2-3 NO.4 HI (HTONBO) Natural Gas Piping Line (Example)



#7-1 Reclamation & Recycling of Coated Sand
- No.3 HI: Coated Sand Shop -

(1) Objectives and Outline of the Plan

Approximately 1,000T of raw sand for coated sand used for shell mold is consumed annually at the foundry of No.3 HI. Sea sand is used as raw material of this coated sand because of the requirements of high quality silica content, round particles and fine grain size. This sea sand is transported over long distance by boat to Sinde where No.3 HI is located, and is used after being washed, dried and sieved. Only a part of the sea sand can be used as the coated sand. Sand with more than #14 mesh is thrown away because the particle is too coarse. Sand with mesh #14 to #45 amounts about 65%, and is mainly used as sand for pepset mold since it is too coarse for coated sand. Sieved sand with mesh less than #45 is used for coated sand of shell molding. This amounts to about 22% of all after classification. Such being the case, the cost of the sand becomes very expensive. Furthermore, the used sand is thrown away because there is no reclamation and recycling equipment.

The objective of the plan is to reclaim the used sand by introduction of the used sand reclamation and recycling equipment, and establish an integrated sand treatment system by making use of the said equipment.

The following items are included in this plan.

- Measuers will be taken to realize the reclamation and recycling of the coated sand, which is being threw away at the present time.
- Measures will be taken to increase the yield of sea sand by crushing the coarse sand and polishing them to make round particles that are being sieved and threw away in the coated sand manufacturing process currently in use.
- Measures will be taken to cut down the rejection rate of castings caused by improper characteristics of the sand by improving the particle shape of river sand used as raw material in the green sand and self-hardening molding line, and by eliminating fine grading powder and iron content.

According to the results of tests conducted so far, it has been found that the river sand of Irawadi, if made finer in granularity, washed in water and sieved, offered a good possibility of becoming usable for shell molding sand of light alloy castings as it is or as shell molding sand of cast iron in mixture with high $SiO_2$ content sand.

As mentioned above, the future possibility of cutting down the quantity of sea sand used by making use of river and with improved quality in the coated sand will be taken into consideration in the reclamation system.

(2) Details of the Plan

1) Process of the Reclamation Facilities

The process flow of the existing facilities is shown in Attached Figure 2-1. this process has no reclamation facilities. The process flow based on this plan is shown in Attached Figure 2-2. The reclamation facilities will be used in combination with the existing facilities. The main facilities are as follows.

- Facilities to crush the sand lumps
- Facilities to eliminate the iron content
- Facilities to eliminate the impurities stuck on the sand
- Facilities to grind the sand particles
- Facilities to eliminate fine powder

These facilities will be installed in the coasted sand shop, but reconstruction of part of the building will be required because the height of the existing building will be insufficient to install such facilities as sand hopper, bucket conveyor and the like. Since part of the existing facilities such as sand dryer, sand hopper, conveyor is used in the recycling system, the specifications of introduced facilities have to match the existing ones.

The layout of coated sand reclaiming and recycling facility is shown in Attached Figure 2-3.

(3) Estimated Capital Requirement

1) Required Facilities

The machine and equipments required for the plan are listed in Attached Table 3-1.

2) Estimated Capital Requirement

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

(4) Expected Effects of the Plan

As a result of implementing the plan, following effects are expected:

1. Decrease in coated sand production cost
2. Decrease in rejected rate of casted products by improvement of input river sand specifications

The coated sand production cost may be reduced through;

1. Reclamation of used coated sand
2. Utilization of sea sand with mesh #14 through 45 for coated sand by crushing and polishing
3. Utilization of river sand for coated sand by crushing

The extent of coated sand production cost reduced various depending on the reclamation/utilization rates of the above. The rates cannot be fixed at this stage of study. Attached Table 3-3 shows the cost reduction estimated using an assumed reclamation/utilization rates generally accepted for this type of process. According to the estimate, the coated sand production cost will be hard to be reduced unless the utilization of river sand is materialized.

Nevertheless, the planned facilities enable to improve the particle size of river sand, remove the sand particle too small in size, and remove the iron contained.

Thus, good quality shell molding sand may be obtained from the river sand by mixing it with high $SiO_2$ containing sea sand, resulting in reduction of presently 20% of reject rate of casted products.

(5) Recommendation of Implementation of the Plan

It is recommended to proceed with further technical study especially with respect to the specifications of river sand and possible utilization rate of it for coated sand. The plan should be implemented upon confirming the economic viability.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 7-1(1) Coated Sand Reclaiming/Recycling
- No.3 HI: Foundry -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 1 | Build'g&found'n matr'l for coated sand reclam'g recycl'g eq. | | |
| 1 1 | Set of steel structure | Lot | 1 |
| 1 2 | Set of siding and roofing material(local supply):Slate | Lot | 1 |
| 1 3 | Set of gutter and rain proof materials | Lot | 1 |
| 2 | Imported M/E | | |
| 1 | Equipment for new sand receiving & coated sand reclaming | | |
| 1 1 | Belt feeder with sand charging chute (cap. 3ton/h) | Set | 1 |
| 1 2 | Belt conveyor (cap. 3t/h,belt width 400mm,belt speed 50m/m) | Set | 1 |
| 1 2 1 | Sand hopper (existing equipment C-1) | Set | 1 |
| 1 2 2 | Belt conveyor (existing equipment C-2) | Set | 1 |
| 1 2 3 | Bucket elevator (existing equipment C-3) | Set | 1 |
| 1 2 4 | Rotary dryer (existing equipment C-4) | Set | 1 |
| 1 2 5 | Belt conveyor (existing equipment C-4-1) | Set | 1 |
| 1 2 6 | Set of anchillary equipment (existing eq. C-4-2 to C-4-22) | Set | 1 |
| 1 2 7 | Vibrating screen (existing equipment C-5) | Set | 1 |
| 1 2 8 | Belt conveyor (existing equipment C-6) | Set | 1 |
| 1 3 | Belt conveyor(cap.3t/h,belt width 400mm,belt speed 50m/min.) | Set | 1 |
| 1 4 | Bucket elevator(cap.3t/h,belt width 150mm,belt spd 80m/min.) | Set | 1 |
| 1 5 | Set of sand hopper | Set | 1 |
| 1 6 | Belt feeder (cap.5t/h,belt width 400mm,belt speed 15m/min.) | Set | 2 |
| 1 7 | Magnetic separator(cap.5t/h,motor 0.4kW,magnet 1.3kW) | Set | 1 |
| 1 8 | Bucket elevator(cap.5t/h,belt width 150mm,belt spd 80m/min.) | Set | 1 |
| 1 9 | Sand reclaimer (continuous type,cap.4t/h,motor 22kW) | Set | 1 |
| 110 | Batch hopper (cap. 800kg) | Set | 1 |
| 111 | Sand reclaimer (batch type, cap. 800kg/batch) | Set | 1 |
| 112 | Vibratory feeder (cap. 5t/h, trough W310xL762mm) | Set | 1 |
| 113 | Bucket elevator(cap.5t/h,belt width 150mm,belt spd 80m/min.) | Set | 1 |
| 114 | Air separator (cap. 5ton/h) | Set | 1 |
| 115 | Belt conveyor(cap.5t/h,belt width 400mm,belt speed 50m/min.) | Set | 1 |
| 116 | Turn table (motor o.4kW) | Set | 1 |
| 117 | Set of sand hopper | Set | 1 |
| 118 | Vibratory feeder (cap.5t/h,trough W310xL762mm) | Set | 4 |
| 119 1 | Sand hopper | Set | 1 |
| 119 2 | Pneumatic conveyor (existing equipment) | Set | 1 |
| 120 | Bucket elevator with grating chute (cap. 3ton/h) | Set | 1 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 7-1(2) Coated Sand Reclaiming/Recycling
- No.3 HI: Foundry -

| No | Items | Unit | No. |
|---|---|---|---|
| 121 | Skip hoist (cap. 0.5m3, motor 3.7kW) | Set | 1 |
| 122 | Vibro crusher (cap.1t/h,hopper cap. 0.5m3, 0.6kWx2) | Set | 1 |
| 123 | Dust hood | Set | 1 |
| 124 | Bucket elevator(cap.1t/h,belt width 150mm,belt spd 80m/min.) | Set | 1 |
| 125 | Control panel | Set | 1 |
| 126 | Set of secondary wiring material | Set | 1 |
| 127 | Dust collector (extracted air volume 400Nm3/min.) | Set | 1 |
| 128 | Dust collector for item 109&111(extr.air volume 260Nm3/min.) | Set | 1 |
| 129 | Set of ducting material | Set | 1 |
| 130 | Set of steel structure | Set | 1 |
| 131 | Set of sand testing facility | Set | 1 |

Attached Table 3-2: REQUIRED INVESTMENT (#7-1)

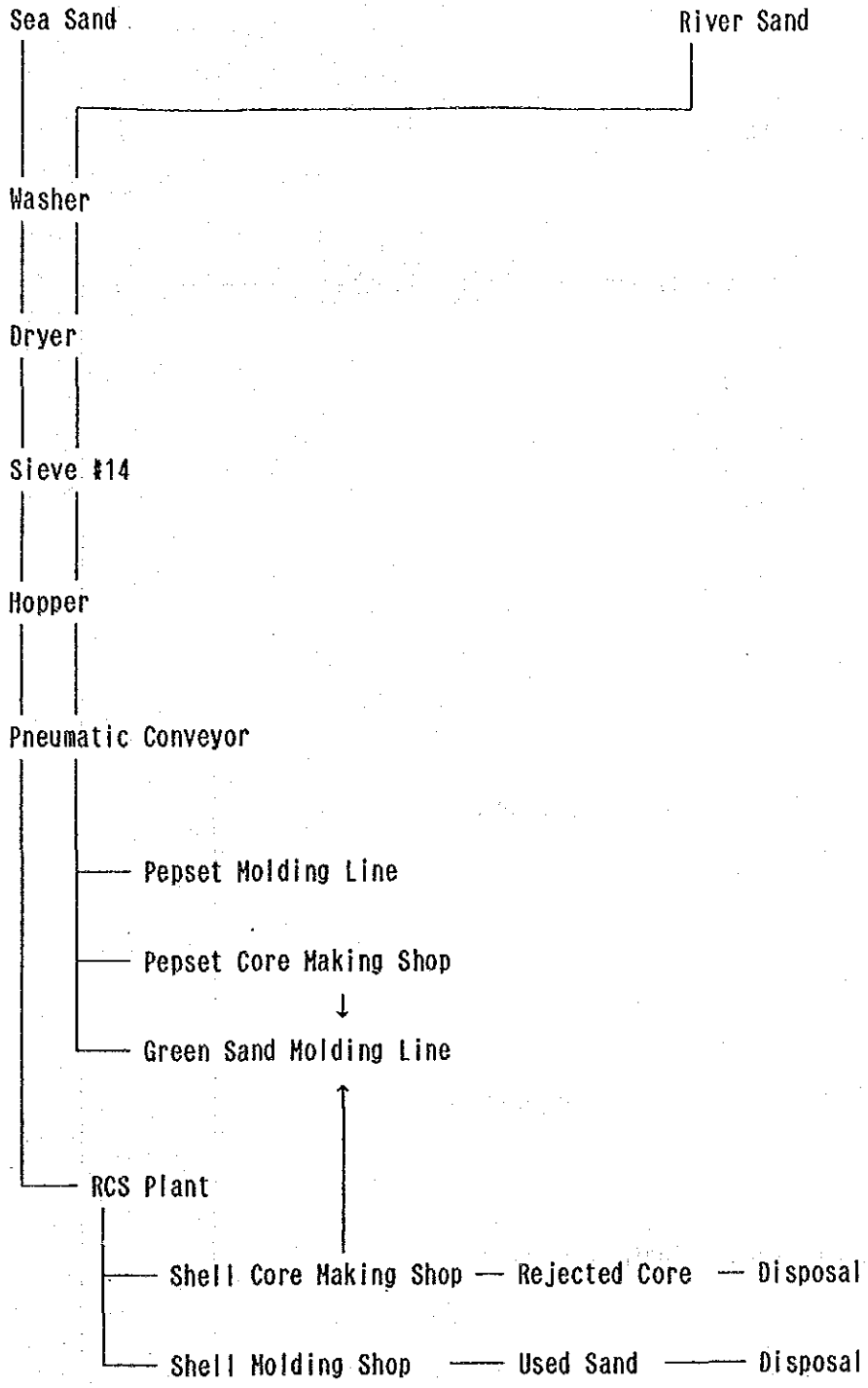
(Unit: million yen)

| 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) | 162.8 | - | 162.8 |
| | 2 | Freight & Insurance | 15.5 | - | 15.5 |
| | | Sub-total | 178.3 | - | 178.3 |
| | 3 | Import Duty | - | 26.7 | 26.7 |
| | 4 | Unloading | - | 3.6 | 3.6 |
| | 5 | Installation Cost | - | 0.5 | 0.5 |
| | | Imported M/E Total | 178.3 | 30.8 | 209.1 |
| 3 | | Local M/E | - | 0.0 | 0.0 |
| 4 | | Other Costs | | | |
| A | | License Fee | 0.0 | - | 0.0 |
| B | | Eng Fee | 7.2 | - | 7.2 |
| C | | Software | 11.8 | - | 11.8 |
| D | | Interest | 0.0 | - | 0.0 |
| | | Other Costs Total | 19.0 | - | 19.0 |
| | | Total Investment | 197.3 | 30.8 | 228.1 |

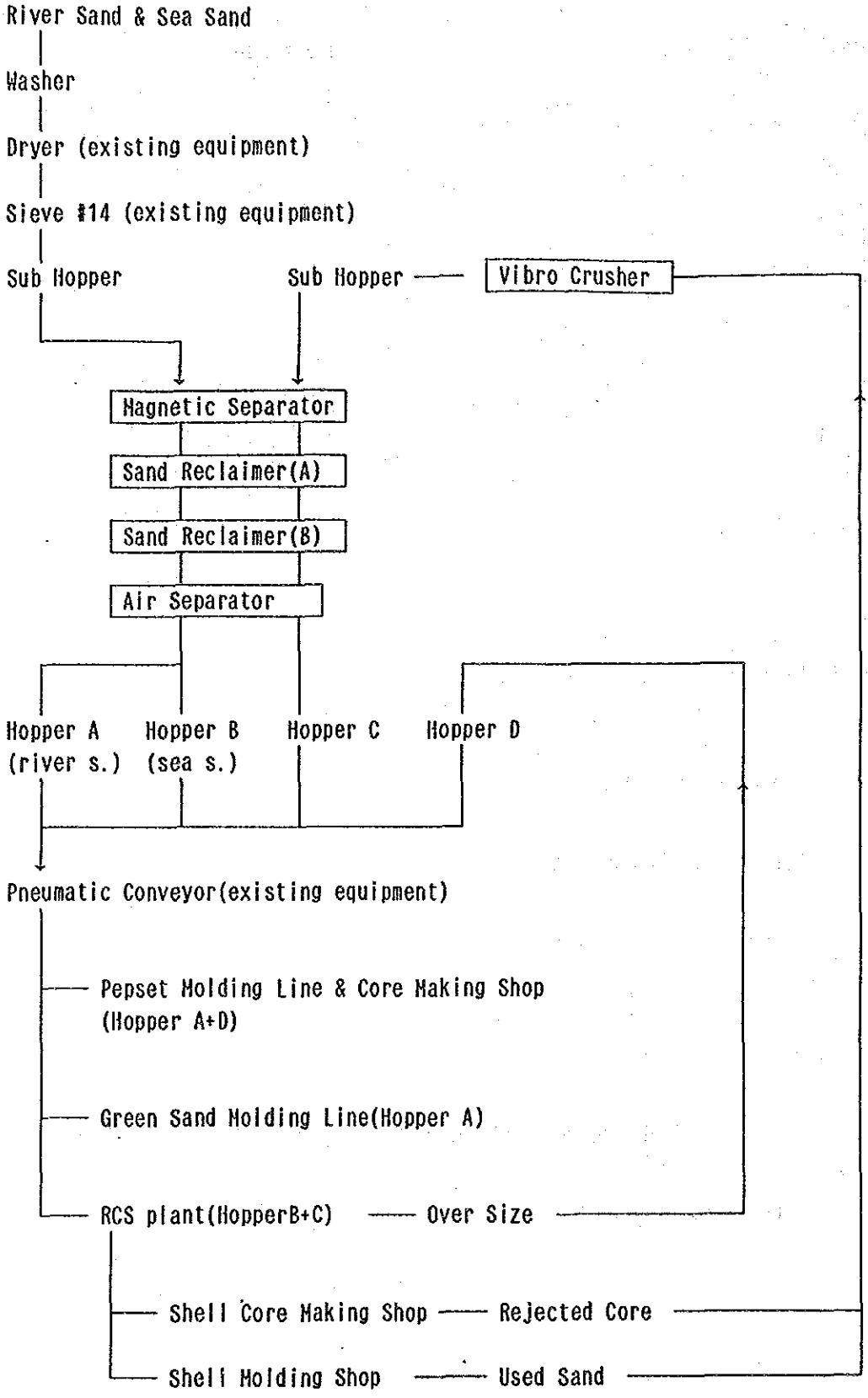
Attached Table 3-3: PRODUCTION COST STATEMENT (#7-1)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| | A Imported CP/RM (FOB) | 0.0 | - | 0.0 | 0 |
| | Freight & Insurance | 0.0 | - | 0.0 | 0 |
| | Import Duty | - | 0.0 | 0.0 | 0 |
| | Unloading | - | 0.0 | 0.0 | 0 |
| | Sub-total | 0.0 | 0.0 | 0.0 | 0 |
| | B Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 0.0 | 0.0 | 0.0 | 0 |
| 2 | Utilities | 0.0 | 1.9 | 1.9 | 8 |
| | Variable Cost | 0.0 | 1.9 | 1.9 | 8 |
| 3 | Depreciation | 10.7 | 2.0 | 12.7 | 55 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 5.3 | 0.9 | 6.2 | 27 |
| 6 | Design Fee | 0.0 | - | 0.0 | 0 |
| 7 | Labor | - | 0.0 | 0.0 | 0 |
| 8 | Ovehead | - | 1.1 | 1.1 | 5 |
| 9 | Admin.Cost | - | 1.0 | 1.0 | 4 |
| | Fixed Cost | 16.0 | 5.0 | 21.0 | 92 |
| | Annual Cost | 16.0 | 6.9 | 22.9 | 100 |
| | Unit P.Cost | | | | |
| 10 | Mark-up | | | | |
| 11 | Excise Tax | | | | |
| | Ex-fact.Cost | | | | |

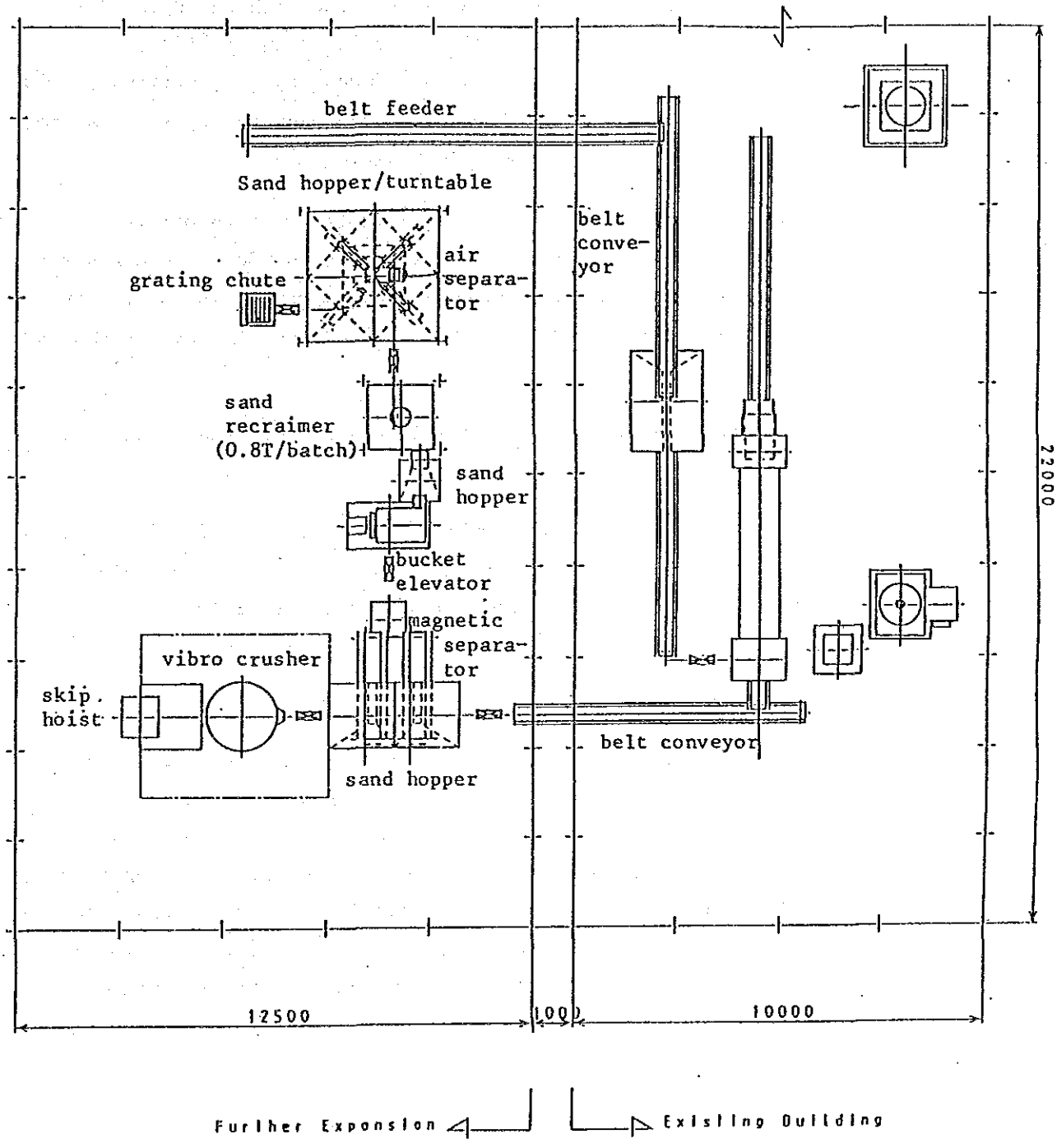
Attached Figure 2-1 Flow Chart of Present Process



Attached Figure 2-2 Flow Chart of Improved Process



ATTACHED FIGURE 2-3 Layout of coated sand reclaiming & recycling E/Q



## #7-2 Reclamation and Recycling of Cutting Oil and Chips - No.1 HI, No.3 HI, No.4 HI and No.5 HI -

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

Large quantities of cutting oil are used in the machine tools of various kinds installed in the various machining shops of HIC. As there are no facilities for reclamation of cutting oil, cutting oil is being abandoned together with chips generated when the workpieces are machined by means of the said machine tools.

Cutting oil is being imported in Burma. If the cutting oil is reclaimed and recycled, it would contribute to cut down the purchased quantity of raw materials and therefore the expenditures in foreign currency. Furthermore, deoiled chips could be used as part of the raw materials for castings.

The objective of this plan is to reclaim and recycle the cutting oil and iron chips.

One set of facilities for reclamation of cutting oil and chips will be installed in No.1 HI, No.3 HI, No.4 HI and No.5 HI, respectively, to realize the reclamation and recycling of these materials.

### (2) Details of the Plan

Large-sized chips resulting from the machining process will be cut into small pieces. After that cutting oil stuck on the chips will be separated by means of centrifugal oil separator. The separated cutting oil will be passed through a magnetic separator to separate the contained fine iron powder. Since cutting oil thus separated may contain water, the water is removed through an oil filter equipped with water separator and then the refined cutting oil is reclaimed.

On the other hand, the deoiled chips will be stored in containers, etc. temporarily, and then they will be conveyed to the Foundry of No.3 HI and used as melting material.

The flow of the reclamation process is shown in Attached Figure 2-1.

(3) Estimated Capital Requirement

1) Required Facilities

The machine and equipments required for the plan are listed in Attached Table 3-1.

2) Estimated Capital Requirement

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

(4) Expected Effects of the Plan

The annual cost for the plan is shown in Attached Table 3-3. The price of steel scrap purchased by HIC was 1,000 Kyats per ton. Assuming that one ton of cutting chips is equivalent to 0.7 tons of steel scrap in terms of effectiveness as casting raw materials, the cutting chips may be priced at 700 Kyat (or 14,200 Yen) per ton. Therefore, if 415 tons/year of the cutting chips are reclaimed and utilized as the raw material, then the plan will be viable.

The maximum allowed input volume of cutting chip is estimated 5 through 10% of total input iron. In case of casting volume being 3,500 tons/year,

| | |
|---|---|
| Casting products (A) | 3,000 tons/year |
| Melting weight (B) | 4,260 (A x 1.42) |
| Maximum cutting chips allowed to be input (C) | 426 (B x 10%) |

Therefore, if the casted volume at the Foundry exceeds 3,000 tons/year, the plan will be viable. The presently planned casting volume is 3,600 tons/year with actual production being 2,400 tons/year. The casting volume will be expanded to 7,800 tons/year in the future. Therefore, this plan is quite effective in terms of uti-

lization of wasted cutting chips. In addition, the effect from reclaiming imported cutting oil may be expected at the same time.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 7-2 Cutting Chips/Oil Recovery
- No.1, No.3, No.4&No.5 HIs: # Cutting Chip Recovery Plant -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Chip and oil separation/recovery units | Set | 4 |
| 1 1 | Chip crusher | Set | 4 |
| 1 2 | Continuous oil separator | Set | 4 |
| 1 3 | Magnet separator | Set | 4 |
| 1 4 | Oil filter | Set | 4 |
| 1 5 | Other M/E | Set | 4 |

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

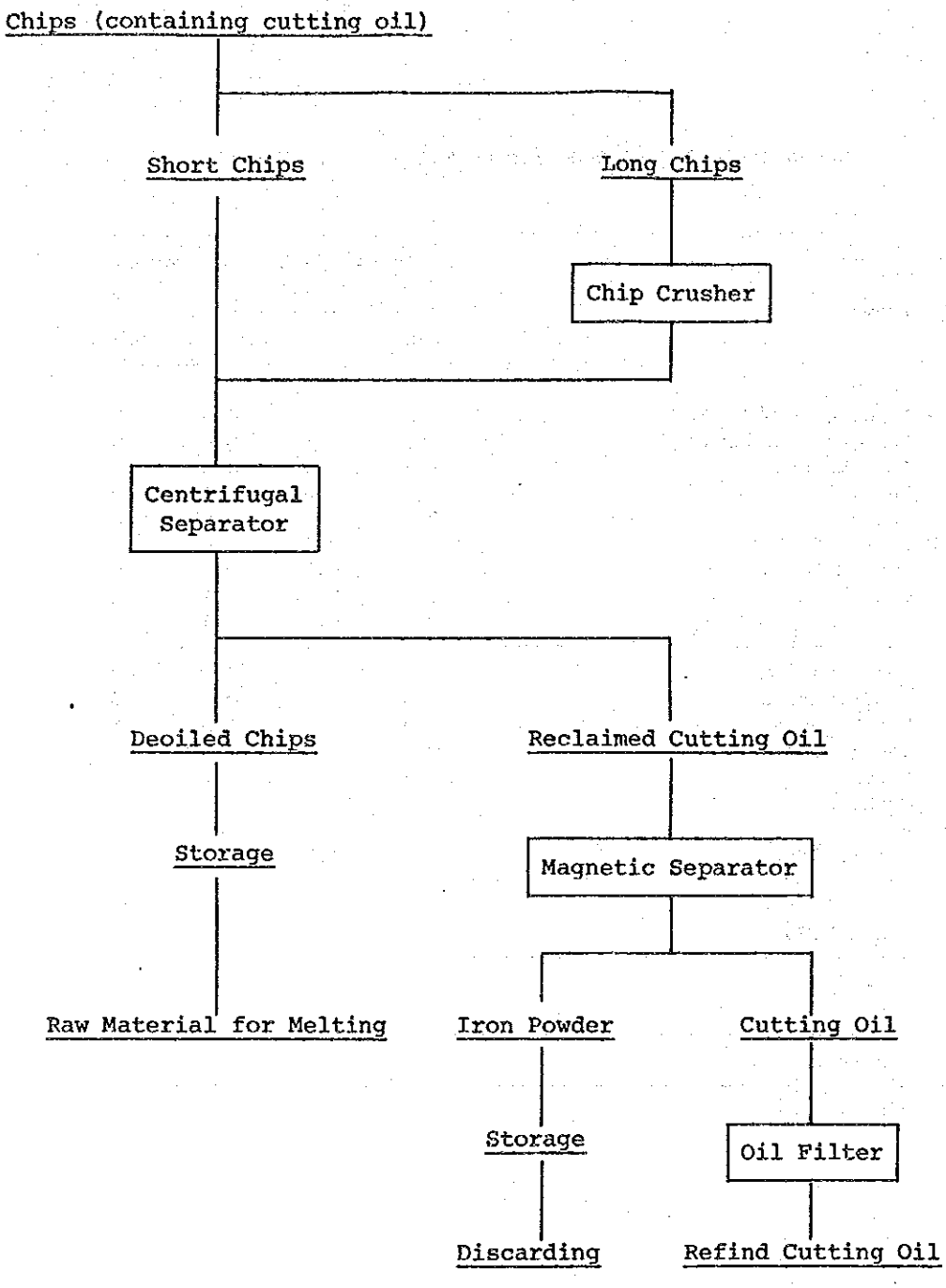
(Unit: million yen)

| 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) | 41.0 | - | 41.0 |
| | 2 | Freight & Insurance | 3.9 | - | 3.9 |
| | | Sub-total | 44.9 | - | 44.9 |
| | 3 | Import Duty | - | 6.7 | 6.7 |
| | 4 | Unloading | - | 0.9 | 0.9 |
| | 5 | Installation Cost | - | 0.1 | 0.1 |
| | | Imported M/E Total | 44.9 | 7.7 | 52.6 |
| 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 | 0.5 | - | 0.5 |
| D | | Interest | 0.0 | - | 0.0 |
| | | Other Costs Total | 4.1 | - | 4.1 |
| | | Total Investment | 49.0 | 7.7 | 56.7 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#7-2)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 0.0 | - | 0.0 | 0 |
| | Freight & Insurance | 0.0 | - | 0.0 | 0 |
| | Import Duty | - | 0.0 | 0.0 | 0 |
| | Unloading | - | 0.0 | 0.0 | 0 |
| | Sub-total | 0.0 | 0.0 | 0.0 | 0 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 0.0 | 0.0 | 0.0 | 0 |
| 2 | Utilities | 0.0 | 0.1 | 0.1 | 2 |
| | Variable Cost | 0.0 | 0.1 | 0.1 | 2 |
| 3 | Depreciation | 2.7 | 1.0 | 3.7 | 63 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 1.3 | 0.2 | 1.5 | 25 |
| 6 | Design Fee | 0.0 | - | 0.0 | 0 |
| 7 | Labor | - | 0.0 | 0.0 | 0 |
| 8 | Ovehead | - | 0.3 | 0.3 | 5 |
| 9 | Admin.Cost | - | 0.3 | 0.3 | 5 |
| | Fixed Cost | 4.0 | 1.8 | 5.8 | 98 |
| | Annual Cost | 4.0 | 1.9 | 5.9 | 100 |
| | Unit P.Cost | | | | |
| 10 | Mark-up | | | | |
| 11 | Excise Tax | | | | |
| | Ex-fact.Cost | | | | |

Attached Figure 2-1 PROCESS FLOWCHART



## #7-3 Reclamation & Recycling of Aluminum Chips
- No.4 HI -

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

Aluminum chips resulting from the machining of piston (aluminum alloy) are not reclaimed and reused. This is because there are no facilities for reclamation and remelting of this material. At the present time the reclamation is limited to such items as riser, sprue, casting fin, residual molten metal and the like.

Ingots used to manufacture aluminum alloy piston are imported and are very expensive. Such being the case, reclaimable materials should be reclaimed as much as possible to upgrade the yield and to cut down the purchasing cost of raw materials. This is expected to contribute also to cut down foreign currency expenditures.

This plan is aimed at reclaiming and recycling aluminum piston machining chips.

### (2) Details of the Plan

The piston machining shop of No.4 HI is dedicated to aluminum piston machining, and it is very convenient for the sake of reclamation because there is no risk of mixture of other kinds of materials.

A set of facilities for reclamation and recycling of aluminum chips will be installed in No.4 HI.

The reclamation quantity is estimated as follows:

- Assumption: Sixty percent of the cihps resulting from the machining of aluminum piston will be reclaimed. The average weight reclaimed is assumed 0.107 kg/piece of piston.

- The annual reclamation quantities:

| 1990 | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 and onwards |
|---|---|---|---|---|---|---|
| 4.5T | 8T | 9.2T | 11T | 13T | 15.5T | 17.2T |

(Based on the 10-years production plan)

The flow of the chip reclamation process is shown in Attached Figure 2-1.

The major machine and equipments installed in the plan are as follows.

| | | |
|---|---|---|
| 1. | Dehydrater | 1 unit |
| 2. | Rotary Kiln | 1 unit |
| 3. | Magnetic drum | 1 unit |
| 4. | Bailing | 1 unit |
| 5. | Melting furnace | 1 unit |
| 6. | Ingot case | 1 set |

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Requirement

This is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Foreign Exchange Saving

Foreign exchange outflow per one ton reclamation is expected to be 238,000 yen. (The annual reclamation quantity is assumed 17.2 ton)

| | Foreign Exchange Required at Implementation of Plan (yen per ton) | Amount of Foreign Currency Required at Present (yen per ton) |
|---|---|---|
| Cost of parts | - | - |
| Raw Material Costs | - | - |
| Freight & Insurance | - | 320,000 |
| Sub-total | - | 320,000 |
| Working equipment costs | 558,140 | - |
| TOTAL | 558,140 | 320,000 |

Note: The working equipment costs are only for the additional costs incurred by this plan. For detail, see Attached Table 3-3, cost of aluminum ingot is 32,000 yen per ton. (Actual cost from HIC in 1985-1987)

| Annual Production (ton/year) | Foreign Currency Required at Implementation of Plan ('000 yen per ton) | Foreign Currency Required at Present Production ('000 yen per ton) |
|---|---|---|
| 20 | 48 | 32 |
| 30 | 32 | 32 |
| 40 | 24 | 32 |

The saving of foreign exchange can be expected when the annual planned reclamation capacity increase two-fold or the unit price of aluminum material increase drastically. But with the present plan, the foreign exchange saving effect cannot be expected.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 7-3 Reclamation of aluminum chip
- No.4 HI: Piston Manufacturing Shop -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Dehydrator | Set | 1 |
| 2 | Rotary kiln (dryer) | Set | 1 |
| 3 | Magnetic separator (drum) | Set | 1 |
| 4 | Baling machine | Set | 1 |
| 5 | Melting furnace | Set | 1 |

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

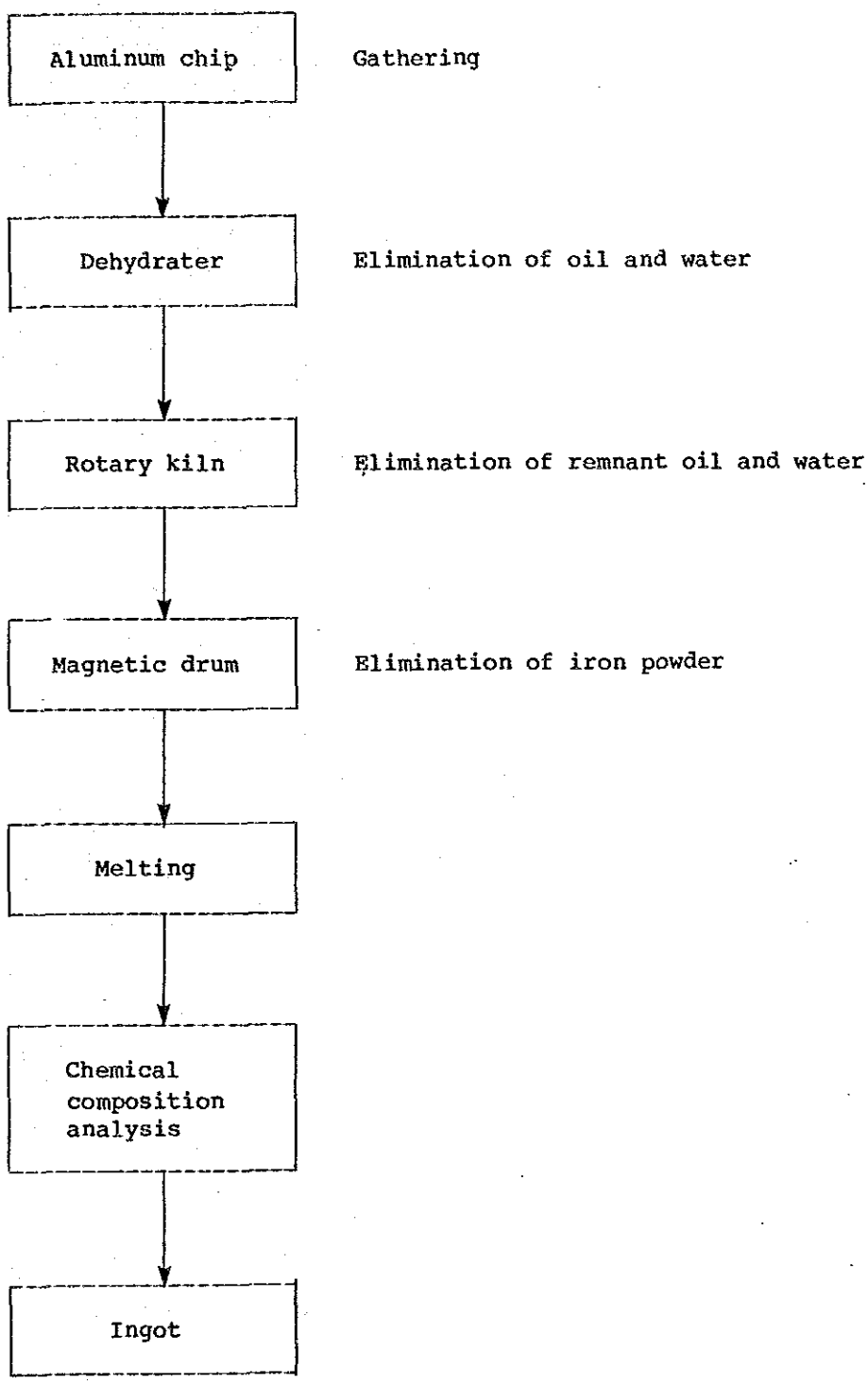
(Unit: million yen)

| | Items | Investment | | |
|---|---|---|---|---|
| | | Foreign | Local | Total |
| 1 | Bldg & Land | | | |
| A | Land | - | 0.0 | 0.0 |
| B 1 | Building | 38.0 | 23.8 | 61.8 |
| 2 | Freight & Insurance | 3.6 | - | 3.6 |
| | Sub-total | 41.6 | 23.8 | 65.4 |
| 3 | Import Duty | - | 6.2 | 6.2 |
| 4 | Unloading | - | 0.8 | 0.8 |
| | Building Total | 41.6 | 30.8 | 72.4 |
| | Bldg & Land Total | 41.6 | 30.8 | 72.4 |
| 2 1 | Imported M/E (FOB) | 67.0 | - | 67.0 |
| 2 | Freight & Insurance | 6.4 | - | 6.4 |
| | Sub-total | 73.4 | - | 73.4 |
| 3 | Import Duty | - | 11.0 | 11.0 |
| 4 | Unloading | - | 1.4 | 1.4 |
| 5 | Installation Cost | - | 0.0 | 0.0 |
| | Imported M/E Total | 73.4 | 12.4 | 85.8 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 0.0 | - | 0.0 |
| B | Eng Fee | 0.9 | - | 0.9 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 0.9 | - | 0.9 |
| | Total Investment | 115.9 | 43.2 | 159.1 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#7-3)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 0.0 | - | 0.0 | 0 |
| | Freight & Insurance | 0.0 | - | 0.0 | 0 |
| | Import Duty | - | 0.0 | 0.0 | 0 |
| | Unloading | - | 0.0 | 0.0 | 0 |
| | Sub-total | 0.0 | 0.0 | 0.0 | 0 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 0.0 | 0.0 | 0.0 | 0 |
| 2 | Utilities | 0.0 | 0.0 | 0.0 | 0 |
| | Variable Cost | 0.0 | 0.0 | 0.0 | 0 |
| 3 | Depreciation | 6.1 | 1.7 | 7.8 | 57 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 3.5 | 1.1 | 4.6 | 34 |
| 6 | Design Fee | 0.0 | - | 0.0 | 0 |
| 7 | Labor | - | 0.0 | 0.0 | 0 |
| 8 | Ovehead | - | 0.6 | 0.6 | 4 |
| 9 | Admin.Cost | - | 0.6 | 0.6 | 4 |
| | Fixed Cost | 9.6 | 4.0 | 13.6 | 100 |
| | Annual Cost | 9.6 | 4.0 | 13.6 | 100 |
| | Unit P.Cost | | | 790697.7 | |
| 10 | Mark-up | | | 0.0 | |
| 11 | Excise Tax | | | 0.0 | |
| | Ex-fact.Cost | | | 790697.7 | |

Attached Figure 2-1 THE FLOW OF ALUMINUM RECLAMATION PROCESS



#8-1 Increase in Fluorescent Lamp Production
- No.1 HI: Lamp Manufacturing Plant -

(1) Objectives and Outline of the Plan

At present, there is one production line for fluorescent lamps (FL), and both the 20 W and 40 W tubes are produced on this same line. The production capacity of the current line has been fixed at 400,000 items per annum by HIC, and in order to meet the increased production planned in the future it is necessary to strengthen and increase this productive capacity.

The fluorescent lamp currently produced at the HIC has a 38 mm diameter, although other countries already use the 28 mm diameter type. If production of the 38 mm diameter model is continued then it will be necessary in the near future to arrange to have imported parts produced at specially established facilities and this may lead to increase costs. It is therefore advisable to establish a new line for the 28 mm diameter model and to choose the first favorable opportunity to switch over the existing line from the 38 mm to the 28 mm diameter model.

The present plan objectives are therefore to establish an increased production system and at the same time undertake the product switch over to the 28 mm model as outlined above. The following points are necessary for the realization of this plan;

1) Expansion of Line Facilities

The proposed production schedule for the year of 1998 is for 2,000,000 items per annum, and since the current line production capacity is determined to be 400,000 items per annum it will be necessary to operate a total of 5 lines similar to the present one. However, if conditions for supply of necessary parts and uninterrupted operations could be arranged for the working equipment of the current line a production of 800,000 items per annum would be possible for the existing line equipment. In order therefore to reduce required capital to a minimum one more line similar to that existing should be set up and at the same time the increase of the productive efficiency of both these

lines undertaken, and a two shift work system implemented as part of planning for a production system of 2,000,000 items per annum. That is to say the production output of each individual shift of each of the lines should be raised from 400,000 items per annum to 500,000 per annum. The target output will be as follows:

500,000 items per line shift x 2 lines x 2 shifts =
2,000,000 items per annum

Together with this it is necessary to realize the following headings.

2) Repair of Existing Equipment

Deterioration of existing equipment is quite advanced. It is necessary to take counter measures for this deterioration in order to raise production capacity from its present level of 40,000 items to 500,000 items per annum.

3) Expansion of the Section in Charge of Maintenance

In order to reduce production stoppages to a minimum it is necessary to have a system whereby small repairs of the line are immediately undertaken. With the existing machine tools of the section in charge of maintenance in the lighting shop such a system cannot be provided. The present plan proposes the introduction of the minimum of equipment required to handle minor repairs. Further, a repair system of larger scope is incorporated into the plan for the Auxiliary Machine Shop (#3-1).

4) Provision for Quality Control and Quality Inspection Systems

The measuring device for what is one of the important particular features of the light bulbs, i.e., brightness, has been out of order now for 2 to 3 years. further, the measuring devices needed for processing management are not provided and their provision is necessary for the assurance of quality control. The time for replacement with standard light bulbs has almost come.

(2) Details of the Plan

1) Expansion of Lines

1. Products; 20 watt and 40 watt fluorescent lamps (bulb size 28 mm diameter)

2. Production speed; same as present

3. Outline of equipment;

Change in the lamp marking mechanism, and rationalize the making and wiping devices (for wiping of the two ends of the bulb of the fluorescent lamp body) will be made. Change in the flare machine to a new one which can carry out production on the line will be made. The present flare machine as a supply of spare parts will be kept and change in the deteriorated flare machine of the I/L line (cf. #8-2) will be made. Other equipment is to have the same specifications as present equipment.

4. Addition to the existing motor equipment will be made so that this will be able to respond to needs in the future when the equipment of the I/L line is expanded.

5. As location for installation the mercury lamp line will be moved and use the area vacated will be used.

6. Technical services for the installation and trial running will be carried out and operational training for the staff of HIC will be undertaken.

2) Repair of Existing Equipment

As there is a need to maintain a determined level of production once a new line has been finished and started production implementation of counter measures for the deterioration of existing machinery are to be put into operation. As these counter measures do not necessitate the replacement of the entire deteriorated equipment performance can be raised considerably by changing spare parts. The present plan is for overhaul chiefly involving the changing of spare parts and equipping of spare parts for operations hereafter.

When overhauling operations are being carried out the changeover from the present specialist parts for production of the 38 mm diameter product are to switched to those for the 28 mm diameter model.

After the overhaul of existing machinery has been completed the new line and old line will operate respectively as the specialist lines for the 20 W and 40 W products so that a reduction in wasteful model changing operations will be effected. However, in urgent cases both lines will be able to carry out shared production.

3) Other Equipment

1. Introduction of lathes and welding equipment necessary for provision of the maintenance system

2. Replacement of quality control and quality inspection equipment (the brightness measuring device)

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Requirement

This is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving on Foreign Currency

Without the present plan the fluorescent lamp has to be imported in the future.

The saving of foreign capital achieved for production of one unit compared with the import is 298 Japanese yen (Assumption; with annual production of 1,600,000 units of 20 W plus 40 W lamps, sharing 50% quantity each).

| | Foreign Currency Required with Implementation of the Present Plan (yen per unit) | Foreign Currency Required in Case of Importing (yen/unit) |
|---|---|---|
| Cost of Product | - | 600 |
| CP/RM Cost | 259 | - |
| Freight & Insurance | 22 | 51 |
| Sub-total | 281 | 651 |
| M/E Costs | 72 | - |
| TOTAL | 353 | 651 |

Notes: The equipment costs indicated are only those additional costs incurred by the present plan. Details of items refer to the Attached Table 3-3.

2) Reduction in Production Costs Achieved

A comparison of production costs of one unit at present and after implementation of the present plan is as follows (assumed annual production; 2,000,000 units of 40 W lamp):

| | Production Costs After Implementation of the Presnet Plan | Present Production Costs in Case of FL 40W/4FT |
|---|---|---|
| Imported CP/RM Costs | | |
| FOB price | 259 | 108 |
| Freight & Insurance | 22 | 9 |
| Sub-total | 281 | 117 |
| Local CP/RM Costs | - | 301 |
| Depreciation | 41 | 14 |
| Utility Costs | - | 2 |
| Labor Costs | 1 | 3 |
| Overheads | 2 | 3 |
| Admin. Costs | 6 | 3 |
| Other Costs | 75 | 43 |
| Sub-total | 126 | 369 |
| Mark-up, profit | 12 | 2 |
| Excise Tax | 125 | 146 |
| TOTAL | 544 | 634 |

Therefore, with the production output of the present plan, a reduction in production costs will be achieved. In fact production costs per unit will decrease by 96 yen. The official sales price is 569 yen per unit and the market price for one unit is 1,420-2,129 yen.

3) Number of Years for Recovery of Foreign Capital Invested

If the index for investment results is calculated as follows:

(A)/ (B)*(C)

where,

(A) Amount of foreign capital investment (676.8 million yen)
(B) Foreign currency saved (298 yen/unit)
(C) Annual production output (1,600,000 units)

giving a result of 1.4 years for the present plan.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-1 F/L Production Increase
- No.1 HI: Lamp Manufacturing Plant -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Prod'n incr:F/L | | |
| 1 1 | Machine and Equipment for FL (28mm) | Set | 1 |
| 1 2 | Power supply equipment (gas,compressed air, etc.) | Set | 1 |
| 1 3 | Regulation | Set | 1 |
| 1 4 | Setting and remove of ML line | Set | 1 |
| 1 5 | Materials for piping and wiring | Lot | 1 |
| 2 | PR:DME & conversion of 38/28 | | |
| 2 1 | Marking unit | Set | 1 |
| 3 | Introduce:ME for auxil mainten | | |
| 3 1 1 | Frosting machine | Set | 1 |
| 3 1 2 | Stemming machine | Set | 2 |
| 3 1 3 | Cap filler machine | Set | 1 |
| 3 1 4 | Flare machine | Set | 2 |
| 3 2 1 | Water purification apparatus | Set | 1 |
| 3 2 2 | Air cooling unit | Set | 1 |
| 3 2 3 | Vacuum pump unit (spare) | Set | 1 |
| 3 3 1 | Lathe 4 feet | Set | 1 |
| 3 3 2 | Milling machine (#2 vertical) | Set | 1 |
| 3 3 3 | Others | Lot | 1 |
| 4 | Inspection equipment | | |
| 4 1 | Measuring unit for IL and FL characteristics | Set | 1 |
| 4 2 | Time controller for FL life test | Set | 1 |
| 5 | Introduce:ME for water treat't | | |
| 5 1 | Frosting liquid neutralizer for IL | Set | 1 |

Attached Table 3-2: REQUIRED INVESTMENT (#8-1)

(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) | 1008.5 | - | 1008.5 |
| 2 | Freight & Insurance | 84.7 | - | 84.7 |
| | Sub-total | 1093.2 | - | 1093.2 |
| 3 | Import Duty | - | 164.0 | 164.0 |
| 4 | Unloading | - | 15.3 | 15.3 |
| 5 | Installation Cost | - | 5.1 | 5.1 |
| | Imported M/E Total | 1093.2 | 184.4 | 1277.6 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 24.9 | - | 24.9 |
| B | Eng Fee | 59.4 | - | 59.4 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 84.3 | - | 84.3 |
| | Total Investment | 1177.5 | 184.4 | 1361.9 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#8-1)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 518.0 | - | 518.0 | 64 |
| | Freight & Insurance | 43.5 | - | 43.5 | 5 |
| | Import Duty | - | 84.2 | 84.2 | 10 |
| | Unloading | - | 7.9 | 7.9 | 1 |
| | Sub-total | 561.5 | 92.1 | 653.6 | 80 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 561.5 | 92.1 | 653.6 | 80 |
| 2 | Utilities | 0.0 | 0.9 | 0.9 | 0 |
| | Variable Cost | 561.5 | 93.0 | 654.5 | 81 |
| 3 | Depreciation | 65.6 | 17.0 | 82.6 | 10 |
| 4 | Amortization | 16.9 | - | 16.9 | 2 |
| 5 | Maintenance | 32.8 | 8.5 | 41.3 | 5 |
| 6 | Design Fee | 0.0 | - | 0.0 | 0 |
| 7 | Labor | - | 1.3 | 1.3 | 0 |
| 8 | Ovehead | - | 4.1 | 4.1 | 1 |
| 9 | Admin.Cost | - | 11.4 | 11.4 | 1 |
| | Fixed Cost | 115.3 | 42.3 | 157.6 | 19 |
| | Annual Cost | 676.8 | 135.3 | 812.1 | 100 |
| | Unit P.Cost | | | 406.1 | |
| 10 | Mark-up | | | 12.2 | |
| 11 | Excise Tax | | | 125.5 | |
| | Ex-fact.Cost | | | 543.8 | |

## #8-2 Increase in Incandescent Lamp Production
- No.1 HI: Lamp Manufacturing Plant -

### (1) Outline of Objectives and Planning

The present productive capacity of the two Incandescent lamp production lines is established by HIC at 2,400,000 items per annum. However, this slightly underestimates actual performance and it is estimated that a production reaching the maximum production output to date of 3,600,000 per annum is possible. However, deterioration of the existing line is very severe and an overhaul is required in order to reach this level of production output capacity. Moreover, in order to reduce to a minimum stoppages in operation it is necessary to provide for product quality control and inspection systems so as to improve the in shop small repairs program and product yield.

The future production schedule is as follows:

| | |
|---|---|
| 1988 | 3,000,000 pcs |
| 1989 | 3,000,000 pcs |
| 1990 | 3,300,000 pcs |
| 1993 | 3,300,000 pcs |
| 1996 | 5,000,000 pcs |
| 1998 | 6,000,000 pcs |

Therefore, it is possible to realize the production schedule by an overhaul of the existing line for the time being but the strengthening and increase of production capacity will be necessary from the latter half of the nineties.

The present plan is aimed at providing the production increase program required to meet the above production schedule.

#### 1) Overhaul of Existing Equipment

As the existing line is badly deteriorated an overhaul is necessary. Given the state of deterioration overhauling should be rapidly implemented.

2) Reinforcement of Departments Responsible for Maintenance

This is included in the fluorescent lamp production increase plan (#8-1) and is necessary to the lamp manufacturing plant.

3) Provision of Product Quality Control and Quality Inspection Systems

This is included in the fluorescent lamp production increase plan (#8-1) and is necessary to the lamp manufacturing plant.

4) Installation of Waste Liquid Treatment Facilities

This is included in the fluorescent lamp production increase plan (#8-1) and is necessary to the lamp manufacturing plant.

5) Increase in the Incandescent Lamp Equipment

The present Incandescent lamp line production capacity is below that of the specifications of the equipment installed on the line because of deterioration of machinery and equipment, insufficiency of parts supplies, the high reject rate of domestically produced bulbs and stoppages in production operations for small repairs, etc. The increase of equipment facilities to respond to the production increase plan outlined above will be necessary in the latter half of the nineties, and the first step in the present plan is the removal of factors hindering the amelioration of capacity on the present line. The required capacity of future expansion of equipment will vary according to results achieved in this, but the present plan proposes the expansion of one new line having a capacity equal to the present line.

(2) Details of the Plan

1) Overhaul of Existing Equipment

Even if the deteriorated lamp making machine is not entirely replaced an increase in its performance can be achieved by replacing some of the machine parts. The present plan therefore proposes an overhaul mainly consisting of replacement of spare parts and the permanent provision of spare parts.

The present line is quite badly deteriorated generally, but the deterioration of the frosting, flare, stemming machines and cap filler

machine is particularly bad and these require an urgent overhaul. For other machines a program is needed for the permanent availability of spare parts so that replacements can be performed as required.

The frosting machine, stemming machine and cap filler machine should be purchased as extra production capacity and these be rotated on the existing A, B lines while overhauling proceeds. This will allow for the completion of overhauling of the 2 lines without any stoppages resulting. As already mentioned in #8-1 as one of the flare machines for the fluorescent lamp will become spare this can be diverted.

Given the level of deterioration it is necessary to undertake the overhauling promptly. Overhauling should be followed by the increase of equipment and overhauling of the fluorescent lamp line outlined in #8-1. This will permit the effective realization of technical service and setting operations.

2) Expansion of Line Equipment

The products, production speed, and working equipment employed are all the same as the existing line. Location for the equipment is between the present Mercury Lamp and LA lines with moving the LA line slightly. However, as this will result in considerable cramping of the layout, it would be advisable to enlarge the building on the south side by an area of 65 m x 12 m if possible (this present proposal for building expansion is not included in the present plan).

3) Other points

The following are necessary to amelioration of the productive capacity of the present line;

1. Introduction of equipment for provision of a maintenance system.

2. Replacement of devices for product quality control and inspection.

3. Provision of waste liquid treatment equipment.

The realization of the above three points is a necessary pre-condition to the #8-1 Fluorescent lamp production increase plan.

4) Operating Personnel

New Operating personnel are needed in the same number as is employed on the current line.

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Requirement

This is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving on foreign Currency

Without the present plan, the incandescent lamp has to be imported in the future.

The saving of foreign capital achieved for production per bulb is 73 Japanese yen compared with the import (assumed annual production; 3,000,000 bulbs).

| | Foreign Currency Required with Implementation of the Present Plan (yen per unit) | Foreign Currency Required in Case of Importing (yen/unit) |
|---|---|---|
| Cost of Product | - | 160 |
| CP/RM Cost | 77 | - |
| Freight & Insurance | 6 | 13 |
| Sub-total | 83 | 173 |
| M/E Costs | 17 | - |
| TOTAL | 100 | 173 |

Notes: The M/E costs indicated are only those additional costs incurred by the present plan. Details of items refer to separate table No. 3-3.

2) Reduction in Production Costs Achieved

A comparison of production costs of one item at present and after implementation of the present plan is as follows:
(Assumed annual production: 6,000,000 units)

| | Production Costs After Implementation of the Plan | Present Production Costs |
|---|---|---|
| Imported CP/RM costs | | |
| FOB price | 77 | 35 |
| Freight & insurance | 6 | 3 |
| Sub-total | 83 | 38 |
| Local CP/RM costs | - | 50 |
| Depreciation | 7 | 1 |
| Utility costs | - | 1 |
| Labor costs | 1 | 3 |
| Overheads | 1 | 1 |
| Admin. costs | 2 | 3 |
| Other costs | 17 | 15 |
| Sub-total | 28 | 74 |
| Mark-up, profit | 3 | 1 |
| Excise tax | 34 | 33 |
| TOTAL | 149 | 146 |

Therefore, with a slight increase in production output of the present plan one can anticipate that a reduction in production costs will be achieved. The market price for one bulb is 264 yen and it is possible to supply at this price level.

3) Number of Years for Recovery of Foreign Capital Invested

If the index for investment results is calculated as follows:

(A)/ (B)*(C)

where,

(A) Required amount of foreign capital investment (557,700,000 yen)
(B) Foreign currency saved (73 yen/unit)
(C) Annual production output (3,000,000 units)

giving a result of 2.5 years for the present plan.

4) Other Results to be Anticipated

Improvement of public welfare.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-2 I/L Production Incr
~ No.1 HI: Lamp Manufacturing Plant ~

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Prod'n incr:I/L | | |
| 1 1 | Machine and equipment for IL | Set | 1 |
| 1 2 | Frosting M/C, drying conveyor | Set | 1 |
| 1 3 | Materials for piping drawing | Lot | 1 |
| 1 4 | Inspection and packing | Lot | 1 |

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

(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) | 507.8 | - | 507.8 |
| 2 | Freight & Insurance | 42.7 | - | 42.7 |
| | Sub-total | 550.5 | - | 550.5 |
| 3 | Import Duty | - | 82.6 | 82.6 |
| 4 | Unloading | - | 7.7 | 7.7 |
| 5 | Installation Cost | - | 15.0 | 15.0 |
| | Imported M/E Total | 550.5 | 105.3 | 655.8 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 0.0 | - | 0.0 |
| B | Eng Fee | 7.2 | - | 7.2 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 7.2 | - | 7.2 |
| | Total Investment | 557.7 | 105.3 | 663.0 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#8-2)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 459.3 | - | 459.3 | 69 |
| | Freight & Insurance | 38.6 | - | 38.6 | 6 |
| | Import Duty | - | 74.7 | 74.7 | 11 |
| | Unloading | - | 7.0 | 7.0 | 1 |
| | Sub-total | 497.9 | 81.7 | 579.6 | 87 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 497.9 | 81.7 | 579.6 | 87 |
| 2 | Utilities | 0.0 | 1.6 | 1.6 | 0 |
| | Variable Cost | 497.9 | 83.3 | 581.2 | 87 |
| 3 | Depreciation | 33.0 | 10.2 | 43.2 | 6 |
| 4 | Amortization | 1.4 | - | 1.4 | 0 |
| 5 | Maintenance | 16.5 | 5.1 | 21.6 | 3 |
| 6 | Design Fee | 0.0 | - | 0.0 | 0 |
| 7 | Labor | - | 8.8 | 8.8 | 1 |
| 8 | Ovehead | - | 3.3 | 3.3 | 0 |
| 9 | Admin.Cost | - | 9.4 | 9.4 | 1 |
| | Fixed Cost | 50.9 | 36.8 | 87.7 | 13 |
| | Annual Cost | 548.8 | 120.1 | 668.9 | 100 |
| | Unit P.Cost | | | 111.5 | |
| 10 | Mark-up | | | 3.4 | |
| 11 | Excise Tax | | | 34.5 | |
| | Ex-fact.Cost | | | 149.4 | |

#8-3 Increase in Dry Cell Battery Production
- No.1 HI: Dry Battery Plant -

(1) Outline of the Objectives and Plan

HIC plans to increase production by 1990 to 42,000,000 dry cell batteries per annum in order to meet domestic demand. Production of dry cell batteries at HIC takes place at the No.1 HI and No.2 HI. Current production output for 1986 - 1987 was 14,000,000 per annum.

In order to realize the above schedule plan it is necessary to strengthen and improve the production equipment of No.1 HI and No.2 HI. The present plan is for the establishment of production increase system in No.1 HI.

The main points are to increase processing yield and efficiency by the introduction of an automatic bobbin inserting device to replace the deteriorated equipment of the old UM-1H Line.

However, in order to run the ABI system effectively together with the strengthening of necessary parts production it will be necessary to incorporate improvements of the production processes for the zinc can and zinc pellet. This will result in the almost complete automation of the entire assembly line. As a result of this an increase in the standards of technology, quality control and management of each process from parts production down to completion can be anticipated.

(2) Details of the Plan

1) Phases of the Plan

In order to increase the supply output of dry cell batteries it is essential to provide for the present production line equipment (#8-3-1) and introduce ABI (Automatic Bobbin Insertion Equipment) to the former UM-1H line of Rangoon.

Introduction of the ABI equipment is to take place in the following phases;

Phase 1; the amelioration and modification of the zinc plate processing to allow for production of superior quality zinc containers (#8-3-2).

Phase 2; in order to adapt the shape and processing methods of the zinc container prior to the introduction of the automatic bobbin insertion equipment the amelioration and modification of the zinc container process line must take place (#8-3-3).

Phase 3; introduction of automatic bobbing insertion equipment and amelioration and modification of existing equipment in order to ensure the stabilization of product quality and the automation of the entire line (#8-3-4 and #8-3-5).

2) General Assembly Processes

a) Both the old and new lines of UM-1H, having a long operating period and high production output, have a large number of working equipment with advanced deterioration evident.

As the production output of the UM-2 and UM-3 assembly lines are low it is possible to respond to line demands with existing machinery.

Together with the introduction of automatic bobbin insertion equipment and supplement of related working machinery is planned in relation to the deteriorated UM-1H line. this line has both high production output and a high demand.

| SITE | ASSEMBLY LINE | ACCUMULATED PRODUCTION (pcs) | OPERATING PERIOD (years) |
|---|---|---|---|
| RANGOON | UM-1H OLD LINE | approx. 117,572,000 | approx. 20 |
| | UM-1H NEW LINE | approx. 88,179,000 | approx. 15 |
| | UM-2H LINE | 4,156,808 | approx. 19 |
| | UM-3T LINE | 3,383,858 | approx. 15 |
| | UM-3P LINE | 1,578,997 | approx. 5 |
| MALUN | UM-1H LINE | 67,284,479 | approx. 10 |

Notes: The production output figures given for UM-1H old line and new line are based on the proportional division of accumulated production by the number of operating years.

b) Parts Production Processes

One of the 15 ton press units and one of the 10 ton press units are currently undergoing repair.

It is necessary to arrange for a more roomy general layout and do away with indiscriminate intermingling of superior goods and scrap, and so do away with separating operations.

c) Py-sealing Production Processes

With the exception of the Injection machine all equipment is operating well. According to the report current daily production output is 100,000 items. Calculating on this level and for a 20 day work month the annual production output can be estimated at 24,000,000. This annual output does not reach the initial annual production capacity of 32,000,000 realized in the early period of production.

On a superficial investigation the injection machine appears to be working satisfactorily. However, there are already machines with increasingly loose general working parts, and this has a detrimental effect on the metal molds. There are already metal molds with pin holes which are now beyond repair.

d) Inner Jacket Production Processes

Considerable deterioration of machinery and equipment is evident. Except for the Rim curling machine other equipment is generally operating at normal levels and do not present any problems.

The rim curling machine frequently makes operational errors at each of the various individual operational stages. It is necessary to ensure provision of machine parts and keep the machine in a constant good condition.

e) Outer jacket Production Processes

Since accuracy of dimensions is important in each process stage it is necessary to ensure an experienced workforce. Present conditions are judged to be satisfactory.

The body making machine is complicated, and it is necessary to make minute adjustments in the timing of operations for the cam, roller, and other individual parts.

It is necessary to make certain that supply parts obtained are always in pre adjusted sets.

The containers used for storage and conveyance of the jacket interior parts are at present of a 1.5 cubic m form, and so it is necessary to change these for others of a smaller volume capacity (1,000 pcs to 1,200 pcs holding capacity).

f) Zinc Pellet Production Processes

As these processes involve operations with a large quantity of heavy materials in operating conditions of high temperature it is necessary to improve measures in the direction of automation of operations.

The ash which accumulates inside of the crucible furnace has a very detrimental effect on the efficacy of smelting operations (90 minutes are required for one 45 minute standard batch). It is necessary to supplement the crucible furnace so that ash removing operations can take place. If continuous casting process is adopted, the problem will be resolved.

Return of the molding apparatus after the ejection of the completed product is frequently not perfect, and because of this there are a large number of bowed or arched rolled materials produced which are a hindrance in the later punching process.

As the rolling machine is a gear tooth drive device abrasion of the toothed wheel has a detrimental effect on the product quality. Since there is already considerable wear on the toothed wheel repair is required. Because of wear on the metal molds for punching burrs on the pellets develop and this lowers the efficiency of the later mixing process. Together with repair of the metal molds it is desirable to improve the method of sealing.

g) Zinc Can Production Process

The two horizontal presses are both inoperative. For a number of years it was usual for one to be undergoing repairs while the remaining press operated in turns, and it would seem that the time has come to consider either a full scale overhaul of the presses or their scrapping and replacement. Since their replacement by vertical press models is considered appropriate for the present plan this is proposed.

Can trimming is performed using equipment constructed for trimming of external burrs. It is necessary for cans with inside burrs to undergo one extra process. When the Automatic bobbing insertion machine is introduced hereafter it will be necessary to use a inside burr trimming machine and it is considered advisable to consider replacement of the present trimming machine in order to render more efficient the product quality of the cans and of trimming operations.

h) The Mixing and Electroyte Processing

Two of the four available compressors for Tamping room use require repairs.

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Requirement

This is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving on Foreign Currency

Without the present plan, the product will be necessary to be imported. The saving of foreign capital achieved for production of one unit is 2 yen compared with that for import (annual production is assumed 19,000,000 units).

| | Foreign Currency Required with Implementation of the Present pLan (yen per unit) | Foreign Currency Required in Case of Importing (yen/unit) |
|---|---|---|
| Cost of Product | - | 30.4 |
| CP/RM Cost | 25 | - |
| Freight & Insurance | 2 | 2.6 |
| Sub-total | 27 | 33 |
| M/E Costs | 4 | - |
| TOTAL | 31 | 33 |

Notes: The equipment costs indicated are only those additional costs incurred by the present plan. Details of items refer to separate table No. 3-3.

2) Reduction in Production Costs Achieved

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

| | Production Costs After Implementation of the Presnet Plan | Present Production Costs |
|---|---|---|
| Imported CP/RM Costs | | |
| FOB price | 25 | 25 |
| Freight & Insurance | 2 | 2 |
| Sub-total | 27 | 27 |
| Local CP/RM Costs | 2 | 2 |
| Depreciation | 2 | - |
| Utility Costs | - | - |
| Labor Costs | 1 | 1 |
| Overheads | - | - |
| Admin. Costs | 1 | 1 |
| Other Costs | 6 | 10 |
| Sub-total | 12 | 14 |
| Mark-up, profit | 1 | 1 |
| Excise Tax | 20 | 23 |
| TOTAL | 60 | 65 |

Moreover, the present official sales price is 64 yen per item. The general market price for one item is 91 yen and it is possible to successfully confront this.

3) Number of Years for Recovery of Foreign Capital Invested

If the index for investment results is calculated as follows:

(A)/ (B)*(C)

where,

(A) Required amount of foreign capital investment (809,600,000 yen)
(B) Foreign currency saved (2 yen/unit)
(C) Annual production output (1,900,000)

giving a result of 21 years for the present plan and the investment result will be large.

4) Other Effects which can be Anticipated

Satisfaction of the domestic demands for dry cell batteries can be anticipated.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-3 (1) Dry Cell Production Increase
- No.1 HI: Dry Battery Plant -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Repr:deteriorated ME | | |
| 1 1 | Bobbin tamping machine | SET | 2 |
| 1 2 | Bobbin conveyor | SET | 2 |
| 1 3 | Paste pouring machine | SET | 1 |
| 1 4 | Wax Pouring machine | SET | 2 |
| 1 5 | Can rim curing machine | SET | 2 |
| 1 6 | Py sealing inserting machine | SET | 1 |
| 1 7 | Ped ring inserting machine | SET | 1 |
| 1 8 | Auto bobbin polishing | SET | 1 |
| 1 9 | Auto outer jacket feeding conveyor | SET | 1 |
| 110 | Auto outer jacket serthing machine | SET | 1 |
| 111 | Outer jacket bottom curing machine | SET | 1 |
| 112 | Power press 10t | SET | 1 |
| 113 | Power press 15t | SET | 1 |
| 114 | Injection molding machine | SET | 4 |
| 115 | Molding die for py sealing | SET | 2 |
| 116 | Injection molding machine | SET | 1 |
| 117 | Paper pipe rim curing machine | SET | 4 |
| 118 | Metal jacket body making machine | SET | 2 |
| 119 | Air compressor (pu-5) | SET | 1 |
| 120 | Air compressor (ed-5) | SET | 1 |
| 121 | Air compressor (15hp) | SET | 1 |
| 122 | Boiler | SET | 1 |
| 123 | Air compressor (10hp) | SET | 1 |
| 2 | Imprv:zince pellet proces'g line | SET | |
| 2 1 | Melting furnace w/ingot feed conv | SET | 1 |
| 2 2 | Melter zinc vat | SET | 1 |
| 2 3 | Casting machine | SET | 1 |
| 2 4 | Rolling mill w/fling shear | SET | 1 |
| 2 5 | Pellet punching press w/roll feeder | SET | 1 |
| 2 6 | Pellet punching die (um-1) | SET | 2 |
| 2 7 | Pellet punching die (um-2) | SET | 1 |
| 2 8 | Pellet punching die (um-3) | SET | 1 |
| 2 9 | Pellet inspection conveyor | SET | 1 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-3 (2) Dry Cell Production Increase
- No.1 HI: Dry Battery Plant -

| No | Items | Unit | No. |
|---|---|---|---|
| 3 | Imprv:zinc can proces'g line | | |
| 3 1 | Vertical press (250t) | SET | 1 |
| 3 2 | 2 ways pellet feeder | SET | 1 |
| 3 3 | Can trimming machine (um-1) | SET | 1 |
| 3 4 | Can flaring machine (um-1) | SET | 1 |
| 3 5 | Zinc can conveyor | SET | 1 |
| 4 | Introduce:auto bobbin ins sys | | |
| 4 1 | Bobbin tamping machine | SET | 3 |
| 4 2 | Chucking device | SET | 3 |
| 4 3 | Chucking bobbin feeding conveyor | SET | 1 |
| 4 4 | 3 stories rotary table | SET | 1 |
| 4 5 | Chuck jig lifting conveyor | SET | 1 |
| 4 6 | Zinc can feeding rotary table | SET | 1 |
| 4 7 | Zinc can/cell feeding conveyor | SET | 1 |
| 4 8 | Paste pouring machine | SET | 1 |
| 4 9 | Paste tank w/agitator | SET | 1 |
| 410 | Bottom insulator inserting machine | SET | 1 |
| 411 | Bottom insulator feeder | SET | 1 |
| 412 | Automatic bobbin insertion machine | SET | 1 |
| 413 | Connecting conveyor (after abi) | SET | 1 |
| 414 | Connecting conveyor (cooking inlet) | SET | 1 |
| 415 | Cooking conveyor | SET | 1 |
| 416 | Center guide return conveyor | SET | 1 |
| 417 | Wax pouring machine | SET | 1 |
| 418 | Wax tank | SET | 1 |
| 419 | Cell transfering conveyor | SET | 1 |
| 420 | Chucking jig (4000pcs) | SET | 1 |
| 421 | Center guide (100 set) | SET | 1 |
| 422 | Control box for bobbin tamping | SET | 1 |
| 423 | Bobbin for abi | SET | 1 |
| 424 | Bobbin for paste pouring | SET | 1 |
| 425 | Bobbin for b.insulator | SET | 1 |
| 426 | Control box for cooking | SET | 1 |
| 427 | Water level/temp control | SET | 1 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-3 (3) Dry Cell Production Increase
- No.1 HI: Dry Battery Plant -

| No | Items | Unit | No. |
|---|---|---|---|
| 5 | Imprv:ass'y processes | | |
| 5 1 | Rotary table (a) 1200dia | Set | 1 |
| 5 2 | Carbon rod heating M/C | Set | 1 |
| 5 3 | Parafin applicator w/tank | Set | 1 |
| 5 4 | Can rim curling machine | Set | 1 |
| 5 5 | Py-seal feeder w/hopper | Set | 1 |
| 5 6 | Rotary table (b) 1200dia | Set | 1 |
| 5 7 | Capping/red ring insertion machine | Set | 1 |
| 5 8 | Cap feeder | Set | 1 |
| 5 9 | Red ring feeder | Set | 1 |
| 510 | Rotary table (c) 1200dia | Set | 1 |
| 511 | Inspection conveyor | Set | 1 |
| 512 | Boxing machine | Set | 1 |
| 513 | Control box for can curing/py seal | Set | 1 |
| 514 | Control box for capping/red ring | Set | 1 |
| 515 | Control box for boxing | Set | 1 |

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

(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) | 746.9 | - | 746.9 |
| 2 | Freight & Insurance | 62.7 | - | 62.7 |
| | Sub-total | 809.6 | - | 809.6 |
| 3 | Import Duty | - | 121.4 | 121.4 |
| 4 | Unloading | - | 11.3 | 11.3 |
| 5 | Installation Cost | - | 25.7 | 25.7 |
| | Imported M/E Total | 809.6 | 158.4 | 968.0 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 0.0 | - | 0.0 |
| B | Eng Fee | 0.0 | - | 0.0 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 0.0 | - | 0.0 |
| | Total Investment | 809.6 | 158.4 | 968.0 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#8-3)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 800.0 | - | 800.0 | 66 |
| | Freight & Insurance | 67.2 | - | 67.2 | 6 |
| | Import Duty | - | 130.1 | 130.1 | 11 |
| | Unloading | - | 12.1 | 12.1 | 1 |
| | Sub-total | 867.2 | 142.2 | 1009.4 | 84 |
| B | Local CP/RM | - | 64.0 | 64.0 | 5 |
| | CP/RM Total | 867.2 | 206.2 | 1073.4 | 89 |
| 2 | Utilities | 0.0 | 5.0 | 5.0 | 0 |
| | Variable Cost | 867.2 | 211.2 | 1078.4 | 90 |
| 3 | Depreciation | 48.6 | 9.5 | 58.1 | 5 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 24.3 | 4.8 | 29.1 | 2 |
| 6 | Design Fee | 0.0 | - | 0.0 | 0 |
| 7 | Labor | - | 14.9 | 14.9 | 1 |
| 8 | Ovehead | - | 6.0 | 6.0 | 0 |
| 9 | Admin.Cost | - | 16.8 | 16.8 | 1 |
| | Fixed Cost | 72.9 | 52.0 | 124.9 | 10 |
| | Annual Cost | 940.1 | 263.2 | 1203.3 | 100 |
| | Unit P.Cost | | | 37.6 | |
| 10 | Mark-up | | | 1.1 | |
| 11 | Excise Tax | | | 39.2 | |
| | Ex-fact.Cost | | | 77.9 | |

## #8-4 Increase in Electric Accessories Production
- No.1 HI: Bakelite Molding Shop -

### (1) Outline of Objectives and Planning

There are 32 different kinds of electric accessory including holder, plug, socket, switch, and circuit breaker items. Hereafter, it is planned to organize those items which have a low demand and to specify 14 types of item which are to be given production priority and to give precedence to increasing production of these. For the realization of this plan the following points are essential;

#### 1) Working Equipment

In 1964 20 Compression Molding Machines (37 ton models) were installed, in 1971 four more 37 ton machines and in 1974 two 50 ton machines were installed, but all of these are in a state of deterioration, and repair or replacement is required.

#### 2) Molds

As metal molds are at present defective a number of molded items produced are without commodity value. It is necessary to immediately undertake replacement of the metal molds.

#### 3) Others

Since the surface thermometer is out of order it is necessary to replace this.

### (2) Details of the Plan

#### 1) Working Equipment

a) Of the 24 compression molding machines of 37 ton type there are 10 which have a high breakdown rate, using these for spare parts together with spare parts received from Japan the remaining 14 machines should be repaired in Burma.

b) Six new compression molding machines of 37 ton size and four new injection molding machines of 75 ton size should be installed.

c) Operators should only carry out the removal of the working section of the injection molding machine.

With the compression molding machine when operators remove the worked part from the metal mold the workload should be reduced to the absolute minimum, and a further increase of operating efficiency should be undertaken. A similar reorganization should be carried out for the 14 compression mold machines to be repaired in Burma mentioned in the above section.

| Machine | | Existing Machine | With the Plan | Remarks |
|---|---|---|---|---|
| Compression M/M | 37 ton | 10 | - | Replace |
| | | 14 | 14 | Repair |
| | | - | 6 | New machine |
| | Sub-total | 24 | 20 | |
| | 50 ton | 2 | 2 | |
| Injection M/M | 75 ton | - | 4 | New machine |
| | 100 ton | 1 | 1 | |

As a result of this the net capacity of the molding machinery is as follows:

Injection Molding machinery (75 tons) 7,200 hrs/yr. (4 machines)
Compression Molding Machinery (35 tons) 36,000 hrs/yr. (20 machines)
Note; No. of machines x 7.5 hours per day x 20 days x 12 months

2) Auxiliary Equipment

a) Deflasher : 1 machine
Buffing Machine : 1 machine

The above two machines are to be replaced.

b) In order to improve the productivity of the metal parts processing and reduce the reject rate an automatic lathe and auxiliary machinery as indicated below is to be newly installed;

| | | |
|---|---|---|
| Automatic lathe | : | 6 machines |
| Automatic nut tapping machine | : | 1 machine |
| Tapping machine | : | 1 machine |
| Drilling machine | : | 1 machine |
| Cutting machine | : | 1 machine |

3) Molds (as indicated on the Attached Table 2-1)

a) New equipment to be installed as follows (refer to the Attached Table 3-1):

| | | |
|---|---|---|
| Injection mold | : | 6 sets |
| Compression mold | : | 20 sets |

b) Calculation of the number of metal molds needed is based on the estimation that one face is needed for 1,000 hours of parts processing annually.

c) The total annual processing time for the 13 types of parts item are as follows:

| Items | Net Processing Time for Metal Mold | Net Available Adjustment Processing Time Molding | Excess Capacity |
|---|---|---|---|
| Injection Mold | 3,180 | 7,200 | 44.2% |
| Compression Mold | 15,838 | 36,000 | 44.0% |

d) Given the above range of excess capacity it is considered that sufficient production capacity is available even when machine break-

down and changing of the metal molds is taken into account. Moreover, there are still two 50 ton size compression molding machines kept as reserve.

4) Spare Parts

Provision of the spare parts needed for repair of the molding machine.

5) Operating Personnel

No change of personnel is envisaged in this present plan.

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Requirement

This is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving on Foreign Currency

Without the present plan import of the product will become necessary in the future.

The saving of foreign capital achieved for production of one unit is 27 Japanese yen compared with the import (annual production assumption; 7,500,000 units).

| | Foreign Currency Required with Implementation of the Present Plan (yen per unit) | Foreign Currency Required in Case of Importing (yen/unit) |
|---|---|---|
| Cost of Product | - | 131 |
| CP/RM Cost | 55 | - |
| Freight & Insurance | 4 | 10 |
| Sub-total | 59 | 141 |
| M/E Costs | 55 | - |
| TOTAL | 114 | 141 |

Notes: The equipment costs indicated are only those additional costs incurred by the present plan. Details of items refer to separate table No. 3-3. Further, the average prices were used as the product prices for the following models; W3011, W1803, 9000, 9022, 9041, 9059, 9059/B, 532, 533 and 9042.

2) Reduction in Production Costs Achieved

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

| | Production Costs After Implementation of the Presnet Plan | Present Production Costs |
|---|---|---|
| Imported CP/RM Costs | | |
| FOB price | 55 | 55 |
| Freight & Insurance | 4 | 4 |
| Sub-total | 59 | 59 |
| Local CP/RM Costs | - | - |
| Depreciation | 21 | 7 |
| Utility Costs | - | - |
| Labor Costs | 1 | 2 |
| Overheads | 13 | 8 |
| Admin. Costs | 2 | 1 |
| Other Costs | 24 | 19 |
| Sub-total | 61 | 38 |
| Mark-up, profit | 4 | 3 |
| Excise Tax | 37 | 30 |
| TOTAL | 161 | 130 |

Therefore, with the production output of the present plan one cannot anticipate that a reduction in production costs will be achieved.

3) Number of Years for Recovery of Foreign Capital Invested

If the index for investment results is calculated as follows:

(A)/ (B)*(C)

where,

(A) Required amount of foreign capital investment (408,800,000 yen)
(B) Foreign currency saved (27 yen/unit)
(C) Annual production output (7,500,000)

giving a result of 20.2 years for the present plan.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-4 (1) Production Increase: Electric Accessories
- No.1 HI: Bakelite Molding Shop -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Prod'n incr:elec accessories | | |
| 1 1 | Mold:holder 9000 body | Set | 2 |
| 1 2 | Mold:holder 9000 washer | Set | 1 |
| 1 3 | Mold:holder 9000 cap | Set | 1 |
| 1 4 | Mold:plug 9059 body | Set | 1 |
| 1 5 | Mold:plug 9059/b body | Set | 1 |
| 1 6 | Mold:plug 9059/b lid | Set | 1 |
| 1 7 | Mold:socket 532 cover | Set | 1 |
| 1 8 | Mold:socket 533 body | Set | 1 |
| 1 9 | Mold:socket 533 cover | Set | 1 |
| 110 | Mold:socket 9042 body | Set | 1 |
| 111 | Mold:socket 9042 cover | Set | 1 |
| 112 | Surface temperature measuring unit | Set | 3 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-4 (2) Production Increase: Electric Accessories
- No.1 HI: Bakelite Molding Shop -

| No | Items | Unit | No. |
|---|---|---|---|
| 2 | Prd'n incr:elec accessories | | |
| 2 1 | Injection molding M/C | Set | 4 |
| 2 2 | Compression molding M/C | Set | 6 |
| 2 3 | Buffing M/C | Set | 1 |
| 2 4 | Automatic lathe for production of metal parts | Set | 6 |
| 2 5 | Cam for automatic lathe (spare parts for automatic lathe) | Set | 1 |
| 2 6 | Drilling M/C w/jig | Set | 2 |
| 2 7 | Automatic nut tapping M/C w/jig | Set | 1 |
| 2 8 | Tapping M/C s/jig | Set | 1 |
| 2 9 | Cutting M/C w/jig | Set | 1 |
| 210 | Automatic supply equip | Set | 1 |
| 211 | Deflasher | Set | 1 |
| 212 | Testing equipments of high voltage | Set | 1 |
| 213 | Mold:switch w3011 body (im) | Set | 2 |
| 214 | Mold:switch w3011 cap (cm) | Set | 2 |
| 215 | Mold:switch w3011 handle (cm) | Set | 1 |
| 216 | Mold:joint box w1803 body (cm) | Set | 1 |
| 217 | Mold:joint box w1803 cap (cm) | Set | 1 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-4 (3) Production Increase: Electric Accessories
- No.1 HI: Bakelite Molding Shop -

| No | Items | Unit | No. |
|---|---|---|---|
| 220 | Mold:holder 9000 body (im) | Set | 1 |
| 221 | Mold:holder 9000 washer (cm) | Set | 1 |
| 222 | Mold:holder 9000 cap (cm) | Set | 1 |
| 223 | Mold:holder 9022 body (im) | Set | 1 |
| 224 | Mold:holder 9022 washer (cm) | Set | 1 |
| 225 | Mold:holder 9022 base (cm) | Set | 2 |
| 226 | Mold:plug 9041 body (cm) | Set | 1 |
| 227 | Mold:plug 9041 cap (cm) | Set | 1 |
| 228 | Mold:plug 9059 body (cm) | Set | 1 |
| 229 | Mold:plug 9059 lid (cm) | Set | 1 |
| 230 | Mold:plug 9059/b body (cm) | Set | 1 |
| 231 | Mold:plug 9059/b lid (cm) | Set | 1 |
| 232 | Mold:socket 532 body (cm) | Set | 1 |
| 233 | Mold:socket 532 cover (cm) | Set | 1 |
| 234 | Mold:socket 533 body (cm) | Set | 1 |
| 235 | Mold:socket 533 cover (cm) | Set | 1 |
| 236 | Mold:socket 9042 body (im) | Set | 1 |
| 237 | Mold:socket 9042 cover (im) | Set | 1 |

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

(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) | 354.2 | - | 354.2 |
| 2 | Freight & Insurance | 27.6 | - | 27.6 |
| | Sub-total | 381.8 | - | 381.8 |
| 3 | Import Duty | - | 57.3 | 57.3 |
| 4 | Unloading | - | 5.0 | 5.0 |
| 5 | Installation Cost | - | 11.6 | 11.6 |
| | Imported M/E Total | 381.8 | 73.9 | 455.7 |
| 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 | 408.8 | 73.9 | 482.7 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#8-4)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 87.5 | - | 87.5 | 46 |
| | Freight & Insurance | 6.8 | - | 6.8 | 4 |
| | Import Duty | - | 14.1 | 14.1 | 7 |
| | Unloading | - | 1.2 | 1.2 | 1 |
| | Sub-total | 94.3 | 15.3 | 109.6 | 57 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 94.3 | 15.3 | 109.6 | 57 |
| 2 | Utilities | 0.0 | 0.3 | 0.3 | 0 |
| | Variable Cost | 94.3 | 15.6 | 109.9 | 57 |
| 3 | Depreciation | 22.9 | 10.2 | 33.1 | 17 |
| 4 | Amortization | 5.4 | - | 5.4 | 3 |
| 5 | Maintenance | 11.5 | 5.1 | 16.6 | 9 |
| 6 | Design Fee | 1.7 | - | 1.7 | 1 |
| 7 | Labor | - | 1.8 | 1.8 | 1 |
| 8 | Ovehead | - | 20.7 | 20.7 | 11 |
| 9 | Admin.Cost | - | 2.7 | 2.7 | 1 |
| | Fixed Cost | 41.5 | 40.5 | 82.0 | 43 |
| | Annual Cost | 135.8 | 56.1 | 191.9 | 100 |
| | Unit P.Cost | | | 119.9 | |
| 10 | Mark-up | | | 3.6 | |
| 11 | Excise Tax | | | 37.1 | |
| | Ex-fact.Cost | | | 160.6 | |

Attached Table 2-1 REQUIRED MOLD AND OPERATION TIME OF MACHINE

| Products | Parts | Present Molding Time(min./piece) | Renovation Plan | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | Molding Time(min./piece) | Number of Mold Change | Production (volume/year) | Molding Time(hours/year) | Required Number of Mols | Type of M/M |
| W 3011 | Body | 2.5 | 1.0 | 4 | 380,000 | 1584 | 2 | Injection |
| | Cap | 2.5 | 1.0 | 4 | | 1584 | 3 | Compression |
| | Handle | 2.5 | 1.0 | 12 | | 792 | 1 | Compression |
| W 1803 | Body | 3.0 | 1.0 | 4 | 150,000 | 625 | 1 | Compression |
| | Cap | 5.0 | 1.0 | 4 | | 625 | 1 | Compression |
| WS 9000 | Body | 3.5 | 1.0 | 8 | 305,000 | 636 | 1 | Injection |
| | Washer | 2.5 | 1.0 | 6 | | 848 | 1 | Compression |
| | Cap | 3.0 | 1.0 | 6 | | 848 | 1 | Compression |
| WS 9022 | Body | 3.5 | 1.0 | 8 | 230,000 | 480 | 1 | Injection |
| | Washer | 2.5 | 1.0 | 6 | | 639 | 1 | Compression |
| | Base | 2.5 | 1.0 | 2 | | 1917 | 2 | Compression |
| WS 9041 | Body | 3.0 | 1.7 | 6 | 110,000 | 520 | 1 | Compression |
| | Cap | 2.5 | 1.4 | 6 | | 428 | 1 | Compression |
| WS 9042 | Body | 3.0 | 1.0 | 8 | 115,000 | 240 | 1 | Injection |
| | Cover | 3.0 | 1.0 | 8 | | 240 | 1 | Injection |
| WS 9059 | Body | 3.0 | 1.4 | 4 | 86,000 | 502 | 1 | Compression |
| | Lid | 3.0 | 1.7 | 4 | | 610 | 1 | Compression |
| WS 532 | Body | 3.0 | 2.0 | 4 | 90,000 | 750 | 1 | Compression |
| | Cover | 3.0 | 2.0 | 4 | | 750 | 1 | Compression |
| WS 533 | Body | 5.0 | 2.5 | 4 | 60,000 | 625 | 1 | Compression |
| | Cover | 3.0 | 2.0 | 2 | | 1000 | 1 | Compression |
| WS 5059/B | Body | 3.0 | 1.7 | 4 | 50,000 | 355 | 1 | Compression |
| | Lid | 3.0 | 2.0 | 2 | | 834 | 1 | Compression |
| BS 2021/3 | Body | 5.0 | | 1 | 15,500 | 259 | 0 | |
| | Cover | 5.0 | | 1 | | 259 | 0 | |
| | Handle | 5.0 | | 4 | | 323 | 0 | |
| | Movable Frame | 6.0 | | 4 | | 388 | 0 | |

#8-5 Increased Production of the Watt Hour Meter
- No.3 HI: Watt Hour Meter Shop -

(1) Outline of the Objectives and Planning

HIC at present manufactures a single phase two wire model (TE1 Model) and a three phase three wire model (TW1 Model). The only model for domestic use is the single phase two wire type.

Since Burmese electricity is on a three phase four wire method the three phase three wire TW1 model by connecting the neutral wire with one of the other wires has the flaw of stealing electricity.

The single phase two wire TE1 Model was designed about 20 years ago and since this is almost only produced in Burma supply of parts is troublesome. Also the metal molds for the TE1 are deteriorated and it is necessary to replace these.

Production schedules for the watt hour meter are as follows:

| | |
|---|---|
| 1986 (performance) | 26,000 sets |
| 1998 | 40,000 sets |

In response to the situation outlined above the present plan is to undertake:

1. A model change of the single phase two wire model (over to the TE5 model) to be timed for the date scheduled for metal mold replacement. By this the supply of parts will be made easier.

2. Development of a three phase four wire type in line with the distribution system of Burma, and model change to this from the three phase three wire model.

3. Provisions for the current equipment and organization of a system for increasing production.

(2) Details of the Plan

1) Model Change

a) Plan for Model Change of the two phase single wire model (TE1 type) over to the two phase single wire model TE5.

b) Undertake a model change of the three phase three wire TW1 to a three phase four wire model.

2) Repair of Existing Equipment

a) The following machinery is inoperative due to breakdown and as these are beyond repair replacement is required;

| | | |
|---|---|---|
| Air compressor | : | 3 machines |
| Element Driver | : | 1 machine |
| Belton Abrasive Grinder | : | 1 machine |

b) Spare parts are to be obtained for machinery which is operating because of breakdown but which could be repaired. However, as spare parts for the resistance welding machine are not available replacement is necessary.

| | | |
|---|---|---|
| Resistance Welder | : | 1 machine |
| Tapping and Drilling machine | : | 1 machine |
| 30 Ton Power Press | : | 1 machine |

c) Currently spare parts for the following machines among machines in operation have already been exhausted and it is necessary to supplement their supply of spare parts.

1. Bearing for the Dieing Machine
2. Wire straightening and Cutting Machines
3. Bench Lathe
4. Others

d) The coating equipment is deteriorated and in the present state of affairs the monthly production of 2,500 devices is handled by over-time working. It is necessary to construct new shop buildings and replace the coating equipment including the drying equipment.

e) There are two pre-calibration test boards. According to calculations, these are sufficiently capable of a daily production output of 225 items. However, because of the low efficiency of operators and the short daily operating time the actual production output is between 120 and 130 items.

Hereafter, when production increase takes place it will be necessary to install an extra pre-calibration test board.

f) The necessary time for employment of the gear tooth cutting of the Mini-gear bobbing machine is 1,400 hours annually, and as the annual available time is calculated at 1,800 hours annually, there is an excess capacity of 20%. However, from the viewpoint of operating efficiency, it is necessary to install one device.

g) With regard to metal molds and jig devices there are no problems at the present time but the date for replacement approaches. In order to synchronize the model change with this replacement period it is best for some time to use the molds as they are.

h) As the floor of the Assembly Shop is exposed it is necessary to take measures for the coating of the floor area with anti dust coating.

i) The correcting device for the Standard Watt-Hour Meter must be installed for effecting corrections of the watt-hour meter which will act as the standard meters.

j) Local production of the digital counter is not included in the present plan because;

1. As the dimension tolerance is strict expenditure on the environmental equipment of the molding shop is needed.

2. As glass fiber is one of the materials abrasion and wear on the metal molds is immediate and maintenance is difficult.

The above concludes the activities relating to the existing machinery included in the present plan. That is the introduction of a mini-automatic lathe and NC system are not included in the present plan as an activity relating to existing machinery. Further, since the watt hour meter'shop is not equipped with plating equipment at present and as pollution problems would be involved in each shop having such equipment it is best to have this in one place and managed there. Therefore, the present shop will continue as at present to make use of Plating shops No.1 and 2.

(2) Details of the Plan

1) Working Equipment

Present equipment is to be used for parts processing. It will be necessary to supplement the following pieces of equipment for the purposes f model changes.

a) New equipment needed for the change of model to the three phase four wire type watt-hour meter;

| | | |
|---|---|---|
| Power Press (150 tons) | : | 1 machine |
| 3 Phase 4 Wire Test Board | : | 1 machine |
| Standard Watt Hour Meter | : | 1 machine |

b) New equipment which can be shared in use;

| | | |
|---|---|---|
| Washing equipment | : | 1 set |
| Drying equipment | : | 1 set |

c) Additional equipment which can be shared in use;

| | | |
|---|---|---|
| Mini-gear Hobbing machine | : | 1 machine |

2) Metal Molds

It is necessary to supplement the following metal molds. 26 sets of the 84 metal molds used for the TE1 model Watt Hour Meter can be used for parts processing of the new model watt-hour meter.

a) Single phase two wire watt hour meter : 56 sets

b) Three phase four wire type watt hour meter : 36 sets

However, after changeover to the new model has been completed, the metal molds and jigs for the TE1 model WHM should be stored as these will be necessary for the production of replacement parts needed for repairs of the returned old watt hour meters still in use by customers and for repair of old watt hour meters which break down.

3) Jigs and Tools

It is necessary to supplement the following jigs. 17 sets of the 43 jigs used for the TE1 model WHM can be used for the new model.

a) Single phase two wire hour meter : 26 sets

b) Three phase four wire watt hour meter : 23 sets

4) Operating Personnel

There were approximately 112 operating personnel directly involved in the decision and working out of the future production increase and model change.

5) Other results that can be anticipated

The model change to the single phase two wire device will not only increase the supply capacity but introduction of the 3 phase 4 wire model will make the provision of equipment models adapted to the electric distribution system of Burma and thus contribute to the provision of a domestic electrical distribution system.

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Requirement

This is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving on Foreign Currency

Without the present plan product import is required. Compared with the case of import, the saving of foreign capital cannot be expected (however, annual production increase is of 14,000 units).

| | Foreign Currency Required with Implementation of the Present Plan (yen per item) | Foreign Currency Required in Case of Importing (yen/item) |
|---|---|---|
| Cost of Product | - | 9,350 |
| CP/RM Cost | 5,950 | - |
| Freight & Insurance | 475 | 748 |
| Sub-total | 6,425 | 10,098 |
| M/E Costs | 8,307 | - |
| TOTAL | 14,732 | 10,098 |

Notes: The equipment costs indicated are only those additional costs incurred by the present plan.
Details of items refer to the Attached Table 3-3.
The assumed product price, RM/CP costs and annual production quantity by type are as follows (yen/unit);

| | Product Price | RM/CP Cost | Annual Production |
|---|---|---|---|
| Single phase 3 wires | 8,000 | 5,540 | 35,500 units |
| Three phase 4 wires | 20,000 | 9,180 | 4,500 |

2) Reduction in Production Costs Achieved

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

| | Production Costs After Implementation of the Presnet Plan | Present Production Costs |
|---|---|---|
| Imported CP/RM Costs | | |
| FOB price | 5,950 | 5,950 |
| Freight & Insurance | 475 | 477 |
| Sub-total | 6,425 | 6,427 |
| Local CP/RM Costs | - | - |
| Depreciation | 2,750 | 571 |
| Utility Costs | 253 | 389 |
| Labor Costs | 253 | 389 |
| Overheads | 333 | 227 |
| Admin. Costs | 110 | 49 |
| Other Costs | 2,212 | 2,357 |
| Sub-total | 5,910 | 3,982 |
| Mark-up, profit | 370 | 312 |
| Excise Tax | 3,812 | 3,216 |
| TOTAL | 16,517 | 13,935 |

Therefore, with the present low production output the present production plan cannot be expected to effect a reduction in production costs.

(5) Recommendation on Implementation of the Plan

Both foreign exchange saving and production cost reduction are hard to be expected from the implementation of the present plan; nevertheless, model change of the product and replacement of molds are indispensable in the near future, and the plan should be implemented from this stand point of view.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-5 Watt-Hour Meter Production Increase
- No.3 HI: Watt-Hour Meter Shop -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Prd'n incr:watt hour meter | | |
| 1 1 | Painting device:WHM | Set | 1 |
| 1 2 | Abrasive grinding:WHM | Set | 1 |
| 1 3 | Washing equipment:WHM | Set | 1 |
| 1 4 | Drier equipment:WHM | Set | 1 |
| 1 5 | Precalibration test board:WHM | Set | 1 |
| 1 6 | Mini-gear hobbing m/c:WHM | Set | 1 |
| 1 7 | Power press (150 ton):3P 4W | Set | 1 |
| 1 8 | Test board for 3p.4w | Set | 1 |
| 1 9 | Press die:single p. | Set | 50 |
| 110 | Die casting die:single p. | Set | 4 |
| 111 | Molding die:single p. | Set | 2 |
| 112 | Press die:3p 4w | Set | 34 |
| 113 | Die casting die:3p 4w | Set | 1 |
| 114 | Molding die:3p 4w | Set | 1 |
| 115 | Jig and tool for s.phase | Set | 26 |
| 116 | Jig and tool for 3.phase | Set | 23 |
| 2 | Repl:deteriorated M/E | | |
| 2 1 | Air compressor | Set | 3 |
| 2 2 | Registor welding | Set | 1 |
| 3 | Checking Equipment | | |
| 3 1 | Checking eqpt for standard WHM (common use for s.p&3p 4w) | Set | 1 |

Attached Table 3-2: REQUIRED INVESTMENT (#8-5)

(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) | 710.0 | - | 710.0 |
| 2 | Freight & Insurance | 56.8 | - | 56.8 |
| | Sub-total | 766.8 | - | 766.8 |
| 3 | Import Duty | - | 115.0 | 115.0 |
| 4 | Unloading | - | 10.7 | 10.7 |
| 5 | Installation Cost | - | 6.4 | 6.4 |
| | Imported M/E Total | 766.8 | 132.1 | 898.9 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 0.0 | - | 0.0 |
| B | Eng Fee | 32.4 | - | 32.4 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 32.4 | - | 32.4 |
| | Total Investment | 799.2 | 132.1 | 931.3 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#8-5)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 238.0 | - | 238.0 | 48 |
| | Freight & Insurance | 19.0 | - | 19.0 | 4 |
| | Import Duty | - | 38.6 | 38.6 | 8 |
| | Unloading | - | 3.6 | 3.6 | 1 |
| | Sub-total | 257.0 | 42.2 | 299.2 | 61 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 257.0 | 42.2 | 299.2 | 61 |
| 2 | Utilities | 0.0 | 10.1 | 10.1 | 2 |
| | Variable Cost | 257.0 | 52.3 | 309.3 | 63 |
| 3 | Depreciation | 81.4 | 28.6 | 110.0 | 22 |
| 4 | Amortization | 6.5 | - | 6.5 | 1 |
| 5 | Maintenance | 23.0 | 11.4 | 34.4 | 7 |
| 6 | Design Fee | 5.4 | - | 5.4 | 1 |
| 7 | Labor | - | 10.1 | 10.1 | 2 |
| 8 | Ovehead | - | 13.3 | 13.3 | 3 |
| 9 | Admin.Cost | - | 4.4 | 4.4 | 1 |
| | Fixed Cost | 116.3 | 67.8 | 184.1 | 37 |
| | Annual Cost | 373.3 | 120.1 | 493.4 | 100 |
| | Unit P.Cost | | | 12335.0 | |
| 10 | Mark-up | | | 370.1 | |
| 11 | Excise Tax | | | 3811.5 | |
| | Ex-fact.Cost | | | 16516.6 | |

#8-6 Increased Production of Electric Motors

- No.3 HI: AME Component Manufacturing Shop No.1 -

(1) Objectives and Outline of the Plan

At the start f operations HIC's motor production planned for and produced motors with output of 0.2 kW, 0.4 kW for use mainly with domestic electrical appliances such as air conditioning, water coolers, and washing machines and with industrial sewing machines. From around 1980 production of motors with outputs from 0.75 kW up to 7.5 kW was begun for use with water drawing pumps and machine tools. At present, excepting the 0.2 kW type there are five models being produced.

With regard to the domestic supply of motors besides the products of HIC each public corporation has had relative freedom to import but with the tightening situation on foreign currency the importance of HIC's products is growing.

The production of electric motors carried out at present in No.3 HI uses equipment for producing the electric fan and generator. However, more than 20% of this equipment is of West German origin and so is impossible to repair and it is though to be running at 50% operating rate. The production performance for the recent period are as follows:

| Annual Period | Production Output (items per year) |
|---|---|
| 1984/85 | 1,074 |
| 1985/86 | 750 |
| 1986/87 | 1,475 |

Hereafter while increasing the relative importance of items with a large output in its production of motors HIC needs to increase the total quantity of production generally. The production outputs predicted are as follows:

| Annual Period | Production Output (items per year) |
|---|---|
| 1988 | 1,250 |
| 1992 | 2,500 |
| 1995 | 4,000 |
| 1998 | 5,000 |

In order to reach the scheduled production outputs it will be necessary to undertake a specialization of production equipment, repair and replacement of existing machinery and model changes.

The following conditions need to be taken into account with regard to the situation of demand and production in reference to production of models and planning;

a) It is necessary to add the 0.2 kW model to the existing 5 models being produced (i.e. 0.4 kW, p.75 kW, 1.5 kW, 3.75 kW and 7.5 kW models). Production of this is to take place as there is demand for its small scale production.

b) Combination of output and number of phases

With present production the 0.4 kW and 0.75 kW models are single phase the 1.5 kW, 3.75 kW, and 7.5 kW models are three phase. Of these the 0.75 kW motor production was started in 1977/78 and the demand for a 1.5 kW single phase motor arose due to the shortage of output in the domestic booster pump for 3 or 4 story housing (in general homes there are no three phase sockets). On the other hand, the 1.5 kW three phase motor is extremely economical. Therefore, production of both the single phase and three phase 1.5 kW motor is necessary.

c) Improvement of frame materials

At present the frame is casted iron but the frame for motors of 1.5 kW and less output should be changed over to one made of welded steel plates to allow production increase and increase efficiency.

d) Re-consideration of layout

A reconsideration of the general layout to allow for a more efficient production of motors, electric fans and parts should be made using the opportunity of the modernization plan.

(2) Details of the Plan

1) Order of Implementation

The plan is to be implemented in the following order;

1. Repair and replacement of existing equipment
2. Provision and strengthening of equipment required for present production
3. Specialization of lines and re-consideration of general layout done by electric motor types
4. Streamlining of assembly operations and evaluation of equipment for mechanization

2) Arrangement of Functions and Processes in the AME Shop

a) Transfer the electric fan assembly and production processes for completed products to the Lighting Shop D

b) Transfer the processing of the electric ironing board to No.1 HI.

c) Concentrate the assembly, completes production and inspection of generators in the Agricultural Machinery Assembly shop and undertake a policy of splitting this away from the AME shop. However, it is advisable to leave the machine processing of the main parts to the AME Shop.

d) Since the tasks of the AME shop are basically the production of the main parts of the motor, electric fan and generator only the motor is to have an integrated production system for processes right down to finished product.

e) Install the production equipment for plastic parts included in the present modernization plan inside the AME Shop.

f) Place the individual machine processing stages of the press processes and the processes for intermediate assembled parts of the motor in a production system essentially for the motor. Layout is to be centered around this with machining processes for other parts also using this equipment.

3) Outline of the Layout of Working Equipment

a) Install the production equipment planned for use in plastic parts manufacture (separate plan) in the present processing area for the electric iron soleplate and electric fan guard.

b) Use and expand the storehouse for intermediate goods in progress placed next to the present press shop for steel frame, base, iron core and press processing.

c) Change the arrangement of a part of the Machine Tool Section located almost in the center of the shop and arrange the processing equipment effectively for the motor shaft and bracket.

d) The secondary processing for the starter, rotor, and frame (processing to be amalgamated partly) is to be place effectively in the vicinity of the present AME Office.

e) The boring machine located in the drilling area is to be place in the machine tool section (the present two sections being amalgamated) and the area vacated to be used as a store for parts in progress.

f) The Diesel Engine Testing room at present is no functioning due to a breakdown in equipment. The removal and transfer of this is to be planned and the area vacated to be used by Office Inspection or the Progress Station.

g) Other functions are to be located near to their present positions and details can be adjusted during implementation procedures.

(3) Estimated Capital Requirement

1) Required Facilities

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

2) Estimated Capital Required

This is shown in the Attached Table 3-2.

(4) Expected Effects of the Plan

1) Saving on Foreign Currency

As the production output of the present plan is low, the saving of foreign capital cannot be anticipated. However, this would be possible by increasing production output to a level of 8,500 items per year. (However, annual production is 4,000 units)

| | Foreign Currency Required with Implementation of the Present Plan (yen per item) | Foreign Currency Required in Case of Importing (yen/item) |
|---|---|---|
| Cost of Product | - | 44,380 |
| CP/RM Cost | 27,380 | - |
| Freight & Insurance | 2,200 | 3,550 |
| Sub-total | 29,580 | 47,930 |
| M/E Costs | 37,480 | - |
| TOTAL | 67,060 | 47,930 |

Notes: The equipment costs indicated are only those additional costs incurred by the present plan.
Details of items refer to Attached Table No. 3-3.
Further, the product and CP/RM prices used are those of the weighted mean for the assumed production ( .4 kW x 1,000 items per year, 0.75 kW x 1,500 per year, and 1.5 kW x 2,500 items per year).

| With Increased Prod. Output (items/yr.) | Required Foreign Capital When Plan is Implemented (items/yr.) | Foreign Capital Required In case of Imports (items/yr.) |
|---|---|---|
| 5,000 | 59,560 | 47,930 |
| 8,000 | 48,318 | 47,930 |
| 10,000 | 44,570 | 47,930 |

2) Reduction in Production Costs Achieved

A comparison of production costs of one item at present and after implementation of the present plan, with an assumed production 5,000 items per annum is as follows:

| | Production Costs After Implementation of the Presnet Plan | Present Production Costs |
|---|---|---|
| Imported CP/RM Costs | | |
| FOB price | 27,380 | 27,380 |
| Freight & Insurance | 2,200 | 2,200 |
| Sub-total | 29,580 | 29,580 |
| Local CP/RM Costs | - | - |
| Depreciation | 17,200 | 5,189 |
| Utility Costs | 40 | 746 |
| Labor Costs | 80 | 294 |
| Overheads | 1,980 | 746 |
| Admin. Costs | 660 | 220 |
| Other Costs | 23,640 | 3,004 |
| Sub-total | 43,600 | 10,199 |
| Mark-up, profit | 2,195 | 1,193 |
| Excise Tax | 15,075 | 8,194 |
| TOTAL | 90,450 | 49,166 |

Therefore, with the present low production output the present production plan cannot be expected to effect a reduction in production costs.

5) Recommendations on the Implementation of the Plan

Since domestic demand for the electric motor both for general public use and industrial use is expected to increase hereafter it is desirable to proceed with provisions for the production system.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 8-6 Electric Motor Production Increase
- No.3 HI: AME Shop No.1 -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Prod'n incr:electric motor | | |
| 1 1 | Frame processing | Set | 1 |
| 1 2 | Base processing | Set | 1 |
| 1 3 | Starter processing | Set | 1 |
| 1 4 | Roter processing | Set | 1 |
| 1 5 | Shaft processing | Set | 1 |
| 1 6 | Braket processing | Set | 1 |
| 1 7 | Slinger processing | Set | 1 |
| 1 8 | Air guide processing | Set | 1 |
| 1 9 | Condensor box processing | Set | 1 |
| 110 | Condensor cover processing | Set | 1 |
| 111 | Condensor attachment processing | Set | 1 |
| 112 | Assembly | Set | 1 |
| 113 | Maintenance of dies | Set | 1 |

Attached Table 3-2: REQUIRED INVESTMENT (#8-6)

(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) | 1327.1 | - | 1327.1 |
| 2 | Freight & Insurance | 106.2 | - | 106.2 |
| | Sub-total | 1433.3 | - | 1433.3 |
| 3 | Import Duty | - | 215.0 | 215.0 |
| 4 | Unloading | - | 20.1 | 20.1 |
| 5 | Installation Cost | - | 81.3 | 81.3 |
| | Imported M/E Total | 1433.3 | 316.4 | 1749.7 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 0.0 | - | 0.0 |
| B | Eng Fee | 84.6 | - | 84.6 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 84.6 | - | 84.6 |
| | Total Investment | 1517.9 | 316.4 | 1834.3 |

Attached Table 3-3: PRODUCTION COST STATEMENT (#8-6)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| | A Imported CP/RM (FOB) | 136.9 | - | 136.9 | 37 |
| | Freight & Insurance | 11.0 | - | 11.0 | 3 |
| | Import Duty | - | 22.2 | 22.2 | 6 |
| | Unloading | - | 2.1 | 2.1 | 1 |
| | Sub-total | 147.9 | 24.3 | 172.2 | 47 |
| | B Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 147.9 | 24.3 | 172.2 | 47 |
| 2 | Utilities | 0.0 | 0.2 | 0.2 | 0 |
| | Variable Cost | 147.9 | 24.5 | 172.4 | 47 |
| 3 | Depreciation | 86.0 | 20.0 | 106.0 | 29 |
| 4 | Amortization | 16.9 | - | 16.9 | 5 |
| 5 | Maintenance | 43.0 | 10.0 | 53.0 | 14 |
| 6 | Design Fee | 4.0 | - | 4.0 | 1 |
| 7 | Labor | - | 0.4 | 0.4 | 0 |
| 8 | Ovehead | - | 9.9 | 9.9 | 3 |
| 9 | Admin.Cost | - | 3.3 | 3.3 | 1 |
| | Fixed Cost | 149.9 | 43.6 | 193.5 | 53 |
| | Annual Cost | 297.8 | 68.1 | 365.9 | 100 |
| | Unit P.Cost | | | 73180.0 | |
| 10 | Mark-up | | | 2195.4 | |
| 11 | Excise Tax | | | 15075.1 | |
| | Ex-fact.Cost | | | 90450.5 | |

#9-1 Model Change of 2000 cc Engine
- No.4 HI: Machine Shop -

(1) Objectives and Outline of the Plan

The present plan aims at producing an improved model which meets the domestic and export market needs through utilisation of the existing production equipment for the X2000.

1) Present Situation of Light Vehicle Production

The base models of the 2000 cc class of HIC are the 4 door cross country X2000 and the T2000 2 ton Truck. Both of these are largely sold to Governmental institutions, and some 20% of the T 2000 are used for transportation purposes by the Co-operative Unions.

Of these two models the domestic production of the T2000 has not been proceeded with in order to save on the equipment expenditure of HIC. (refer to #4-18) Since the start of production the X2000 has been the chief model in efforts towards local production. Starting with body changes the local production of the engine, transmission and power train has been made possible and the level of parts locally produced has reached a level of more than 75%. HIC has independently proceeded with the model change of the X 2000 and in order to respond to market needs;

1. has developed the two wheel drive X2000
2. has developed the X2000 Path Finder (which is a station wagon type model having a cabin chassis and with a 510 mm extension of the basic model's wheel base)

2) Market needs with regard to Light Vehicles

In Burma recently there has been an inflow of second hand cars which far surpasses domestic production and in particular the inflow of light or small-sized trucks is especially strong. Also although these are second hand models the models distributed are considerably newer models than those currently proeduced by HIC. Economic expansion, increase in the flow of materials, will necessarily increase in the future and the time when the X2000 rough road use passenger transport

vehicle will no longer be able to meet the needs of the time is approaching.

In September of 1987 two samples of the 4 door model and two of the two door model Pathfinder series were trial exported by HIC. Hic has a keen interest on export of these vehicles. In the event of continued export being intended as a means of gaining foreign currency it will be necessary to keep in mind the competitivity of commodities in the destination country and the various legal regulations operating therein.

3) Determination of Objectives

As outlined above HIC has made a certain number of advances towards the local realisation of a model change but this is limited by existing technology and surplus production capacity moreover since the model used as a base had already dated since considerably since its development the new model did not reached levels to satisfy domestic and external markets. In particular, important tasks include the clearing of emission regulations by the engine and improvement of the performance of the power train.

It is physically impossible for the VA Engine currently mounted in the X2000 to meet foreign emission regulations. Further, even if this were possible in order to give the X2000 specifications permitting general competitiveness on foreign markets besides the meeting of emission regulations, it would be necessary to obtain certification for a number of individual parts such as noise, tires, glass, headlights etc. and undertake measures to ensure the brake, speedometer, and back bumper met safety regulations, so that re-modelling and re-development over a wide range of areas would be necessitated.

With the above in mind the objectives of the present plan have been the following targets to try to achieve;

1. If the general export market is set as an objective new development throughout a wide range of fields will be needed a mentioned above, so the objective is to be limited to markets needs which can be met only by specificcation modifications of the X2000 and replacement of a mounted engine which can pass emission regulations. In this case, this model of vehicle may have the potentiality for export, though the exportable market will be limited due to the limited specifications.

2. Acquire the technologies related to emission regulations clearance.

3. Establish a technical development system at the same time which can respond to the future diversification of needs on the domestic market.

4) Outline of the Plan

1. Examine the possibility to change the currently mounted VA Engine to the FE Engine which can clear the emission regulations.

2. Together with this in order to match the engine performance change examine the possibility to change the 4 present shift transmission for the VA Engine to the 5 shift transmission which has a positive record of achievement with the FE Engine.

3. Carry out the technical evaluation relating to the mounting of the FE Engine and new transmission.

4. Establish an increase in production for the 2000cc Engine to be used with the FE Engine and the new transmission (#4-21).

Through the above measures the following market needs can be met;

1. Operational ease of the shift through the change of transmission and improvement of commodity value of the X2000 through a reduction of gear noise.

2. By renovation of the mounted engine, increase in marketability of the model may be expected and the possibility of exporting the X2000 will be increased. However, the export market will be limited due to the design and other specifications.

3. In contrast to the VA Engine and transmission which are exclusive to Burma the FE Engine and transmission are widely used abroad in a number of models so that it will be possible to export these as OEM for CKD vehicle use or as spare parts for completed vehicles.

4. In addition to export possibilities of the engine and transmission as single items there are possibilities of export of component parts or forged blank materials parts of these.

5. Further, since the FE Engine and transmission have a positive record of use with the various individual models they will serve as the foundation for a future model diversification in Burma.

(2) Details of the Plan

1) In order to produce the FE Engine and 5 shift transmission it will be necessary to develop over 100 new parts. However, there are 6 machines of the existing equipment of the No.4 HI Machine Shop which can be used as they are, and there are only 30 pieces of new equipment which must be introduced and almost all of the jigs and molding devices can be used with modifications.

2) In order to increase the commodit value of the X2000 Path Finder modifications highly demanded in the market of the bonnet are to be undertaken, and keeping in mind the flow of parts for mass production development, design and trial manufacture stages are to be carried out. On the basis of these results production jigs and molds are to be developed and prepared. The present plan is equivalent to the development of a new vehicle model and since the various development processes must be followed through over a long term period it is necessary to begin operations promptly.

(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.

The present plan is a product development plan and require equipment, etc., will be determined on the basis of the development situation. Therefore, estimates of the required capital for the present plan are given for reference purposes.

(4) Expected Effects of the Plan

The annual increase in production costs which are consequent on the implementation of the present plan are as shown in the Attached Table 3-3.

The initial cost in 1987 for the X2000 is as follows:

(Units: yen per vehicle)

| | Foreign Currency Costs | Local Currency Costs | TOTAL |
|---|---|---|---|
| Variable Costs | 1,467,414 | 468,113 | 1,935,527 |
| Fixed Costs | 10,951 | 694,079 | 705,030 |
| Mark up | - | 52,809 | 52,809 |
| Excise Tax | - | 808,010 | 808,010 |
| Total | 1,478,365 | 2,023,011 | 3,501,376 |

Therefore, the increase in production costs consequent on the implementation of the present plan can be absorbed by the increased production of 246 vehicles annually. Further, if one assumes that these can be exported with the same price the increase in the foreign currency part of production costs can be absorbed by the export of 63

vehicles. It is expected that there will be an increase in the domestic and foreign demand since the implementation of the present plan will ensure a higher level of satisfaction of the market needs. Further, as has already been said, export of parts and rough shaped blanks is possible.

The present plan acting as a means of acquiring foreign capital also permits the establishment of an autonomous system for equipment replacement required by the future changes in technology and market needs.

Moreover, although time limitations do not permit the development included in the present plan to be carried out on an autonomous basis the experience gained and knowledge acquired in the developmental processes can be used as a guideline for future autonomous development programmes.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 9-1 Model change of 2000cc engine & T/M
- No.4 HI: Machine shop -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | Development for mounting FE engine | | |
| 1 1 | Development, design and trial manufacture | Set | 1 |
| 1 2 | Special tools for revised body parts | Set | 1 |
| 1 3 | Press dies for bonnet/fender | Set | 1 |

Attached Table 3-2: REQUIRED INVESTMENT (#9-1)

(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) | 1261.0 | - | 1261.0 |
| 2 | Freight & Insurance | 147.5 | - | 147.5 |
| | Sub-total | 1408.5 | - | 1408.5 |
| 3 | Import Duty | - | 211.3 | 211.3 |
| 4 | Unloading | - | 21.1 | 21.1 |
| 5 | Installation Cost | - | 38.0 | 38.0 |
| | Imported M/E Total | 1408.5 | 270.4 | 1678.9 |
| 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 | 1430.1 | 270.4 | 1700.5 |

Attached Table 3-3: ANNUAL PRODUCTION COST INCREASE (#9-1)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 0.0 | - | 0.0 | 0 |
| | Freight & Insurance | 0.0 | - | 0.0 | 0 |
| | Import Duty | - | 0.0 | 0.0 | 0 |
| | Unloading | - | 0.0 | 0.0 | 0 |
| | Sub-total | 0.0 | 0.0 | 0.0 | 0 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 0.0 | 0.0 | 0.0 | 0 |
| 2 | Utilities | 0.0 | 0.0 | 0.0 | 0 |
| | Variable Cost | 0.0 | 0.0 | 0.0 | 0 |
| 3 | Depreciation | 84.5 | 32.4 | 116.9 | 67 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 42.3 | 8.1 | 50.4 | 29 |
| 6 | Design Fee | 1.0 | - | 1.0 | 1 |
| 7 | Labor | - | 0.0 | 0.0 | 0 |
| 8 | Ovehead | - | 3.3 | 3.3 | 2 |
| 9 | Admin.Cost | - | 2.1 | 2.1 | 1 |
| | Fixed Cost | 127.8 | 45.9 | 173.7 | 100 |
| | Annual Cost | 127.8 | 45.9 | 173.7 | 100 |
| | Unit P.Cost | | | | |
| 10 | Mark-up | | | | |
| 11 | Excise Tax | | | | |
| | Ex-fact.Cost | | | | |

#9-2 Improvement of B600 Pick Up Specifications
- No.4 HI: Light Vehicle Assembly Shop -

(1) Objectives and Outline of the Plan

The B600 Model is highly valued in urban areas both for taxi use and private use. However it has remained unchanged since its initial introduction and the product is increasingly outdated with the passing of time.

In particular there has been a great increase in the inflow of second hand 0.5 - 1 ton model pickup trucks onto the market and demands for an expansion of passenger space in cabine and box of the B600 are very strong. The present plan proposes a improvement of specifications aimed at meeting the needs of the Burmese mrket.

The B600 model is outdated and its engine capacity small, nd therefore the possibility of export is minimal. On the other hand local production has progressed well and HIC has reached a stage of considerable proficiency and experience concerning the handling of the model. In this sense production of a redesigned trial product and its incorporation into production should be relatively easy. The present plan therefore proposes that development of a model change be undertaken by HIC itself with the advice of external technical expertise in order to bring the B600 more in line with the needs of the domestic Burmese market.

The main points of the specification improvement are:

1. Extension of the vehicle length, and
2. Expansion of the vehicle width

Consideration must be given to ensuring that there is no imbalance between the capacity of the engine range and the redesigned size when these modifications are to be evaluated.

(2) Details of the Plan

As an improvement is equivalent to the development of a new product it is generally necessary to proceed with the various steps of development over a long term period. Of course it goes without saying that sufficient consideration must be given not only to the improvement programme from the technical angle but also sufficient attention must be accorded to the questions of productivity and economic viability.

The improvement can divided into two steps. Further, this improvement process must followed through as part of the establishment of an integrated product development system (refer to #10-1).

1) First Step of Improvement Programme

Extension of the vehicle length taking into account a survey of market needs together with technical considerations

Results of the above examination must be drawn up in plan form and design plans made.

Production of a trial product on the basis of the above design plans. Reconsideration using the trial product and results of this reconsideration are drawn up in plan form which is used for trial. This process is repeated several times.

Finally, the determined specifications are used for completion of the final design plan.

The final plan is for preparation of the necessary production facilities such as press pattern tools, assembly jigs for the vehicle and body completes.

2) Second Step of Improvement Programme

Using the sme procedure as that outlined in step 1) indicated above widening of the vehicle is to be carried out.

(3) Estimated Capital Requirement

1) Required Facilities

The details of the 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.

The present plan is a development plan and required equipment, etc., will differ according to the development research results. Therefore, estimates of the required capital for the present plan are given as estimates for reference purposes.

The annual increase in production costs which are consequent on the implementation of the present plan are as shown in the Attached Table 3-3.

The initial cost in 1987 for the B600 is as shown below, the increase in production costs consequent on the implementation of the present plan can be absorbed by the increased production of 812 vehicles annually. This represents a 190% increase over present production (1986) but as the demand for the B600 is strong it is expected that this can sufficiently be reached by the present renovation. Moreover, production output for 1986 was 433 vehicles.

| | Foreign Currency Costs | Local Currency Costs | Total |
|---|---|---|---|
| Variable Costs | 520,047 | 180,455 | 700,502 |
| Fixed Costs | 8,716 | 292,662 | 301,378 |
| Sub-total | 528,763 | 473,117 | 1,001,880 |
| Mark-up | - | 20,038 | 20,038 |
| Excise Tax | - | 306,575 | 306,575 |
| Total | 528,763 | 799,730 | 1,328,493 |

The present plan is a product development project to be carried out by HIC itself and the technical expertise acquired is expected to prove of great value to the establishment of a future development system.

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 9-2 B600 pick-up specifications improvement
No.4 HI: LV ass'y shop/LV body ass'y shop

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Bldg | | |
| 2 | Imported M/E | | |
| 1 | 1st phase development (lengthen) | | |
| 1 1 | Development design and trial manufacturing | Set | 1 |
| 1 2 | Prod. facilities(press dies & eqpt for body & vehicle ass'y) | Set | 1 |
| 2 | 2nd phase development (widen) | | |
| 2 1 | Development, design and trial manufacture | Set | 1 |
| 2 2 | Prod. facilities(press dies & eqpt for body & vehicle ass'y) | Set | 1 |

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

(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) | 1808.0 | - | 1808.0 |
| 2 | Freight & Insurance | 211.5 | - | 211.5 |
| | Sub-total | 2019.5 | - | 2019.5 |
| 3 | Import Duty | - | 302.9 | 302.9 |
| 4 | Unloading | - | 30.3 | 30.3 |
| 5 | Installation Cost | - | 25.7 | 25.7 |
| | Imported M/E Total | 2019.5 | 358.9 | 2378.4 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 0.0 | - | 0.0 |
| B | Eng Fee | 43.2 | - | 43.2 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 43.2 | - | 43.2 |
| | Total Investment | 2062.7 | 358.9 | 2421.6 |

Attached Table 3-3: ANNUAL PRODUCTION COST INCREASE (#9-2)

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 0.0 | - | 0.0 | 0 |
| | Freight & Insurance | 0.0 | - | 0.0 | 0 |
| | Import Duty | - | 0.0 | 0.0 | 0 |
| | Unloading | - | 0.0 | 0.0 | 0 |
| | Sub-total | 0.0 | 0.0 | 0.0 | 0 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 0.0 | 0.0 | 0.0 | 0 |
| 2 | Utilities | 0.0 | 0.0 | 0.0 | 0 |
| | Variable Cost | 0.0 | 0.0 | 0.0 | 0 |
| 3 | Depreciation | 121.2 | 43.0 | 164.2 | 67 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 60.6 | 10.8 | 71.4 | 29 |
| 6 | Design Fee | 1.5 | - | 1.5 | 1 |
| 7 | Labor | - | 0.0 | 0.0 | 0 |
| 8 | Ovehead | - | 4.6 | 4.6 | 2 |
| 9 | Admin.Cost | - | 2.9 | 2.9 | 1 |
| | Fixed Cost | 183.3 | 61.3 | 244.6 | 100 |
| | Annual Cost | 183.3 | 61.3 | 244.6 | 100 |
| | Unit P.Cost | | | | |
| 10 | Mark-up | | | | |
| 11 | Excise Tax | | | | |
| | Ex-fact.Cost | | | | |

#9-3 Introduction/Model Change of Diesel Engine for Marine Use
- No.4 HI: Diesel Engine Shop -

(1) Objectives and Outline of the Plan

Considerable demand in Burma and the surrounding countries for a marine use diesel engine is anticipated.

If the DS70 Engine presently mounted in the heavy vehicles can also be used as a marine use engine using present production lines it would be able to meet the market demands for a marine use engine.

Results of a technical consideration of the plan to convert the DS70 Engine to marine use are as follows:

1. It is impossible structurally to attach the accessories needed for marine use.

2. Engine output is insufficient for marine use and the program would result in a considerable lowering of the commercial value of the Diesel Engine

From the above results it was concluded that conversion of the DS Engine to marine use is technically impossible.

Therefore as a substitute proposal introduction of the H-Model Engine (H06 Engine) which has positive achievements both as a heavy vehicle use and marine use engine was put forward.

If the DS Engine is replaced by the H-Model Engine then the following results could be anticipated:

1. It could meet the demand for a marine use engine

2. It could be used for both the heavy vehicle and marine engine.

3. Since the performance of the H-Model Engine is better when compared to the DS Engine the change would result in an improvement of the heavy vehicle engine.

However,

1. The exact scale of demand for a marine use engine has not been clarified.

2. Use of the existing diesel engine production line for installation of machine processing of the H-Engine would result in a severe lowering of productivity because of arrangement changes and conversion of jigs and tools, and the complication of measures required to ensure product quality.

Therefore, in order to proceed with the changeover to the local production of the H-Model Engine a special production line is required.

To that end the present proposal is that the H06 Engine should be imported and assembled with the CKD and performance testing be carried out and then supplied on the market and to carefully observe market reactions, and demand tendencies. If a sufficiently large demand for the marine use engine can be confirmed then replacement of the DS Engine by the H-Model Engine should be considered. In that case since the machine processing equipment for the DS Engine is of a general use type it is expected that much of the existing equipment could be transferred for use in machining of the H-Model Engine. However, since such a conversion will involve a large number of technical considerations it is advisable that the replacement of the DS Engine by the H-Model Engine only start once these considerations have been worked out.

(2) Details of the Plan

For the present parts should be imported CKD, assembled and performance testing carried out, and the completed engine made up. It will therefore be necessary to install assembling jig and accessory equipment for dynamometer use.

(3) Estimated Capital Requirement

In the present plan development will begin once the results of CKD production are made clear. For this reason it is difficult to give an estimate of required capital at the present stage.

#9-4 Model Change of Power Tiller
-No.3 HI: AME Shop-

(1) Objectives and Outline of the Plan

At present attachment and removal of the rotary plowing section to the power tiller produced in No. 3 HI is difficult and so the plow cannot be attached, also driving operations are difficult when pulling the trailer.

Driving speeds are 6 shift forward and 2 shift reverse and selection of the appropriate speed for operations and land conditions can be chosen but the structure is complicated the model belongs to the heaviest type current in Japan.

Such a heavy model can certainly be said to meet the needs of plowing operations during the dry season in Burma better than a light model but this also results in a high price which is a hindrance to its widespread use in Burma.

As counter measures, this plan improve and develop present model into a simplified version and an economical version. This plan includes the followings.

1) Introduction of a number of economical power tillers existing in other countries as small production samples, and re-modelling of these in the R and D Dept. to meet Burmese agricultural conditions and the production technology available, followed by production is to be carried out.

2) As a transitional counter measure until the transfer of the above new models has been completed a simplification of the existing model is to take place. This is to undertake the separate production of specialized versions of the present model for exclusive operation for ploughing or trailer pulling and rotary ploughing operations, so as to reduce the initial production price.

Production output: 1000 per year

(2) Details of the Plan

Refer to the Attached Table 2-1.

(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 Currency

a) Model Simplification

The amount of foreign capital saved on the production of one unit is estimated to be 87,300 yen (production assumption: 600 units/year).

| | Foreign Exchange Required at Implementation of Plan (yen per unit) | Amount of Foreign Currency Required at Present (yen per unit) |
|---|---|---|
| Cost of parts | 145,500 | 228,200 |
| Raw Material Costs | - | - |
| Freight & Insurance | 11,667 | 18,200 |
| Sub-total | 157,167 | 246,400 |
| Working equipment costs | 2,000 | - |
| TOTAL | 159,167 | 246,400 |

Note: The working equipment costs are for those additional costs incurred by the present plan only. Details are shown in the Attached Table 3-3.

| | | |
|---|---|---|
| KMB200W/Rotary | 159,800 | 159,800 |
| Parts for Rotary | -50,000 | - |
| KND7 | - | 68,400 |
| KND5B | 35,700 | - |
| Total | 145,500 | 228,200 |

b) Development of Economical Type

With the present level of planned production output (1,000 units per year) a saving of foreign capital cannot be anticipated due to heavy burden of facility costs.

| | Foreign Exchange Required at Implementation of Plan (yen per unit) | Amount of Foreign Currency Required at Present (yen per unit) |
|---|---|---|
| Cost of parts | 111,100 | 228,200 |
| Raw Material Costs | - | - |
| Freight & Insurance | 8,900 | 18,200 |
| Sub-total | 120,000 | 246,400 |
| Working equipment costs | 185,900 | - |
| TOTAL | 305,900 | 246,400 |

Note: The working equipment costs are for those additional costs incurred by the present plan only. Details are shown in the Attached Table 3-4.

| | | |
|---|---|---|
| KMB200W/Rotary | - | 159,800 |
| KND7 | - | 68,400 |
| KND5B | 35,700 | - |
| CP | 39,000 | - |
| RM | 36,400 | - |
| | 111,100 | 228,200 |

If demand increases and exceeds 1,500 units/year, the foreign exchange saving may be anticipated compared with foreign exchange requirement for present production situation.

| Annual Production (unit/year) | Foreign Currency Required at Implementation of Plan (yen per unit) | Foreign Currency Required at Present Production (yen per unit) |
|---|---|---|
| 1,200 | 243,933 | 246,400 |
| 1,350 | 252,786 | 246,400 |
| 1,500 | 263,000 | 246,400 |

2) Reduction in Production Costs Achieved

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

(unit: yen per unit)

| | Production Costs After Implementation of the Plan (Simplification model) | (Economical type model) | Present Production Costs |
|---|---|---|---|
| Imported CP/RM costs | | | |
| FOB price | 145,500 | 111,100 | 228,200 |
| Freight & insurance | 11,667 | 8,900 | 18,200 |
| Sub-total | 157,167 | 120,000 | 246,400 |
| Local CP/RM costs | 9,300 | - | 9,300 |
| Depreciation | 1,667 | 144,700 | 2,400 |
| Utility costs | 1,200 | 4,800 | 1,200 |
| Labor costs | 600 | 11,100 | 1,400 |
| Overheads | 4,833 | 10,100 | - |
| Admin. costs | 1,167 | 2,400 | 1,200 |
| Other costs | 15,400 | 111,800 | 36,800 |
| Sub-total | 34,167 | 284,900 | 52,300 |
| Mark-up, profit | 5,740 | 12,147 | 9,000 |
| Excise tax | 39,415 | 83,469 | 61,500 |
| TOTAL | 236,488 | 500,456 | 369,200 |

Note: Assumed production quantity; present model 270 units per year, Simplefication model 600 units per year, and economical model 1,000 units per year.

Production costs for the simple type can be reduced by around 36%. However, production of economical model increases the unit production cost compared with the present model due to heavy burden of facilities cost. Out of the estimated production cost of the economical model, 26% is for construction of new building. Another factor increased the production cost is maintenance cost which amounts to approximately 80,000 yen/unit. This maintenance cost can be attributable to the appropriate maintenance of the renovated facilities.

Nevertheless, it is recommended that further examination should be undertaken before implementation as to whether it is possible to refrain from introducing new facilities, and to what extent existing facilities can be mobilized. Annual production output and the production costs for one unit for the economical type tiller are as follows:

| Annual Production | Variable Costs | Fixed Costs | Mark-up | Excise Tax | Total |
|---|---|---|---|---|---|
| 1,000 | 141,500 | 260,400 | 12,147 | 83,409 | 500,456 |
| 1,500 | 141,500 | 173,600 | 9,543 | 65,529 | 393,172 |
| 2,000 | 141,500 | 130,200 | 8,241 | 56,588 | 339,529 |

4) Other Results which can be Anticipated

The main aims of the present plan are the production of a model which is suited to the local farming practice as well as reduction in production costs. As a result of implementing the plan, demand for tiller may increase since it is cheaper and suitable for the local agriculture. Thus, the scale of production be increased and this will possibly allow for a reduction in production costs. Also through such a model change the acquisition of autonomous development expertise can be expected.

(3) Recommendations on Implementation of the Plan

The present plan is for the development of a commercial product and product specifications will be affected by the results of the development. Therefore, an estimate of the required capital is according to an order of magnitude estimate. As has already been pointed out a reduction in production costs cannot be anticipated but it is necessary to take into consideration factors which might realize such a reduction during the development stages. As the simplification of the model can be expected to result in a reduction of costs and savings of foreign capital the simplification should be immediately undertaken and at the same time this trial development and research for the economical model begin and on the basis of the results of these activities a re-consideration of the model change be carried out.

Attached Table 2-1 CONTENTS OF THE PROJECT FOR PROVISION OF MACHINERY AND EQUIPMENT FOR PRODUCTION OF ECONOMICAL POWER TILLER AT NO.3 HI

| Place of installation / Item | No.3 HI | |
|---|---|---|
| | Economical power tiller (new design) | Simplication and modification of existing model (KMB 200) |
| Building | New building will be constructed.<br>Required area: 40 m x 95 m = 3,800 $m^2$ | Present building will be used. |
| Outline of machinery & equipment | 1) Machining facilities<br>2) Press working and welding facilities<br>3) Dies, jigs and inspection tools<br>4) Heat treatment facilities<br>5) Painting equipment<br>6) Assembling facilities | A. Will be simplified into specialized rotary tiller<br>B. Will be simplified into specialized plower or trailer tractor<br><br>None of building, technical guidance or engineering fee is necessary in simplifying existing model (KMB 200) as above, but when simplified and modified into specialized plower or trailer-tractor, jigs, dies and gauges for the additional parts will become necessary.<br><br>1) Additional parts for simplifying into specialized plower or trailer-tractor.<br>a) Hitch<br>b) Hitch receptacle<br>c) Handle reinforcement<br>d) Handle weight fitting pipe<br><br>2) Jigs, dies and gauges for production of additional parts will become necessary. |
| Technical data and technical guidance | Technical data (materials)<br>1) Processing manual<br>2) Inspection manual<br>3) Drawings of jigs and dies<br>4) Manual for installing machinery and equipment<br>5) Manual for handling and operation of machinery and equipment<br>6) Assembling manual<br><br>Technical guidance<br>1) Guidance on construction of building: 6 man-months<br>2) Guidance on installation of machinery and equipment: 12 man-months<br>3) Guidance on processing of parts: 12 man-months | |
| Major component parts and materials | 1) Maker's speciality parts<br>2) Sheet metal<br>3) Bar steel, etc.<br>4) Others | |
| Operating cost | 1) Power 389 kW<br>2) Water 2,154 $m^3$/Hr<br>3) Compressed air 1.8 $m^3$/Hr | |
| Required operating manpower | 76 persons | |
| Remarks | | |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 9-4(1) Model Change of Power Tiller
- No.3 HI: @ AME Project Plants -

| No | Items | Unit | No. |
|---|---|---|---|
| 1 | Bldg & Land | | |
| A | Land | | |
| B | Building materials | Lot | 1 |
| 2 | Imported M/E | | |
| 1 | M/E for simplified type | | |
| 1 1 | Jigs and dies for additional CP | Set | 1 |
| 2 | M/E for production of ecnomic type | | |
| 2 1 | Machining | | |
| 2 1 1 | Bed type vertical milling machine | Set | 1 |
| 2 1 2 | Special purpose boring machine | Set | 1 |
| 2 1 3 | Special purpose boring machine | Set | 1 |
| 2 1 4 | Upright drilling machine | Set | 1 |
| 2 1 5 | Radial drilling machine | Set | 2 |
| 2 1 6 | Bed type horizontal milling machine | Set | 1 |
| 2 1 7 | Multiple spindle drilling machine | Set | 1 |
| 2 1 8 | Washing equipment | Set | 1 |
| 2 1 9 | Roller conveyors | Set | 1 |
| 2 110 | Circular sawing machine | Set | 1 |
| 2 111 | Centering and facing machine | Set | 1 |
| 2 112 | NC lathe | Set | 1 |
| 2 113 | NC lathe | Set | 3 |
| 2 114 | Engine lathe | Set | 1 |
| 2 115 | Rolling machine | Set | 1 |
| 2 116 | Spline hobbing machine | Set | 1 |
| 2 117 | Cylindrical grinding machine | Set | 1 |
| 2 118 | Broaching machine | Set | 1 |
| 2 119 | Gear hobbing machine | Set | 2 |
| 2 120 | Gear shaping machine | Set | 1 |
| 2 121 | Chamfering machine | Set | 1 |
| 2 122 | Gear shaving machine | Set | 1 |
| 2 123 | Gear deburring and chamfering machine | Set | 1 |
| 2 124 | Upright drilling machine | Set | 1 |
| 2 125 | Upright tapping machine | Set | 1 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 9-4(2) Model Change of Power Tiller
- No.3 HI: @ AME Project Plants -

| No | Items | Unit | No. |
|---|---|---|---|
| 2 126 | Radial drilling machine | Set | 1 |
| 2 127 | Bench drilling machine | Set | 1 |
| 2 128 | Internal grinding machine | Set | 1 |
| 2 129 | Bed type vertical milling machine | Set | 1 |
| 2 130 | Bed type Vertical milling machine | Set | 1 |
| 2 131 | Bed type horizontal milling machine | Set | 1 |
| 2 132 | Bushing press | Set | 1 |
| 2 133 | Multiple spindle drilling machine | Set | 1 |
| 2 134 | Belder | Set | 1 |
| 2 135 | Washing equipment | Set | 1 |
| 2 136 | Micrometer, caliper, dial indicator, height master, etc. | Lot | 1 |
| 2 2 | Press and welding | | |
| 2 2 1 | Crank press 60ton | Set | 1 |
| 2 2 2 | Crank press 300ton | Set | 1 |
| 2 2 3 | Mechanical shearing machine | Set | 1 |
| 2 2 4 | Hydraulic pipe bender machine | Set | 1 |
| 2 2 5 | Cut off machine | Set | 1 |
| 2 2 6 | Bench type drilling & tapping machine | Set | 1 |
| 2 2 7 | Cutting grinder | Set | 1 |
| 2 2 8 | Spot welding machine 55KVA | Set | 1 |
| 2 2 9 | Semi automatic CO2 arc welder 350A | Set | 2 |
| 2 210 | Gas cutting & welding machine | Set | 1 |
| 2 211 | Brazing equipment | Set | 1 |
| 2 212 | Copy gas cutting machine | Set | 1 |
| 2 213 | Torch turn type arc welding machine | Set | 1 |
| 2 214 | Suspention crane 250kg | Set | 1 |
| 2 215 | Micrometer, caliper, dial indicator, height master, etc. | Lot | 1 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 9-4(3) Model Change of Power Tiller
- No.3 HI: @ AME Project Plants -

| No | Items | Unit | No. |
|---|---|---|---|
| 2 3 | Jig, die & gauge for local manufacturing parts | Lot | 1 |
| 2 4 | Heat treatment | | |
| 2 4 1 | High frequency hardening equipment | Set | 1 |
| 2 4 2 | Pit type carburizing furnace | Set | 1 |
| 2 4 3 | Heating furnace | Set | 1 |
| 2 4 4 | Quenching tank | Set | 1 |
| 2 4 5 | Tempering furnace | Set | 1 |
| 2 4 6 | Washing equipment | Set | 1 |
| 2 4 7 | Straighteing press | Lot | 1 |
| 2 4 8 | Work coil for chassis | Lot | 1 |
| 2 4 9 | Tray and fixture | Set | 1 |
| 2 5 | Painting | | |
| 2 5 1 | Pretreatment equipment | Set | 1 |
| 2 5 2 | Dry oven | Set | 1 |
| 2 5 3 | Free curve conveyors for pretreatment | Set | 1 |
| 2 5 4 | Painting booth | Set | 2 |
| 2 5 5 | Bake oven for painting | Set | 1 |
| 2 5 6 | Painting instrument (air spray gun, etc.) | Set | 1 |
| 2 5 7 | Free curve conveyors for painting | Set | 1 |
| 2 5 8 | Suspension crane 250kg | Set | 1 |
| 2 5 9 | Jig:primary hanger, S type hanger, masking cover, etc. | Lot | 1 |
| 2 510 | Transporation equipment:pallet truck 1.5ton, pallet, etc. | Lot | 1 |
| 2 6 | Chassis assembly | | |
| 2 6 1 | Ass'y equipment:bushing press 5ton | Set | 1 |
| 2 6 2 | Ass'y equipment:air piping | Set | 1 |
| 2 6 3 | Ass'y equipment:Lighting equipment | Set | 1 |
| 2 6 4 | Ass'y equipment:motor chain block with rail | Set | 1 |
| 2 6 5 | Ass'y equipment:suspention frame for tools | Set | 1 |
| 2 6 6 | Jig:pressing stand, driving tool, arbor, etc. | Lot | 1 |
| 2 6 7 | General tool:impact wrench, screw driver, hand tool, etc. | Lot | 1 |
| 2 6 8 | Measuring instrument:motoring test equip., etc. | Lot | 1 |
| 2 6 9 | Transportation equipment:pallet truck 1.5ton, etc. | Lot | 1 |

Attached Table 3-1 LIST OF REQUIRED FACILITIES

#: 9-4(4) Model Change of Power Tiller
- No.3 HI: @ AME Project Plants -

| No | Items | Unit | No. |
|---|---|---|---|
| 2 610 | Rigging ass'y:air piping | Set | 1 |
| 2 611 | Rigging ass'y:lighting equipment | Set | 1 |
| 2 612 | Rigging ass'y:motor chain block with rail | Set | 1 |
| 2 613 | Rigging ass'y:motor chain block with rail | Set | 1 |
| 2 614 | Rigging ass'y:suspension frame for tools | Set | 1 |
| 2 615 | Jig:rigging ass'y jig, setting tool, etc. | Lot | 1 |
| 2 616 | General tool:impace wrench, screw driver, hand tool, etc. | Lot | 1 |
| 2 617 | Transportation equipment:pallet truck 1.5ton, etc. | Lot | 1 |
| 2 7 | Transporation | | |
| 2 7 1 | 3ton fork lift truck | Set | 1 |
| 2 7 2 | 1.5ton fork lift truck | Set | 1 |
| 2 7 3 | Other small equipment:pallet truck 1.5ton, etc. | Lot | 1 |
| 2 7 4 | Chassis final inspection:steel rule, convex rule, etc. | Lot | 1 |
| 2 8 | Others | | |
| 2 8 1 | Wiring & piping material for power line | Lot | 1 |
| 2 8 2 | Air compressor:75kW | Set | 1 |

Attached Table 3-2: REQUIRED INVESTMENT (#9-4)
- Model simplification -
(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) | 11.9 | - | 11.9 |
| | 2 | Freight & Insurance | 1.0 | - | 1.0 |
| | | Sub-total | 12.9 | - | 12.9 |
| | 3 | Import Duty | - | 1.9 | 1.9 |
| | 4 | Unloading | - | 0.2 | 0.2 |
| | 5 | Installation Cost | - | 0.1 | 0.1 |
| | | Imported M/E Total | 12.9 | 2.2 | 15.1 |
| 3 | | Local M/E | - | 0.0 | 0.0 |
| 4 | | Other Costs | | | |
| A | | License Fee | 0.0 | - | 0.0 |
| B | | Eng Fee | 0.0 | - | 0.0 |
| C | | Software | 0.0 | - | 0.0 |
| D | | Interest | 0.0 | - | 0.0 |
| | | Other Costs Total | 0.0 | - | 0.0 |
| | | Total Investment | 12.9 | 2.2 | 15.1 |

Attached Table 3-2: REQUIRED INVESTMENT (#9-4)
- Development of Economic Type -
(Unit: million yen)

| | Items | Investment | | |
|---|---|---|---|---|
| | | Foreign | Local | Total |
| 1 | Bldg & Land | | | |
| A | Land | - | 0.0 | 0.0 |
| B 1 | Building | 218.9 | 305.2 | 524.1 |
| 2 | Freight & Insurance | 17.5 | - | 17.5 |
| | Sub-total | 236.4 | 305.2 | 541.6 |
| 3 | Import Duty | - | 35.5 | 35.5 |
| 4 | Unloading | - | 3.3 | 3.3 |
| | Building Total | 236.4 | 344.0 | 580.4 |
| | Bldg & Land Total | 236.4 | 344.0 | 580.4 |
| 2 1 | Imported M/E (FOB) | 1589.0 | - | 1589.0 |
| 2 | Freight & Insurance | 127.1 | - | 127.1 |
| | Sub-total | 1716.1 | - | 1716.1 |
| 3 | Import Duty | - | 257.4 | 257.4 |
| 4 | Unloading | - | 24.0 | 24.0 |
| 5 | Installation Cost | - | 36.0 | 36.0 |
| | Imported M/E Total | 1716.1 | 317.4 | 2033.5 |
| 3 | Local M/E | - | 0.0 | 0.0 |
| 4 | Other Costs | | | |
| A | License Fee | 10.0 | - | 10.0 |
| B | Eng Fee | 54.0 | - | 54.0 |
| C | Software | 0.0 | - | 0.0 |
| D | Interest | 0.0 | - | 0.0 |
| | Other Costs Total | 64.0 | - | 64.0 |
| | Total Investment | 2016.5 | 661.4 | 2677.9 |

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

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 87.3 | - | 87.3 | 76 |
| | Freight & Insurance | 7.0 | - | 7.0 | 6 |
| | Import Duty | - | 14.1 | 14.1 | 12 |
| | Unloading | - | 1.3 | 1.3 | 1 |
| | Sub-total | 94.3 | 15.4 | 109.7 | 96 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 94.3 | 15.4 | 109.7 | 96 |
| 2 | Utilities | 0.0 | 0.0 | 0.0 | 0 |
| | Variable Cost | 94.3 | 15.4 | 109.7 | 96 |
| 3 | Depreciation | 0.8 | 0.2 | 1.0 | 1 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 0.4 | 0.1 | 0.5 | 0 |
| 6 | Design Fee | 0.0 | - | 0.0 | 0 |
| 7 | Labor | - | 0.0 | 0.0 | 0 |
| 8 | Ovehead | - | 2.9 | 2.9 | 3 |
| 9 | Admin.Cost | - | 0.7 | 0.7 | 1 |
| | Fixed Cost | 1.2 | 3.9 | 5.1 | 4 |
| | Annual Cost | 95.5 | 19.3 | 114.8 | 100 |
| | Unit P.Cost | | | 191333.3 | |
| 10 | Mark-up | | | 5740.0 | |
| 11 | Excise Tax | | | 39414.7 | |
| | Ex-fact.Cost | | | 236488.0 | |

Attached Table 3-3: PRODUCTION COST STATEMENT (#9-4)
- Development of Economic Type -

| | Items | Annual Cost (million Yen) F/C | L/C | Total | Component (%) |
|---|---|---|---|---|---|
| 1 | CP/RM | | | | |
| A | Imported CP/RM (FOB) | 111.1 | - | 111.1 | 27 |
| | Freight & Insurance | 8.9 | - | 8.9 | 2 |
| | Import Duty | - | 18.0 | 18.0 | 4 |
| | Unloading | - | 1.7 | 1.7 | 0 |
| | Sub-total | 120.0 | 19.7 | 139.7 | 35 |
| B | Local CP/RM | - | 0.0 | 0.0 | 0 |
| | CP/RM Total | 120.0 | 19.7 | 139.7 | 35 |
| 2 | Utilities | 0.0 | 4.8 | 4.8 | 1 |
| | Variable Cost | 120.0 | 24.5 | 144.5 | 36 |
| 3 | Depreciation | 112.5 | 32.2 | 144.7 | 36 |
| 4 | Amortization | 0.0 | - | 0.0 | 0 |
| 5 | Maintenance | 58.6 | 18.7 | 77.3 | 19 |
| 6 | Design Fee *) | 14.8 | - | 14.8 | 4 |
| 7 | Labor | - | 11.1 | 11.1 | 3 |
| 8 | Ovehead | - | 10.1 | 10.1 | 2 |
| 9 | Admin.Cost | - | 2.4 | 2.4 | 1 |
| | Fixed Cost | 185.9 | 74.5 | 260.4 | 64 |
| | Annual Cost | 305.9 | 99.0 | 404.9 | 100 |
| | Unit P.Cost | | | 404900.0 | |
| 10 | Mark-up | | | 12147.0 | |
| 11 | Excise Tax | | | 83409.4 | |
| | Ex-fact.Cost | | | 500456.4 | |

Note: *) Royalty ; 3 % of ex-factory price