Heat Treatment Servicing Unit

PRODUCT CODE: 344020002
QUALITY AND STANDARDS: IS EN and I.S. (as per the metal Specification)
MONTH AND YEAR OF PREPARATION: December, 2002
PREPARED BY: Small Industries Service Institute
                     Kanjani Road, Ayyanthole,
                     Thrissur - 680 003
                     Kerala,

UPDATED ON: March 2011
UPDATED BY: MSME- DI, Thrissur

INTRODUCTION

Heat Treatment is a term used for hardening and tempering of Metal components/Mechanical products of Ferrous and Non-Ferrous origin to increase the life or mechanical properties. Steel in general, supplied in annealed conditions having hardness between 140 to 280 BHN depending on the percentage of alloying elements which facilitate further mechanical operations. 15%–20% of the steel produced is tool steel which will be the raw material for manufacturing of gears, fixtures, shafts, cutting tools, blades and many more products. If these products are used in soft conditions, it will be worn out in a short period. Hence such products are to be hardened and tempered. Heat Treatment is a general term which consists of processes like Hardening, Tempering, Annealing and Case Hardening etc.

MARKET POTENTIAL

Demand in the market mainly arises from:
1. Defence
2. Railways
3. Automobile
4. Ball & Roller Bearings
5. General Engineering
6. Fasteners and Hardware

The demand in the above areas again depends upon the primary market, i.e., replacement market and substitution market. Most of the general engineering units in SSI Sector offload the Heat Treatment jobs to servicing units because they may not have enough capital for an independent Heat Treatment section.

BASIS AND PRESUMPTIONS

The profile is worked out on the basis of following presumptions:

1. Working hours/shift 8 hrs/day
2. No. of shift/day Single
3. No. of working days/annum 300 days
4. Efficiency of the plant 75%
5. Time for achieving max. two years from capacity the date of
   Commencement of production
6. Labour charges as per the Minimum Wages Act of the State Govt.
7. Margin Money 25%
8. Rate of Interest 14% per annum
9. Pay back period 5 years
10. Land and Building On Rent
11. The cost of machinery and equipment is on the basis of prevailing market rates
12. The selling rates are calculated 1% lower than the present market rates to facilitate
   competition and credit period.

IMPLEMENTATION SCHEDULE
The major activities and their implementation schedule are furnished below. The
assessment of the time required for implementation of the project has been considered
and counted from the date of sanction of the loan.

Activity Period in Days

1. Preparation of scheme and SSI Provisional Registration 15 days
2. Financial arrangements 60 days
3. Procurement of M/c & Installation 60 days
4. Power and water connection 30 days
5. Infrastructure and communication 30 days
All these activities are to be carried out simultaneously. The commencement of
production should be within 3 months.

TECHNICAL ASPECTS

Process of Manufacture
The Heat Treatment processes involve a series of operations, mainly:
1. Hardening (which follows Tempering)
2. Annealing/Normalizing/Stress relieving
3. Carburising/Case Hardening All Direct hardening materials are heated in the muffle
   furnace. The material is heated to the pre-determined temperature and the required
   soaking time is given. Then it is rapidly cooled in water, oil or air. Then it should be
   tempered at low temperature to remove the stresses developed inside. Direct
   hardening and case hardening process can be carried out in salt bath furnace also which
   is more productive and with 100% prevention of oxidation. In this process, jobs are to
   be preheated compulsorily, as the jobs are put into the furnace at higher temperature.
   The hardening and tempering procedures are the same as mentioned earlier. The salt
   bath should have cyanide salt of 18% to 20% concentration.

Quality Control and Standards
1. NDT Test for crack/flaw defects.
2. Microscopic test for structure.
3. Hardness Testing in RA, RB, RC and BHN which are faster and sure for Metal
condition. Quality Standards conform to IS and EN Standards.

**Production Capacity (per annum)**
Quantity : 65 M.T.
Value : Rs.26,00,000

**Motive Power** 30 H.P. 22.5 kW

**Pollution Control**
The work shed should be well ventilated with exhaust fans. Disposable waste salt, acids etc. should be treated before disposed off. Smoke from the chimney can be controlled effectively by monitoring furnace oil flow by using LDO.

**Energy Conservation**
Waste gases from the salt bath can be routed to pre-heating chamber which is an option.

**FINANCIAL ASPECTS**

**A. Fixed Capital**

(i) **Land and Building Rent**

<table>
<thead>
<tr>
<th>Covered Area (for office, 400sq.ft. store, work place)</th>
<th>@ Rs.25/sq.ft.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>20,000</td>
</tr>
</tbody>
</table>

(ii) **Machinery and Equipments**

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Description</th>
<th>Indigenous/Imported</th>
<th>Qty</th>
<th>Rate (In Rs.)</th>
<th>Amount (In Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Electrical muffle furnace, 600x300x300 mm with automatic Temp. Control, panel board, max. temp. 10000 24 KW</td>
<td>Indigenous</td>
<td>1 No.</td>
<td>1,52,000</td>
<td>1,52,000</td>
</tr>
<tr>
<td>2.</td>
<td>Air circulating Tempering furnace with temp control, panel board, Max.power.18 KW</td>
<td>-do-</td>
<td>1 No.</td>
<td>2,10,000</td>
<td>2,10,000</td>
</tr>
<tr>
<td>3.</td>
<td>Oil fired salt bath furnace 2 HP Motorised, blower 2800 RPM, Pot size 450 x 600 mm, LAP-1 Burner Temp. indicator, Max temp. 1000ºC</td>
<td>- do -</td>
<td>1 No.</td>
<td>4,18,000</td>
<td>4,18,000</td>
</tr>
<tr>
<td>4.</td>
<td>Hardness testing m/c 150 kg. Load, reading of RA, RB and RC with 120O iron ball and 2 &amp; 5 mm dia steel ball indentors</td>
<td>- do -</td>
<td>1 No.</td>
<td>61,000</td>
<td>61,000</td>
</tr>
<tr>
<td>5.</td>
<td>Pre-heating chamber for salt bath furnace</td>
<td>-do-</td>
<td>1 No.</td>
<td>1,10,000</td>
<td>110,000</td>
</tr>
<tr>
<td>6.</td>
<td>Quenching tanks 1Mx0.75 Mx1 M</td>
<td>- do -</td>
<td>4 Nos.</td>
<td>10,000</td>
<td>40,000</td>
</tr>
<tr>
<td>7.</td>
<td>1 MT capacity chain pulley block with tripoy</td>
<td>- do -</td>
<td>1 No.</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>8.</td>
<td>Platform type trolleys</td>
<td>- do -</td>
<td>2 Nos.</td>
<td>3,000</td>
<td>6,000</td>
</tr>
<tr>
<td>9.</td>
<td>Hand tools</td>
<td>- do -</td>
<td>L.S.</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Power tools</td>
<td>- do -</td>
<td>L.S.</td>
<td>20,000</td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Handling tools</td>
<td>- do -</td>
<td>L.S.</td>
<td>10,000</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td>Weighing M/c platform type 200 kg</td>
<td>- do -</td>
<td>1 No.</td>
<td>20,000</td>
<td>20,000</td>
</tr>
<tr>
<td>13.</td>
<td>Fire fighting equipment</td>
<td>- do -</td>
<td>L.S.</td>
<td>15,000</td>
<td></td>
</tr>
</tbody>
</table>

**Total 10,92,000**

14. Office and workshop furniture and equipment | 40,000 |
15. Erection and Electrification | 80,000 |
HEAT TREATMENT SERVICING UNIT

B. Working Capital (per month)

(i) Raw Materials (per month)

One time raw materials such as Neutral salt, cyanide and quenching oils are required for initial filling.

<table>
<thead>
<tr>
<th>Sl. Description</th>
<th>Indigenous Qty.</th>
<th>Rate (In Rs.)</th>
<th>Amount (In Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Natural Salt</td>
<td>100 kg</td>
<td>15/kg</td>
<td>1,500</td>
</tr>
<tr>
<td>2. Cyanide Salt</td>
<td>-do- 150 kg</td>
<td>110/kg</td>
<td>16,500</td>
</tr>
<tr>
<td>3. Barium carbonate</td>
<td>-do- 50 kg</td>
<td>26/kg</td>
<td>1300</td>
</tr>
<tr>
<td>4. Quenching oil</td>
<td>-do- 4 Barrel</td>
<td>24,000</td>
<td>72,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(one time investment) 91,300</td>
</tr>
</tbody>
</table>

(ii) Personnel

Administrative and Workshop

<table>
<thead>
<tr>
<th>Sl. Designation</th>
<th>Nos.</th>
<th>Salary (In Rs.)</th>
<th>Amount (In Rs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Manager</td>
<td>1</td>
<td>15,000</td>
<td>15,000</td>
</tr>
<tr>
<td>2. Supervisor</td>
<td>1</td>
<td>10,000</td>
<td>10,000</td>
</tr>
<tr>
<td>3. Clerk</td>
<td>2</td>
<td>6,000</td>
<td>6,000</td>
</tr>
<tr>
<td>4. Skilled Workers</td>
<td>2</td>
<td>7,000</td>
<td>14,000</td>
</tr>
<tr>
<td>5. Unskilled Workers</td>
<td>6</td>
<td>4,000</td>
<td>24,000</td>
</tr>
<tr>
<td>6. Watch &amp; Ward</td>
<td>2</td>
<td>4000</td>
<td>8,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>Total 77,000</strong></td>
</tr>
</tbody>
</table>

Perquisites @ 15% 11,550

Total 88,550

(iii) Other Contingent Expenses (per month) (In Rs.)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rent</td>
<td>20,000</td>
</tr>
<tr>
<td>2</td>
<td>Stationery, Postage, Telephone</td>
<td>3,000</td>
</tr>
<tr>
<td>3</td>
<td>Electricity and Water</td>
<td>8,500</td>
</tr>
<tr>
<td>4</td>
<td>Transport and Conveyance</td>
<td>3,000</td>
</tr>
<tr>
<td>5</td>
<td>Maintenance and Repairs</td>
<td>2500</td>
</tr>
<tr>
<td>6</td>
<td>Consumable Stores</td>
<td>4,000</td>
</tr>
<tr>
<td>7</td>
<td>Tax</td>
<td>750</td>
</tr>
<tr>
<td>8</td>
<td>Miscellaneous</td>
<td>4,000</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>45,750</strong></td>
</tr>
</tbody>
</table>

(iv) Working Capital (per month) (Rs.)

<table>
<thead>
<tr>
<th>No.</th>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Raw materials (one time investment)</td>
<td>91,300</td>
</tr>
<tr>
<td>2</td>
<td>Salaries and Wages</td>
<td>77,000</td>
</tr>
<tr>
<td>3</td>
<td>Other Contingent Expenditure</td>
<td>45,750</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>2,14,050</strong></td>
</tr>
</tbody>
</table>

(v) Working Capital (for 3 months) (Rs.)

Working Capital

for 3 months = (2,14,050−91,300)×3+91,300 = **4,59,550**
C. Total Capital Investment
   a. Fixed Capital  Rs. 12,62,000
   b. Working Capital for 3 months Rs. 4,59,550
       Total Rs.17,21,550

FINANCIAL ANALYSIS
(1) Cost of Production (per annum)  (Rs.)
   a) Recurring Expenses  15,64,300
      (2,14,050–91,300)×12+91,300
   b) Depreciation on Machinery @ 10%  109200
   c) Depreciation on Office Equipment @20%  8,000
   b) Interest on Capital @ 14%  2,41,017
       Total  19,22,517
       Say 19,25,000

(2) Turnover (per annum)
   Sl. Activity Job  Qty./Kg.  Rate(In Rs.)  Amount(In Rs.)
   1 By executing direct hardening  15 MT  35  5,25,000
   2 Case Hardening jobs  30 MT  45  13,50,000
   3 Annealing/ Normalising  5 MT  25  1,25,000
   4 Special Steels  15 MT  40  6,00,000
       Total  26,00,000

(3) Profitability (per annum)
   Rs. 26,00,000 – 19,25,000 = Rs. 6,75,000

(4) Net Profit Ratio = \( \frac{\text{Net Profit per year} \times 100}{\text{Sales per annum}} \)
   = \( \frac{6,75,000 \times 100}{26,00,000} \)
   = 25.96%

(5) Rate of Return = \( \frac{\text{Net Profit per year} \times 100}{\text{Total Capital Investment}} \)
   = \( \frac{6,75,000 \times 100}{17,21,550} \)
   = 39.20%

(6) Break-even Point
   Fixed Cost (per annum)  (Rs.)
   1. Rent  2,40,000
   2. Interest on Investment  2,41,017
   3. Depreciation on machinery and Office Equipment  117,200
   4. 40% of Salaries/Wages  4,25,040
   5. 40% of other expenses  1,23,600
   excluding rent
   Total 11,46,857
   Say 11,47,000

   B.E.P. = \( \frac{\text{Fixed cost} \times 100}{\text{Fixed cost + Net Profit}} \)
   = \( \frac{11,47,000 \times 100}{11,47,000 + 6,75,000} \)
   = 62.9%
Addresses of Machinery Suppliers

1. M/s. Hindustan Furnaces Pvt. Ltd.  
   Viyur, Thrissur-680 010  
   Kerala.
2. M/s. Amur Instrumentation  
   Amala Nagar P.O.,  
   Thrissur-680 550  
   Kerala.
   1-C II Phase, Peenya I.A.,  
   P. B. No. 5809  
   Bangalore-560 058
   W-91, MIDC, I.A., Belapur Road,  
   Thana-400 701.

For Testing M/C
5. M/s. Inspection Instruments Corpn.  
   7, Sherif Douj Street,  
   Zakaria Bldg.,  
   Mumbai-400 003
6. M/s. Fuel Instrument and  
   Engineers Pvt. Ltd.  
   Ichalkaranchi,  
   (Maharashtra)
7. M/s. Blue Steel Engineers Pvt. Ltd.  
   Blue Steel House, D-12 MIDC,  
   Marol Ambhri (East),  
   Mumbai-400 073

For Quenching Oil, LDO and Furnace Oil
8. M/s. Indian Oil Corporation

For Sodium Cyanide Salt
9. Local Chemical Dealers