

Gold Plating on Metallic Optical Frames and Jewellery

PRODUCT CODE	:	344021009									
PRODUCTION CAPACITY	:	<table> <thead> <tr> <th>Item</th> <th>Qty.</th> <th>Value (Rs.)</th> </tr> </thead> <tbody> <tr> <td>Optical Frames</td> <td>2 lacs</td> <td>4.00.000</td> </tr> <tr> <td>Jewellery</td> <td>600 sq.mtrs</td> <td>13,20,000</td> </tr> </tbody> </table>	Item	Qty.	Value (Rs.)	Optical Frames	2 lacs	4.00.000	Jewellery	600 sq.mtrs	13,20,000
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Optical Frames	2 lacs	4.00.000									
Jewellery	600 sq.mtrs	13,20,000									
QUALITY AND STANDARDS	:	As per the customer's specification									
MONTH AND YEAR OF PREPARATION	:	January, 2003									
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INTRODUCTION

Gold is a relatively scarce yellow metal often found in the native State, which is the most valuable of all metals. It is extremely corrosion resistant but it may be dissolved by aqua-regia, Potassium cyanide solution and in aqueous solution of the halogens. The metal does not form a coherent oxide film on its surface even at very high temperature and therefore, it has a very low contact resistant.

First of all the Gold plating was done by the ancient Egyptians, but this was only a thin hammered film on other metals, in the middle ages the process called fire gilding was used to 'plate' objects. In this method the articles were coated with a mercury/gold amalgam and subsequently heated to drive off the

mercury with the result a layer of pure gold was left. True electroplating of gold dates from the discovery of the double cyanide of gold and potassium around the middle of the 19th century.

Gold electroplating is mostly carried out to obtain long lasting decorative finishes and in some cases to improve electric contact and conductivity. It is deposited from alkaline or acidic solution. The metal concentration in the bath is low because of the high price of gold. The electrolytes are heated to 50° to 70°C to obtain a reasonable speed of deposition. The cathode efficiency depends upon the metal concentration and the temperature.

The colour of gold deposits depends upon the operating temperature, current density and metal concentration and

also on the composition of the electrolyte. Light yellowish coatings are obtained at low current density, low temperature and high metal concentration. A light colour is also obtained by adding nickel salts while red gold is deposited from baths containing copper. The anodes are composed of very pure sheet gold or some times insoluble carbon. In the later case the concentration must be maintained by adding metal salt.

MARKET POTENTIAL

A number of applications are available for electroplating units. These are:

DECORATIVE

The important uses are in the Jewellery, Cutlery and allied trades, fancy goods such as hand bags, optical frames, power compacts and costumes jewellery. Thin deposit of pure gold may be applied over bright nickel and this can be more economic where wear resistance is required such as in watch cases, pen cases, plumbing fixtures.

INDUSTRIAL USES

The most important industrial use of electroplated gold is in the electronic industries which has grown in the last few years. Because of its unique properties it has become valuable element in the fabrication of micro-electronic and electronic devices such as calculators, transistors and diodes. Larger items such as heat sinks, heater, springs, wires connectors, printed circuits often use gold to protect the tract.

BASIS AND PRESUMPTIONS

1. The efficiency of unit is calculated at 70% of the total production capacity, the unit will work 25 days in a month on single shift basis and 300 days in a year.
2. The time period for achieving the full envisaged capacity utilization is six months.
3. The labour wages are as per the prevailing market rate.
4. The rate of interest for fixed and working capital is taken as 14%.
5. The margin money requirement for this project is 30%.
6. The pay back period of this project is 5 years.

IMPLEMENTATION SCHEDULE

Time required for preparation of Project	2 months
Time requirement for selection of site	1 month
Time required for registration as small scale unit	1 week
Time required for acquiring loan, Machinery procurement, erection and commissioning	2 months
Recruitment of labours etc.	1 month
Trial runs	1 month

TECHNICAL ASPECTS

Process of Manufacture

The gold is mainly electro deposited from gold Potassium Cyanide(GPC)

solution which contains a certain quantity of gold.

The articles which are to be plated are cleaned in a suitable hot alkaline soak cleaner and rinsed well. Then the article is pickled and etching is done in the chromic/sulphuric acid for 1 to 2 minutes at 60 to 70° C.

After etching, the articles are transferred to plating bath where the gold is deposited from the bath. The following sequence of operation is usually followed in gold plating:

Article–Hot clean or degrease–swill–pickle–Swill–Dry–Polished–Aqueous cleaning–Hot clean cathodic–swill–Acid dip, if required–Swill–Final clean cathodic/ Anodic–swill–Cyanide dip–swill–Bright Nickel Plating–Washing–Gold Plating– drying.

The articles are hanged in the cathode bar of the plating bath where the plating is done. Anode is made up of the pure gold metal (Electrode), Then DC current is passed between anode and cathode and gold is deposited on the job. The thickness of deposit depends on the time of deposit and current density.

Preparation of the Bath

To prepare the gold plating bath, first clean the PVC lined plating tank with hot dilute acid and wash it out and again fill it to one third of its capacity with distilled water. The temperature of the water is raised to 60°C and the required weight of potassium gold cyanide and other chemicals are added. The mixture being agitated well until all the salts are dissolved. Now the bath can be filled up to the required final level and the solution must be purified to remove the traces of the metallic impurities.

Many formulations have been prepared so far for the gold plating. However, typical formulation and operating, conditions are given below:

Potassium Cyanide	12 Gms.
Potassium Gold Cyanide	18 Gms.
Caustic Potash	12 Gms.
Potassium Sulphite	5 Gms.
Distilled Water	1 Ltre
Temperature	120°F To 180°F
Current Density	2 – 6 amp/ Sq. ft.
Volt	1.5 – 2 Volts

Now a days a readymade gold plating salt is available in the market in which the required proportion of the chemicals are mixed which can also be utilized for the purpose.

Quality Control Standards

As per the Customer's specification.

Production Capacity (per annum)

Item	Qty.	Value (Rs.)
(i) Optical Frames	2 lakh nos.	14,00,000
(ii) Jewellery	600 Sq. mtrs.	13,20,000
	Total	27,20,000

Motive Power

7 K.W.

Pollution Control

The unit has been identified as the polluting industry. Hence no objection certificate has to be taken from the State Pollution Control Board before starting the unit.

Energy Conservation

The proper planning and proper utilization of the machinery may save the energy.

FINANCIAL ASPECTS

A. Fixed Capital

(i) Land and Building

	Area Sq.mtrs.	Rate Rs. Sq.Mtrs.	Value (Rs.)
Land	100	500	50,000
Built up area	75	2000	1,50,000
	Total		2,00,000

(ii) Machinery and Equipments

Description	Qty. (Nos.)	Value (Rs.)
Rectifier single phase DC output, 200 Amp 6 Volts Complete with Meter panel etc.	1	40,000
Cleaning / swilling tank MS Cap 2' x 2' x 2'	2	10,000
Nickel Plating tank Size 3' x 3' x 3' MS, PVC Lined with electrode Pipe and immersion heater	1	20,000
Etching tank 2' x 2' x 2' MS Rubber Lined with lip duct And blower arrangement	1	15,000
Gold plating tank 3' x 3' x 3' MS PVC Lined with lip duct and Blower Arrangement	1	20,000
Buffing machine single Phase 220 to 240 volts RPM 1440 with other accessories	1	10,000
Miscellaneous machineries PP Tubes, Jigs etc.	L.S.	30,000
Pollution control Equipment Exhaust System etc.	L.S.	1,00,000
Energy Conservation	L.S.	10,000
Testing equipment		10,000

Electrification and Installation Charges @ 10% of cost of Machinery and equipment	26,500
Total cost of Machinery and Equipment	2,91,500
Cost of office equipment/ Working Table etc.	L.S. 50,000
Total	3,41,500

(iii) Pre-operative Expenses Rs. 20,000

Total Fixed Capital

(i+ii+iii) = Rs. 2,00,000+Rs. 3,41,500+Rs. 20,000
= Rs. 5,61,000

Working Capital (per month)

(i) Personnel

Designation	Nos.	Salary (Rs.)	Value (Rs.)
Production chemist/ manager	1	5000	5000
Supervisor/Quality Controller	1	4000	4000
Accountant-cum-Typist	1	3000	3000
Clerk-cum-Typist	1	2000	2000
Skilled Workers	2	2500	5000
Unskilled Workers	2	2000	4000
Peon	1	2000	2000
	Total		25,000
	<i>Perquisites @ 15% of salaries</i>		3750
	Total		28750
	Or say		28700

(ii) Raw Materials Including Packaging Requirement (per month)

Particulars	Qty.	Rate per Kg.	Value (Rs.)
Pure Gold (24 Carat)	200gm.	5 lakhs	1,00,000
Potassium Cyanide	6 Kg.	350 Kg.	2100
Caustic Potash	10 Kg.	56 Kg.	560
Potassium Sulphate	5 Kg.	4 Kg.	20
Miscellaneous Chemicals	L.S.		7320
Total			1,10,000

(iii) Utilities (per month)	(Rs.)
Power	11250
Water	1750
Total	13,000

(iv) Other Contingent Expenses (per month) (Rs.)	
Postage and Stationery	5000
Telephone	1,500
Consumable Stores	500
Repair and Maintenance	1500
Transportation Charges	1000
Advertisement and Publicity	1000
Insurance	1000
Total	11,500

(v) Total Recurring Expenditure (per month)

$$28700 + 13000 + 1,10,000 + 11,500 = \text{Rs. } 1,63,200$$

or say Rs. 1,63,000

(vi) Total Working Capital (for 3 months basis)
Rs. 4,89,600

C. Total Capital Investment

(i) Fixed Capital	5,61,000
(ii) Working capital	4,89,600
Total	10,50,600

Machinery Utilisation

Since this unit totally depends upon the job work, sufficient Job work should be assured before starting the unit. The suggested plant and machinery are sufficient to achieve the targeted production.

FINANCIAL ANALYSIS

I. Cost of Production (per year)	(Rs.)
i. Total recurring cost	19,56,000
ii. Depreciation on building @ 5%	7500
iii. Depreciation on machinery @ 10%	29,150
iv. Depreciation on office equipment @ 20%	10,000
v. Interest on total Capital investment @ 14%	1,47,084
Total	21,49,734
Or say	21,49,700

2. Turnover (per year)

Item	Qty.	Rate	Value (Rs.)
Optical frames	2 lakh nos.	7	14,00,000
Gold jewellery	600 Sqr. Mtrs.	2200	13,20,000
Total			27,20,000

3. Net Profit (per year)

$$= \text{Turnover Profit (Rs.)} - \text{Cost of Production}$$

$$= \text{Rs. } 27,20,000 - 21,49,700$$

$$= \text{Rs. } 5,70,300$$

4. Net Profit Ratio

$$= \frac{\text{Net Profit per year} \times 100}{\text{Turnover}}$$

$$= \frac{5,70,300 \times 100}{27,20,000}$$

$$= 20.9\%$$

5. Rate of Return

$$= \frac{\text{Net Profit per year} \times 100}{\text{Total Investment}}$$

$$= \frac{5,70,300 \times 100}{10,50,600}$$

$$= 54.2\%$$

6. Break-even Point

(i) Fixed Cost	(Rs.)
a. Depreciation on machinery and equipment	29,150
b. Depreciation of office equipment	10,000
c. Depreciation on building	7,500
d. Interest on total capital investment	1,47,084
e. Insurance	12,000
f. 40% of salary and wages	1,37,760
g. 40% of other contingent expenses	50,400
Total	3,93,894
Or say	3,94,000

(ii) Net Profit (per year)

$$\begin{aligned} \text{B.E.P.} &= \frac{\text{F.C.} \times 100}{\text{F.C.} + \text{Profit}} \\ &= \frac{3,94,000 \times 100}{3,94,000 + 5,70,300} \\ &= \frac{3.94,000 \times 100}{9,64,300} \\ &= 40.8\% \end{aligned}$$

Addresses of Machinery and Raw Material Suppliers

1. M/s. Bhavi Shilp Industries
5/C, Bajaan Industrial Estate,
Mumbai-400099
2. M/s. Komal Agencies
4, Shivaji Colony,
Nr. Darpan Cinema,
Andheri (East),
Mumbai-400099
3. M/s. Mahavir Chemical Industries
Mahavir Estate,
Behind Shah Chambers,
Nr. CTM Cross Lane,
Amraiwadi,
Ahmedabad
4. M/s. Delta Chemicals
6, Delta House,
J-I, Camazone,
Goregaon(E),
Mumbai-400063
5. M/s. Manish Sales Corpn.
178, Chetan Cloth Market,
Sarangpur Gate,
Ahmedabad-380001
6. M/s. Canning Mitra Phoenix Ltd.
Eucharstic Congress Bldg. III,
5, Convent Street,
Mumbai-400039
7. M/s. Grauer and Weel (India) Ltd.
Sukh Sagar,
6th Floor, N.S. Patkar Marg,
Choupati,
Mumbai-400007