

## **P.P. THERMOFORMING**

### **1. INTRODUCTION**

Thermoforming is one of many manufacturing processes that convert plastic resin into usable everyday products. Thermoforming is considered to be one of the most cost-effective processes in plastic manufacturing because of the low moulding costs and fast moulding cycles. Speed and cost efficiency are the highlighted qualities that thermoforming offers which lead the way for the process becoming so important in industry today.

We have entered into another area of plastic consumer goods, which are continuously replacing the traditional items. The use of disposable items is increasing day by day because of growing hygiene consciousness, low cost, easy usability and impressive appearance. The major products that are in use are disposable glasses, cups, plates and spoons. These have become a part of the hectic life style due to their convenience. Apart from being used at home, they also come in handy during parties, picnics and other functions and get-togethers. The major users of cups are the ice cream manufacturers and they have started using plastic cups instead of paper ones that were being used earlier. The main advantage of these plastic cups is that they are completely leak proof. Plastic cups can be made up of different sizes and they can hold bulk material easily in comparison to the traditional paper cups.

The new carry away fast food culture has created the demand for the articles to pack food items. These articles consist of a variety of packing boxes such as small tumblers, bowls, etc. Apart from this the use of blisters for packing pencil cells, toothbrushes, pens and a variety of toys,

etc. has also been on the rise. This is the new emerging area, which can be tapped as an ancillary support to the various products of different kind of above-mentioned products.

## **2. MARKET POTENTIAL**

As per the Working Group Report on Petrochemicals, Ministry of Chemicals & Fertilisers, the demand of PP Sheet in India is projected to be 22 KT by 2010-11.

The consumption of PP in PP Thermoformed Cups in India in 2004-05 was 11 KT. Looking to the advantage of thermoformed product, the demand has increased in various sectors for packaging and disposable cups etc. Some of the major sectors where thermoformed products are used are Food Industries, Pharmaceutical, Electronics, Horticulture. Cosmetics, Automobile Industry etc.

## **3. BASIS & PRESUMPTIONS**

- (i) The output capacity is taken as 100 Kgs/hr. The unit will work at 20 hrs. per day for 25 working days in a month and 300 days in a year. The output capacity may vary from machinery to machinery and the cost of machinery may also vary from supplier to supplier.
- (ii) The time period for achieving the full envisaged capacity utilisation is six months
- (iii) The labour wages are as per the prevailing rates in the market
- (iv) The rate of interest for fixed and working capital is taken as 12 per cent
- (v) The margin money requirement for this project is 30 per cent
- (vi) The pay back period of this project is 5 years
- (vii) The rate of land is taken @ Rs. 500/-per sq. mtr. and construction charges are taken @ Rs. 3500 per sq. mtr. This may also vary from place to place.

(viii) The present profile has to be updated taking into prevailing cost of land, building, machinery etc. at the time of implementation of the project

#### **4. IMPLEMENTATION SCHEDULE**

The Time requirement for preparation of Project report	:	Two months
Time requirement for selection of Site	:	One month
Time required for registration as Small Scale Unit	:	One Week
Time required for acquiring the loan		
Machinery procurement, erection and commissioning	:	Three months
Recruitment of labourer etc.	:	One month
Trial runs	:	One month

#### **5. TECHNICAL ASPECT**

##### **MANUFACTURING PROCESS**

In the thermoforming of PP, constant air pressure and the use of a preheating oven are essential requirements of a viable process. The heating station includes two plates, each consisting of 6 transversal rows with 5 IR heating elements. The total power of each plate as well as the power of each transversal row can be adjusted. The position of the thermic screen allows adjusting the length of the exposed zone of the sheet by a multiple of the forming step.

The thermoforming station consists of two mobile tables (lower) & (upper) on which the mould, the chamber and in some cases the mobile plugs are fixed. It is possible to introduce compressed air into the chamber and to create a vacuum in the mould. The mould is

thermoregulated. A measuring device allows visualizing the thermoforming cycle by measuring the pressure in the mould and in the chamber and the plug movement. On one cavity, contact sensors are installed. The cutting is a delicate operation for PP, especially when it is done after the forming station. In order to centre properly the cutting operation, the knives are mobile in relation to the frame. They are positioned with the help of TEFLON centering which lodge in the plastic cup. The knives are heated to 170° C and the clamping force must be strong in order to achieve regular cutting.

The quick cooling of the polypropylene when contacting the tool increases the consistency and the material for the contact areas. Especially during the plug displacement, the strain rates value are almost zero in the frozen areas (that means in the centre of the sheet) and the deformation is localized in the warmer zones.

Thickness profile and mechanical resistance are closely linked especially for thermoforming parts. To design a packaging component, the process conditions have to be optimized and the mechanical behavior to be calculated.

Recent experimental studies confirm that, even with Homopolymer polypropylene, well-controlled thermoforming conditions allow to form deep cups with good properties.

- Processing cycle time
- Thickness distribution
- Transparency
- Mechanical properties

The optimizations must become more efficient because it is easier to quickly test different tool designs, process parameters and polypropylene grades.

**6. QUALITY & STANDARD**

Thermoformed products are manufactured as per Customers' requirement and Specification.

**7. PRODUCTION CAPACITY (Per Annum)**

- (a) Quantity (M.T.) : 600
- (b) Value (Rs.) : 6,60,00,000.00

**8. TOTAL POWER REQUIREMENT**

Total connected load (KW) : 110

**9. POLLUTION CONTROL MEASURES**

The unit does not create any pollution. However, a proper ventilation should be made in the processing area for the better circulation of the fresh air.

**10. ENERGY CONSERVATION**

Entrepreneurs may select energy efficient machinery and proper planning has also to be made for saving energy in the unit.

**11. FINANCIAL ASPECT**

A. FIXED CAPITAL

i) <u>LAND &amp; BUILDING:</u> (Rs.)	Area sq. mtrs.	Rate	Rs.	per Sq. mtr.
Land	300	500		1,50,000.00
Building	200	3500		7,00,000.00
			Total :	8,50,000.00

ii) MACHINERY & EQUIPMENT:

(Rs.)	<u>Sr. No.</u>	<u>Description of machines</u>	Qty. (Nos.)
	(a)	Production Unit	
	i)	Automatic Thermoforming Machine	1
		2,50,00,000.00	
	ii)	Chilling Plant	
		5,00,000.00	
	iii)	Four Colour Dry Offset Printing	1
		9,00,000.00	
		machine with automatic unloading	
	iv)	Air Compressor	1
			2,00,000.00
	v)	Scrap Grinder	1
		1,00,000.00	
	(b)	Testing Equipment & Other Accessories	
		1,00,000.00	
	(c)	Electrification & Installation @ 10% of cost & machinery	
		26,80,000.00	
		(a) & (b)	
	(d)	Pre-operative expenses	
		1,20,000.00	
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		Total cost of machinery & equipment ( a to d )	
		2,96,00,000.00	
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	(e)	Cost of Moulds & Dies	
		6,00,000.00	
	(f)	Cost of Office Equipment/Furniture/Computers etc.	
		3,00,000.00	
			-----
		Total:	3,05,00,000.00
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Fixed Capital	= (i) + (ii)	= 8,50,000 + 3,05,00,000	=
3,13,50,000.00			

B. WORKING CAPITAL

i) Staff and Labour (Per Month)

Designation	Nos.	Salary (Rs.)	(Rs.)
Production Engineer/Manager	1	10,000.00	10,000.00
Sales Executive	1	5,000.00	5,000.00
Accountant-cum-Store Keeper	1	4,000.00	
			4,000.00
Watchman	2	3,000.00	6,000.00
Skilled Workers	3	3,500.00	10,500.00
Helpers	3	3,000.00	9,000.00
			-----
			44,500.00

Add perquisite @ 10% of the Salary  
4,450.00

Total: -----  
48,950.00  
Or Say Rs.

49,000.00

ii) Raw Material (Per Month)  
(Rs.)

Qty. (M.T.)      Rate Rs./M.T.

P.P. Granules                      50      75,000  
37,50,000.00

iii) Utilities (per month):

(Rs.)

a) Power    1,65,000.00

(60% utilisation x 110 KW x 500 hrs. x Rs. 5 per unit)

b) Water

2,000.00

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Total: 1,67,000.00  
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iv) Other Contingent Expenses (Per month) (Rs.)

sss) Repairs and Maintenance  
2,000.00

ttt) Transportation Charges 5,000.00

uuu) Postage and stationery 1,000.00

vvv) Telephone/Fax/Computer  
2,000.00

www) Consumable Stores  
1,000.00

xxx) Advertisement & Publicity  
2,000.00

yyy) Insurance 10,000.00

zzz) Miscellaneous Expenses  
2,000.00

Total: -----  
25,000.00  
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**12. TOTAL WORKING CAPITAL** ( Per Month ) (Rs.)

i) Staff and Labour 49,000.00

ii) Raw Material

37,50,000.00

iii) Utilities 1,67,000.00

iv) Other Contingent Exp. 25,000.00  
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Total: 39,91,000.00  
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Working Capital for 3 months 1,19,73,000.00

### 13. TOTAL CAPITAL INVESTMENT

(Rs.)

A. Fixed Capital	
3,13,50,000.00	B. Working Capital for 3 months
1,19,73,000.00	

Total:

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4,33,23,000.00  
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### 14. FIANCIAL ANALYSIS

(Rs.)

A. Cost of Production (per year) (300 days)

(a) Total Recurring Cost

4,78,92,000.00

(b) Depreciation on building @ 5%

35,000.00

(c) Depreciation on machinery & equipment @ 10%

29,60,000.00

(d) Depreciation on Dies, Moulds & office equipment

1,80,000.00

@ 20%

(f) Interest on total Capital Investment @ 12%

51,98,760.00

Total:

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5,62,65,760.00  
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Or say Rs.

5,62,66,000.00

B. Sales/Turn over (per year)

Item

Qty. (MT)

Rate (MT)

Value (Rs.)

P.P. Thermoforming items

600

1,10,000

6,60,000.00

C. Net Profit (Per year)

	Sales(Rs)	–	Cost of Production (Rs.)	=	Profit
	(Rs.)				
	6,60,00,000	-	5,62,66,000	=	
97,34,000.00					

D. Net Profit Ratio =  $\frac{\text{Net Profit} \times 100}{\text{Sales}}$

=  $\frac{97,34,000 \times 100}{6,60,00,000}$  = 14.74 %

E. Rate of Return =  $\frac{\text{Net Profit} \times 100}{\text{Total Capital Investment}}$

=  $\frac{97,34,000 \times 100}{4,33,23,000}$  = 22.46 %

F. Break-even Point

Fixed Cost (Per Year) Rs.

- a) Depreciation on Building @ 5%  
35,000.00
- b) Depreciation on Machinery & Equipment @ 10%  
29,60,000.00
- c) Depreciation on Moulds/Dies & Office Equipment  
1,80,000.00  
@ 20%
- d) Insurance 1,20,000.00
- e) Interest on total capital investment  
51,98,760.00
- f) 40% of salary and wages  
2,35,200.00

g) 40% of other contingent expenses  
72,000.00

Total: 88,00,960.00

Or say Rs. 88,00,000.00

Net Profit (Per Year)

$$\begin{aligned} \text{B.E.P. \%} &= \frac{\text{Fixed Cost} \times 100}{\text{Fixed Cost} + \text{Net Profit}} \\ &= \frac{88,00,000 \times 100}{88,00,000 + 97,34,000} \\ &= \frac{88,00,000 \times 100}{1,85,34,000} \\ &= 47.48 \% \end{aligned}$$