

# **THERMOFORMING**

## **1. INTRODUCTION**

Thermoforming is one of many manufacturing process that converts plastic resin into usable everyday product. 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 user 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 item. These articles consist of variety of packing boxes such as small tumblers, bowls, etc. Apart from this the use of blisters for packing pencil cell, toothbrushes, pens and 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. PRODUCTS AND ITS APPLICATION**

The major sectors where thermoformed products are used are Food Industries, Pharmaceutical, Electronics, Horticulture, Cosmetics, and Automobile Industry etc.

## **3. DESIRED QUALIFICATION FOR PROMOTER**

The Promoter should have preferably a basic degree in plastic engineering/ processing or a degree/ diploma in engineering / or a degree in chemistry. Experience of at least two to three years in plastic industry is desirable.

## **4. INDUSTRY OUTLOOK/ TREND**

The outlook for disposable food serving and packaging sector is very bright due to changing life style, awareness towards cleanliness and hygiene. Moreover conventional products made from forest resources face the problem of raw material. The trend in the business of disposable item is to serve quickly, efficiently, hygienically, leak proof and longer shelf life of packed products.

## **5. MARKET POTENTIAL AND MARKETING ISSUES, IF ANY**

As per the Working Group Report on Petrochemicals, Ministry of Chemicals & Fertilizers, the demand of PP Sheet in India is projected to be 30 KT by 2015-16.

The consumption of PP in PP Thermoformed Cups in India in 2015-16 was 20 KT. Looking to the advantage of thermoformed product, the demand has increased in various sectors for packaging and disposable items.

Thermoformed products are mainly used in food packaging and serving. With increase in urbanization, changing lifestyle and increase in per capita income, demand for disposable items has increased considerably for various events, household applications,

food packing in the hotels and restaurants, railways and airlines. The growth in this sector is very high and will result in to high demand for such products.

## **6. RAW MATERIAL REQUIREMENTS**

Polypropylene sheets are produced by Kshitij Polyline Private Limited, Silvassa. Mandhana Polymers Private Limited, Sarigam, GIDC, Valsad. And Roechling Engineering Plastics (india) Private Limited, Khar West, Mumbai.

## **7. 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 center 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 center 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.

## 8. MANPOWER REQUIREMENT

| Sr. No. | Particulars         | Nos | Salary (Rs. ) |
|---------|---------------------|-----|---------------|
| 1       | Production Engineer | 1   | 10000         |
| 2       | Manager             | 1   | 12000         |
| 4       | Sales Executive     | 1   | 10000         |
| 5       | Accountant          | 1   | 10000         |
| 6       | Store Keeper        | 1   | 7000          |
| 7       | Watchman            | 2   | 12000         |
| 8       | Skilled Workers     | 4   | 28000         |
| 9       | Unskilled Workers   | 6   | 36000         |
|         | Total               | 17  | 125000        |

## 9. IMPLEMENTATION SCHEDULE

| Sr. No. | Particulars   | Time Period  |
|---------|---|--------------|
| 1       | The Time requirement for preparation of Project report                                  | Two months   |
| 2       | Time requirement for selection of Site  | One month    |
| 3       | Time required for registration as Small Scale Unit                                      | One Week     |
| 4       | Time required for acquiring the loan, Machinery procurement, erection and commissioning | Three months |
| 5       | Recruitment of labourer etc.  | One month    |
| 6       | Trial runs  | Two weeks    |

## 10. COST OF PROJECT

| Sr. No. | Particulars  | Rs. In lakhs  |
|---------|--|---------------|
| 1       | Land and Building  | 38.00         |
| 2       | Plant and Machinery  | 51.20         |
| 3       | Miscellaneous Assets   | 6.50          |
| 4       | P & P Expenses   | 3.50          |
| 5       | Contingencies @ 10% on land and building and plant and machinery | 8.92          |
| 6       | Working capital margin   | 45.26         |
|         |  | <b>153.38</b> |

## 11. MEANS OF FINANCE

| Sr. No. | Particulars             | Rs. (lakhs)   |
|---------|-------------------------|---------------|
| 1       | Promoter's contribution | 46.0128       |
| 2       | Bank Finance            | 107.3632      |
| 3       | <b>Total</b>            | <b>153.38</b> |

## 12. WORKING CAPITAL CALCULATION

| Sr. No. | Particulars                         | Rs. lakhs | Stock Period days | Promoter Margin | Margin Amt. | Bank Finance |
|---------|-------------------------------------|-----------|-------------------|-----------------|-------------|--------------|
| 1       | Salaries and wages                  | 1.25      | 30                | 1               | 1.25        | -            |
| 2       | Raw material and packaging material | 43.25     | 30                | 0.5             | 21.625      | 21.625       |
| 3       | Utilities                           | 0.89      | 30                | 0.5             | 0.445       | 0.445        |
| 4       | Debtors                             | 54.84     | 30                | 0.4             | 21.936      | 32.904       |
|         | Total                               | 100.23    |                   |                 | 45.256      |              |

## 13. LIST OF MACHINERY REQUIRED

| Sr. No. | Particulars   | Rs. lakhs |
|---------|---|-----------|
| 1       | Automatic Thermoforming Machine                                 | 30.00     |
| 2       | Chilling Plant  | 5.00      |
| 3       | Four Color Dry Offset Printing machine with automatic unloading | 12.00     |
| 4       | Air Compressor  | 1.50      |
| 5       | Scraper, grinder  | 1.50      |
| 6       | Testing Equipment & Other Accessories                           | 1.20      |
|         | Total   | 51.20     |

- Rajoo Engineers Limited (Head office)  
Survey No. 210, Plot No.1,  
Rajoo Avenue, Industrial Area,  
Veraval (Shapar), Rajkot - 360 024  
Gujarat
- Sai Thermoformers  
25, DSIDC Shed  
Okhla Industrial Area Phase-1  
New Delhi

## 14. PROFITABILITY CALCULATIONS

(Rs. )

| Sr. No. | Particulars                              | Year 1   | Year 2   | Year 3   | Year 4   | Year 5   |
|---------|--|----------|----------|----------|----------|----------|
| (A)     | Sales Realization per annum              | 46068750 | 52650000 | 59231250 | 59231250 | 59231250 |
| (B)     | Cost of Production                       |          |          |          |          |          |
| 1       | Raw material per annum                   | 37800000 | 43200000 | 48600000 | 48600000 | 48600000 |
| 2       | Utilities                                | 749616   | 856704   | 963792   | 963792   | 963792   |
| 3       | Salaries                                 | 1500000  | 1620000  | 1740000  | 1860000  | 1980000  |
| 4       | Repairs and maintenance                  | 450000   | 500000   | 550000   | 600000   | 650000   |
| 5       | Selling expenses (3% on sales value)     | 1382063  | 1579500  | 1776938  | 1776938  | 1776938  |
| 6       | Administrative Expenses (other expenses) | 650000   | 700000   | 750000   | 800000   | 850000   |
|         | Total                                    | 42531679 | 48456204 | 54380730 | 54600730 | 54820730 |
| (C)     | Profit before interest & depreciation    | 3537072  | 4193796  | 4850521  | 4630521  | 4410521  |
|         | depreciation                             | 1338000  | 1338000  | 1338000  | 1338000  | 1338000  |
|         | Profit Before term loan and tax          | 2199072  | 2855796  | 3512521  | 3292521  | 3072521  |
|         | Interest on term loan (11%)              | 1138817  | 1012282  | 843568   | 674854.4 | 506140.8 |
|         | Profit before tax                        | 1060255  | 1843514  | 2668953  | 2617666  | 2566380  |
|         | Tax (30%)                                | 318076.4 | 553054.2 | 800685.8 | 785299.8 | 769913.9 |
|         | Total Profit                             | 742178.2 | 1290460  | 1868267  | 1832366  | 1796466  |

Underlying assumptions for probability calculation are:-

The installed capacity of the plant is assumed at 600 MT per annum. The capacity utilization is taken at 70% for the first year resulting in production and sales of 420 MT of finished products. The raw material price is assumed at Rs. 90/- per KG. The selling price is taken at Rs.112/- per KG. Power cost is taken at Rs.8/- per unit. Interest rate on long term loan is taken at 11%.

## 15. BREAKEVEN ANALYSIS

| Fixed Cost (FC):          | Rs. In lakhs |
|---------------------------|--------------|
| Wages & Salaries          | 15           |
| Repairs & Maintenance     | 4.5          |
| Depreciation              | 13.38        |
| Admin. & General expenses | 6.5          |
| Interest on Term Loan     | 11.38        |
| Total                     | 50.76        |

Fixed Cost: 50.76

Profit After Tax: 7.42

**BEP = FC x 100/FC+P**

50.76 /58.18 x 70/100 x 100

**61.07%**

## **16. STATUTORY/ GOVERNMENT APPROVALS**

There is no specific statutory requirement for plastic processing industry, however MSME & GST registration, IEC Code for Export of end products and local authority clearance may be required for Shops and Establishment, for Fire and Safety requirement and registration for ESI, PF and Labour laws may be required if applicable. Entrepreneur may contact State Pollution Control Board where ever it is applicable.

## **17. BACKWARD AND FORWARD INTEGRATION**

Backward linkages can be established by putting up the facilities to produce PP sheets. This can be done once the production is stabilized and market is fully developed to utilize production capacity. Similarly forward linkages to diversify in to other thermoform products such as packaging items for industrial parts, electronic products and household items like tray and containers.

## **18. TRAINING CENTERS/COURSES**

For plastic processing industry training and short term courses may be availed from the Central Institute of Plastic Engineering and Technology (CIPET), Guindy, Tamil Nadu and its regional centers. More over training and guidance are also provided by polymer manufacturers such as Reliance Industries Limited, GAIL and Haldia Petrochemicals Limited.

Udyamimitraportal ( link : [www.udyamimitra.in](http://www.udyamimitra.in) ) can also be accessed for handholding services viz. application filling / project report preparation, EDP, financial Training, Skill Development, mentoring etc.

Entrepreneurship program helps to run business successfully is also available from Institutes like Entrepreneurship Development Institute of India (EDII) and its affiliates all over India.



**Disclaimer:**

Only few machine manufacturers are mentioned in the profile, although many machine manufacturers are available in the market. The addresses given for machinery manufacturers have been taken from reliable sources, to the best of knowledge and contacts. However, no responsibility is admitted, in case any inadvertent error or incorrectness is noticed therein. Further the same have been given by way of information only and do not carry any recommendation.