

Retort Pouch Technology for Ready to Eat Products – An Economic Analysis of Retort Processing plant

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Abstract: The research reported in this paper is carried out as a part of the larger project on retort processing. Evaluation of small scale retort processing plant with a capacity of 1,20,000 pouches of Deccan Chicken Curry per year is carried out using project evaluation techniques. Data is taken from the experiments of the larger project. Financial feasibility analysis indicates that the retort processing plant is economically feasible. The plant is financially viable with an Internal Rate of Return of 72% and a Net Present Value of Rs. 1,86,62,503 discounted at 12%. Risk is also found to be less. Sensitivity analysis showed that the project is less sensitive to changes in input and output prices but sensitive to changes in Sales volume. This study may be useful for the entrepreneurs interested in processing sector to get first hand information on investment opportunities in retort processed ready to eat products.

Keywords: Evaluation, Food processing, Investment analysis, Meat products, Retort technology

I. Introduction

Packaging Industry is one of the fastest growing industries in the world representing a 11% growth in volume terms. Global packaging market is approx. \$433 billion¹.

Indian packaging industry is the sixth largest market in the world with a turnover of \$24.6bn in 2013. The industry is expected to grow at 12.3% CAGR during next 4-5 years to become the fourth largest global market, with sales of \$42.7bn(Indiapack 2013)². The growth trend of Indian packaging industry is in line with the global packaging industry.

Flexible packages has the Lion's share followed by other popular packs. The total flexible packaging market is \$671mn in 2013

The sector-wise break-up of packaging industry in India shows that processed food packaging has a lion's share of 48% followed by personal care packaging (27%), pharma (6%) and rest (19%).

The food packaging sector grows in tandem with food processing industry, which is surging at 6-7% per annum

India packaged food industry has expanded at an unparalleled growth rate over the last few years. The market for packaged food in India was valued at USD 15 billion in FY'2013. Growing at a compound annual growth rate (CAGR) of about 15 to 20 per cent annually, the Indian packaged food industry is likely to touch \$30 billion by 2015(ASSOCHAM)

Rapid urbanization is also increasing the demand for packaged foods. This can be reflected by the fact that the Urban residents consumed 78% of all packaged food in 2011, while rural residents consumed just over 22%. The penetration of organised retail is expected to 15 per cent by 2016. Growth of the organised retail sector is also fuelling consumption of packaged foods³.

Packaged foods includes snack foods, ready-to-eat foods, healthy and functional foods. Packaged food industry in India has been dominated by ready to eat market. According to a study by Tata Strategic Management Group, the Indian Ready-to-Eat food market is estimated to grow to \$727.09mn by 2015 from the current level of \$32.09mn(2013). The Indian RTE foods market, canned/preserved segment is more popular, contributing to approximately 90% of the market and growing at a CAGR of 63%. Again RTE foods with normal shelving, i.e., canned RTE foods that require no refrigeration, alone contribute to approximately 60% of the total market(Data monitor).

Ready to eat foods (RTE) are convenience foods, enclosed in aluminium container or pouches that only need to be cut and heated before being served. RTE food includes wide range of products viz. vegetarian / non-vegetarian, basic food / delectable desserts. These include canned foods and Pouched foods. There are again variety of pouched foods. Among pouched foods Ready To Eat(RTE) foods in flexible retort pouches has gained momentum having more storage life, cost effective, requiring less processing time and retention of maximum nutrients compared to other storage materials. This is indicated by the fact that the Global retort pouch consumption has exceeded 10 billion pouches per year and has reached to 19 billion pouches in 2011(Innova

database).As per the industry estimates Retort pouch processed RTE foods are estimated to grow at CAGR of 8% over the next five years.

A retort pouch⁴ is a heat resistant bag made of laminated plastic films or foil.As the name implies, the retort pouch is capable of being retorted. In other words, foods are first sealed in the retort pouch, followed by heat sterilization as in a canning process. Sterilization is carried out in in a retort(autoclave) to yield commercially sterilized state of foods.

Retort pouch generally consists of an outer layer of polyester or nylon for printability and toughness, a middle aluminium foil layer that functions as the principal oxygen and water vapour barrier and an inner heat sealed polypropylene. Packed Ready To Eat food is treated under intense heat and pressure to kill harmful bacteria to ensure freshness and long shelf life. Products can be stored in ambient temperature with a shelf life of 18 months without the use of preservatives.

Retort pouch technology is a fast growing packaging technology in today’s consumer world. In a country like India where refrigeration and cold chain maintenance is a difficult retort foods(thermally processed foods) hold great opportunity for increasing consumption of RTE processed foods. This creates opportunities for the entrepreneurs to venture in to this line and tap the potential of this technology. But for this to happen availability of studies on economics of plant and viability of investment are necessary

Against this backdrop present study is taken up to evaluate the feasibility of setting up of Retort processing plant on small scale for the product Deccan Chicken Curry. This may serve the entrepreneurs to have knowledge on investment in retort processing plant. The main objective of this study is to evaluate the economic viability of small scale retort processing plant for Deccan Chicken Curry. Small scale in this case is defined as the processing plant with one retort pouch filling machine and equipment necessary to keep it operating at full capacity.

II. Data and Methodology

This paper mainly deals with the evaluation of retort processing plant for small scale entrepreneurs by taking only one retort processing machine. The main commodity used for the analysis is Deccan Chicken Curry. Financial feasibility of retort processing unit processing Deccan Chicken Curry in retort pouches is analysed. The data is collected from the experiments of the institute (National Research Centre on Meat). The data corresponds to the cost of making product and cost of processing , time of processing , cost of Machinery and equipment etc.

Various economic measures were used for evaluating the Financial feasibility of retort processing plant. Financial efficiency measures like liquidity ratios, profitability ratios and investment ratios were employed for analysing financial viability of processing plant. Financial feasibility of investment was examined by using the regular project evaluation techniques⁵ like Net Present Value (NPV), Internal Rate of Returns(IRR), Benefit –Cost Ratio(B-C ratio) ⁶, Payback Period etc. Risk analysis is also carried out using Break Even Analysis and other leverage ratios like Degree of Total leverage(DTL),Degree of Operation leverage(DOL), Degree of Financial leverage(DFL). Sensitivity analysis is carried out under varying situations of raw material price, sales price, capacity etc.

III. Results and Discussion

3.1Plant Capacity and Project Cost

Basic assumptions used in this study are given in TABLE 1

Table 1: Basic Assumptions

| S.No | Particulars | Assumption |
|-----------------------------|---|---|
| 1 | Construction and Finance | |
| | Source of Finance | 30% Equity 70% loan |
| | Bank interest | 12% |
| | Discount cashflow | 12% |
| | Credit sales | 50% |
| | Implementation period | 6 months from sanction of loan |
| | Escalation &Contingencies | 10%of project cost excluding Preliminary and pre operative expenses |
| | Value of Land | Commercial land rate |
| | Spare parts, repairs and maintenance | 3% of fixed investment |
| | 2 | Depreciation |
| Building | | 5% |
| Machinery | | 10% |
| Equipment | | 20% |
| Miscellaneous assets | | 10% |

| | | |
|---|----------------------------|--|
| 3 | Working Capital | |
| | Work in progress | 1 |
| | Finished products | 30 days |
| | Accounts receivable | 30 days |
| | Norm for bank assistance | 70% of raw material cost |
| 4 | Production | |
| | Total capacity of the Unit | 24,000kg/ 1,20,000pouches per annum |
| | Capacity Utilization | 60%, 70% in the 1 st and 2 nd years and levelling off at 80% |
| | Shifts/ day | 2 @8 hour per shift |
| | No of working days/annum | 300 |

Source: Author’s Own study

Investment pattern of the unit is presented in TABLE 2 below.

Table 2: Project Cost

| Item | Cost (Rs) |
|--|----------------|
| Land and Fencing | 20,00,000 |
| Building | 17,00,000 |
| Machinery and Equipment(M&E) | 14,10,000 |
| Miscellaneous Assets | 1,00,000 |
| Escalation &Contingencies(10%of above total) | 521000 |
| Preliminary&Pre operative Expenses | 149597.3 |
| Working Capital Margin | 3,63,839 |
| Total | 6244436 |
| Means of Finance | |
| Total Project cost | 6244436 |
| Term loan | 4683327 |
| Equity | 1561109 |

Source: Same as Table 1

Total investment was estimated at Rs. 62,44,436 out of which Rs. 14,10,000 is required for Machinery and equipment and Rs. 3,63,839 Working Capital Margin. Seventy percent of the investment comes from bank finance and the remaining from share holder in the form of equity. Considering 300 working days in a year the unit has an installed capacity of 24,000kgs of finished product that comes to 1,20,000 in terms of retort pouches.

3.2 Financial Evaluation

3.2.1 Financial Efficiency Measures

On the basis of the projected income statement and related projections different financial ratios are calculated and shown in TABLE 3

Table 3: Financial Viability ratios for Retort Processing Plant

| S.No | Financial viability ratios/Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Average |
|------|---|-------|-------|-------|-------|-------|-------|-------|-------|---------|
| 1 | Liquidity ratios | | | | | | | | | |
| | Debt Service Coverage Ratio | 7.88 | 3.81 | 4.63 | 4.97 | 5.38 | 5.87 | 6.46 | 6.8 | 6.06 |
| | Debt Equity Ratio | 3 | 3 | 2.5 | 2 | 1.5 | 1 | 0.5 | 0 | 1.68 |
| | Debt to Capital Turn over | 0.75 | 0.75 | 0.63 | 0.5 | 0.38 | 0.25 | 0.13 | 0 | 0.42 |
| 2 | Profitability ratios | | | | | | | | | |
| | Net profit margin | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 |
| | Operating ratio | 3.49 | 3.49 | 3.49 | 3.49 | 3.49 | 3.49 | 3.49 | 3.49 | 3.49 |
| | Net profit to total sales/ Return on sales(%) | 47.85 | 49.06 | 50.6 | 51.36 | 52.1 | 52.84 | 53.57 | 54.29 | 51.62 |
| | Net profit % on investment | 57.93 | 69.3 | 81.69 | 82.91 | 84.11 | 85.3 | 86.47 | 87.63 | 79.42 |
| | Operating | 65.85 | 67.61 | 69.85 | 70.94 | 72.02 | 73.09 | 74.14 | 75.19 | 71.31 |

| | | | | | | | | | | |
|----------|-----------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| | profit to sales ratio(%) | | | | | | | | | |
| 3 | Investment ratios | | | | | | | | | |
| | Return on Total investment | 0.58 | 0.69 | 0.82 | 0.83 | 0.84 | 0.85 | 0.86 | 0.88 | 0.79 |
| | Return on Equity | 2.32 | 2.77 | 3.27 | 3.32 | 3.36 | 3.41 | 3.46 | 3.51 | 3.18 |
| | Investment turnover ratio | 0.83 | 0.71 | 0.62 | 0.62 | 0.62 | 0.62 | 0.62 | 0.62 | 0.65 |

Source: Same as Table 1

3.2.1.1 Profitability

According to the projected income statement, the project will start generating the profits in the first year of operation. All the profitability ratios show an increasing trend during over the years

3.2.1.2 Liquidity

Though the DSCR which measures enterprise’s capacity to meet term-loan-cum-interest and other long-term commitments/ obligations decreases in the second year it showed increasing trend through out the period and is kept at acceptable level of 6.06 indicating that the plant generates surplus, adequate to meet repayment obligations

Debt equity ratio which measures the extent to which the promoter’s funds are leveraged to procure loans is kept at 1.68. Hence Risk is found to be at the accepted levels and goes on decreasing over time.

All the liquidity ratios showed that the debt obligations decrease over time and surpluses generated by plant will go on increasing

3.2.1.3 Return on Investment

Analysis of investment ratios shows that the unit is able to generate enough returns on total capital, equity

To sum up, the financial viability indicators revealed that the processing unit is financially viable. Overall, the processing plant under study showed satisfactory performance on account of liquidity, profitability, investment.

3.2.2 Economic feasibility

In the present study, economic feasibility of retort processing unit was measured using discounted measures such as NPV, BCR, IRR and Pay Back period⁷.

Table 4: Economic Feasibility measures for Retort processing plant

| Selling Price | Economic Feasibility measures | | | | | |
|---------------|-------------------------------|--------|-----------|---------------------------|--------------------------------------|----------------------|
| | NPV(Rs.) | IRR(%) | B-C ratio | Average net returns (Rs.) | Average Discounted net returns (Rs.) | Pay back period(yrs) |
| 50% Margin | 1,86,62,503 | 72 | 3.99 | 5146301 | 2332813 | 1.21 |
| 100% Margin | 2,94,30,953 | 101 | 5.71 | 7356027 | 3678869 | 0.84 |
| 150% Margin | 4,01,99,402 | 130 | 7.44 | 9565752 | 5024925 | 0.65 |
| 200% Margin | 5,09,67,852 | 159 | 9.16 | 11775477 | 6370981 | 0.53 |
| 250% Margin | 6,17,36,301 | 187 | 10.89 | 13985202 | 7717038 | 0.45 |

Source: Same as Table 1

According to the NPV criteria the processing plants under study turned out to be economically viable projects. The positive NPV (TABLE 4) implied that the discounted worth of benefits was greater than disconnected worth of cost steams. The calculated IRR of the project is 72% and Net Present Value (NPV) at 12% discount is Rs. 1,86,62,503. The project’s initial investment will be fully recovered in less than two years. Benefit cost ratio being greater than unity(3.99)reaffirmed that processing plant is viable and on average the plant will give a return of 3.99 on every rupee investment with average annual net returns of 51,46,301 per annum.

3.3 Risk Analysis of the Enterprise

Risk is estimated in terms of possible variability in profit. The variability in profits arises primarily because of variability in sales (volumes or margins or both).

Degree of Total Leverage (DTL) is another important measure of risk which measures the risk arising out of the sensitivity of profits to sales. The risk includes: (i) the Degree of Operating leverage (DOL) arising from the structure of operating costs of the enterprise, (ii) the Degree of Financial Leverage (DFL) arising from the financial structure of the enterprise. This refers to debt as against the equity structure in the capital of an enterprise. The estimates of these measures are given in TABLE 5

Table 5: Risk Analysis Measures

Risk analysis showed that for every 1% fall in the sales , on an average there will be a fall of more than 1%

| Risk Measure/Year | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Average |
|-------------------|------|------|------|------|------|------|------|------|---------|
| DTL | 1.21 | 1.18 | 1.14 | 1.12 | 1.11 | 1.09 | 1.08 | 1.06 | 1.12 |
| DOL | 1.16 | 1.13 | 1.1 | 1.08 | 1.07 | 1.05 | 1.04 | 1.02 | 1.08 |
| DFL | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 | 1.04 |

Source: Same as Table 1

(1.12%) in Profit Before Tax (PBT) and this fall in Profit goes on decreasing over the years from 1.21 in the first year to 1.06 in the last year. All the liquid ratios measures the risk arising out of debts. As the plant appears to achieve sufficient Debt Service Coverage Ratio (DSCR) as indicated in table 3 even at a low capacity utilisation, the project risk is believed to be low. Decreasing trend of all risk measures showed that the risk goes on decreasing with the passage of time.

3.4. Break Even Analysis

A break-even analysis highlights the level of sales at which the profit before tax (PBT) is zero. Break Even Point of the project is estimated by using income statement projection. As mentioned in the assumptions the plant utilizes 60% of its capacity in the first year and it increases to 70% and 80% in the 2nd and 3rd years. From the 4th year onwards the capacity stagnates at 80% of its total capacity.

Table 6: Break Even Point at different levels of Capacity Utilization

Source: Same as Table 1

| Particulars | Capacity | | | | | | | |
|--|----------|---------|---------|---------|---------|---------|---------|---------|
| | Year 1 | Year 2 | Year 3 | Year 4 | Year 5 | Year 6 | Year 7 | Year 8 |
| Break Even Point(kg) | 2473.98 | 2532.73 | 2382.54 | 2131.45 | 1883.74 | 1639.08 | 1397.18 | 1157.78 |
| Break Even Point (as % of utilized Capacity) | 17.18 | 15.08 | 12.41 | 11.1 | 9.81 | 8.54 | 7.28 | 6.03 |
| Break Even Point (as % of Full Capacity) | 10.31 | 10.55 | 9.93 | 8.88 | 7.85 | 6.83 | 5.82 | 4.82 |
| Break Even Point(Pouches) | 12370 | 12664 | 11913 | 10658 | 9419 | 8196 | 6986 | 5789 |
| per day(no of pouches) | 400 | 400 | 400 | 400 | 400 | 400 | 400 | 400 |
| Time required(days) | 31 | 32 | 30 | 27 | 24 | 21 | 18 | 15 |

Accordingly if the plant works at 60% capacity the project will break at 17.18% and 10.31% of the installed and full capacity respectively (TABLE 6). The BEP goes on decreasing over the time as the capacity goes on increasing. The lesser values of BEP at higher capacities indicate that at higher capacity BEP is achieved in lesser time indicating inverse relation between BEP and Capacity.

The BEP also indicates the risk involved in a project. Since BEP is achieved at lower level of capacity utilization, the plant is found to be less risky and economically viable.

3.5. Sensitivity Analysis

Sensitivity Analysis was carried out to test the changes in income-generating capacity of processing plant under study with changes in costs, benefits and sales may be brought about with passage of time. The economic viability of processing plant under changed circumstances was ascertained through changes in profits and DSCR assuming changes in costs and total benefits for 4 scenarios as follows

Table 7: Sensitivity Analysis- Assumptions under different scenarios

| Scenario | Assumptions/ Changes over basic scenario | | | |
|------------|--|---------------|--------------|-------------|
| | Raw material price | Selling price | Sales | Fixed Costs |
| Scenario 1 | 20% Increase | 20% Increase | 0% | 10% |
| Scenario 2 | 20% Increase | 20% Increase | 20% decrease | 10% |

Source: Same as Table 1

It is evident from the TABLE 8 that the simultaneous increase in raw material price selling price will increase the profits by 22.07% but if the sales are decreased the profits will come down to 6.91%. This showed that the profit is more sensitive to sales than raw material and selling price

Table 8: Profits Under different scenarios

| Scenario | Profit | Revised profit | Change in profit |
|----------------|---------|----------------|---------------------------|
| Basic scenario | 5242752 | | |
| Scenario 1 | 5242752 | 6400022 | 22.07%increase |
| Scenario2 | 5242752 | 4880834 | 6.91% decrease in revenue |

Source: Same as Table 1

The sensitivity analysis was also carried out through changes in DSCR. This analysis shows that the plant is economically viable even if there are variations in the selling price and capacity as the DSCR is kept at acceptable levels of 5.69 and 5.15 respectively(TABLE 9). Comparison of Scenario 3 and 4 shows that the increase in raw material price throughout the period does not make the plant unviable as its effect is offset by the simultaneous increase in selling price by the same amount. However if the sales shows decreasing trend as a result of increasing selling price caused by raw material price, this effect is reflected in terms of capacity utilization. In that case the project is found to be unviable as evident by DSCR of 1.94 which is less than the basic plan. The profit will decrease by 7 per cent.

Table 9: Sensitivity Analysis: Debt Service Coverage Ratio under different situations

| Scenario | Assumptions | DSCR |
|----------------|--|-------|
| Basic scenario | | 6.06 |
| Scenario 1 | Drop of 5% in selling price with costs remaining unchanged | 5.69 |
| Scenario 2 | Capacity Utilisation Levelling off at 70% | 5.15 |
| Scenario3 | increase in raw material price 20% throughout period and simultaneous increase in selling price by 20% | 12.42 |
| Scenario 4 | Increase in raw material price 20% throughout period and simultaneous increase in selling price by 20% and decrease in sales by 20% i.e capacity decrease by 20% | 1.94 |

Source: Same as Table 1

It can be concluded that the raw material increase combined with decreased sales reflected by lower capacity has effect on the viability of project even if there is increase in selling price. Decrease in sales rendered the project unviable.

3.6.Economic Benefits: The unit will generate Rs 1,78,23,963 of tax revenue over 8 years.

IV. Conclusions

In the present study Financial feasibility of a retort processing palnt is investigated for the product Deccan Chicken Curry.Analysis of all the profitability ratios, key project evaluation indicators like NPV, IRR, B-C ratio, Pay back period showed that the setting up of processing plant is profitable. Risk analysis using DSCR, DTL, BEP and DER also proved that the risk is less. Sensitivity analysis also proved that the plant is economically viable for the changes in inputs and output prices

As per the industry estimates Retort pouch processed RTE foods are estimated to grow at CAGR of 8% over the next five years. Retort pouch processing has proved to be a promising technology due to its distinctive advantages over metal cans. Due to its huge potential in institutional catering such as railways, airways, hotels etc there are immense opportunities for retort processing plants.

Rapid urbanization, increasing income, changing life styles, health consciousness of consumers are the driving force for increasing preferences for packaged ready to eat foods. Consumer’s preferences for RTE foods over fresh foods resulted in higher demand for packaged foods which created further scope for processing industry. But the gap between demand and supply of RTE foods due to lack of processing units gives scope for enterprenuers for setting up of new processing plants especially Retorting units. The combined effect of consumer driven growth of RTE foods and Retort pouch market gives immense scope for the enterprenuers to venture into this line and take advantage.

Govt efforts to increase level of food processing from 2 to 25 per cent by 2025 and achieve a share of 3% in global trade by 2015 gives scope for ventures in the food processing industry. Among the food processing industries Meat processing industry is one of the fastest growing industry showing a growth of about 4% per year.

Combined effect of growing food processing industry, meat processing, RTE food industry, Retort market and govt support and viability of processing plants has created a immense scope for setting up of retort processing plants for producing RTE meat products.

Since retort pouch technology offers alternative to canned RTE foods retorted foods have the potential to tap the canned market which contributes around 60% of Indian RTE food market. In a country like India where refrigeration and cold chain maintenance is a difficult retort foods (thermally processed foods) hold great opportunity for increasing consumption of RTE processed foods. It can be concluded that the demand for retort processed meat products and viability of processing units has created immense opportunities for the investment in the retort processing units which will have positive implications on the meat processing industry.

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