PROJECT REPORT

Of

BIODEGRADABLE PLASTIC PELLETS

PURPOSE OF THE DOCUMENT

This particular pre-feasibility is regarding Biodegradable Plastic Pellets.

The objective of the pre-feasibility report is primarily to facilitate potential entrepreneurs in project identification for investment and in order to serve his objective; the document covers various aspects of the project concept development, start-up, marketing, finance and management.

[We can modify the project capacity and project cost as per your requirement. We can also prepare project report on any subject as per your requirement.]

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BIODEGRDABLE PLATSIC PELLETS (PLA BASED) MANUFACTURING

1. INTRODUCTION

The term “Biodegradable” refers to anything or substances that can be degraded by the natural forces and micro-organisms and Bio-degradable plastics refer to those plastics that can be decomposed by the micro-organisms and also natural factors such as rain, sunlight, etc. and these plastics broaden the options for waste management treatment options over traditional plastics. The most favorable disposable options for these plastics are the municipal composting areas instead of the landfills. Hence, the biodegradable plastics can make significant contributions to material recovery options, reduction of landfill, and utilization of the natural resources.

Fig.: Biodegradable PLA pellets

The global production capacity of the biodegradable plastic pellets reached around 5.64 million tons in 2019. Polylactic Acid (PLA) based is probably the most well-known biodegradable plastic but besides that there are about 20 groups of biodegradable plastic polymers. Of these 20 known biodegradable plastic groups, only 3 types are produced commercially and those include (i) Starch blends (ii) PLA; and (iii) Polybutylene based polymers which includes Polybutyl Succinate (PBS) and Polybutylene Adipate

Terephthalate (PBAT) which are both fossil fuel based. In 2012, the two most influential commercial biodegradable and bio-based polymers were the Polylactic Acid (PLA) and Starch-based polymers accounting respectively for about 47 % and 41 % of the total biodegradable polymer consumption.

PLA (Polylactic Acid) is a potential and popular polymer material. It is also called "Polylactide" and can be produced by the fermentation of renewable sources such as Corn, Cassava, Potato, and Sugarcane. Other feedstock that have been researched and explored include Cellulosic Materials, Agricultural Byproducts, and even greenhouse gases such as Carbon dioxide and Methane. But that technology is still under development and agricultural by-products set to remain as the main feedstock for starch blends and PLA in the near future. PLA has excellent properties as compared to aliphatic polyesters such as high mechanical strength, high modulus, biodegradability, biocompatibility, bioabsorbability, transparency, and low toxicity. Because of its excellent properties, PLA has shown potential applications in different sectors such as agricultural films, biomedical devices, packaging, and automotive industries. Although PLA is a bio-degradable polymer, but its complete degradation may take several years. As of 2019, production capacity of PLA was approximately 290 thousand tons.

The initial production of the biodegradable polymers started in the Europe, the US, and Japan but the production was soon shifted to different parts of Asia due to the low cost of the raw materials and the convenience of feedstock acquisition. Many companies have emerged in China, India, and Thailand that are financed by the local investors and also companies from the global north.

In the recent years, the development of the biodegradable plastics from natural renewable sources such as Crop wastes and Agricultural wastes has received increasing attention. If properly managed, this would reduce their environmental impact upon disposal and, also, it would be economically beneficial.

2. MARKET POTENTIAL

The global biodegradable plastics market was valued at USD 3.27 billion in 2019 and is expected to reach USD 16.8 billion by 2027 at a CAGR of 15.1 % from 2019 to 2027. The governments across the world are prohibiting the use of single use plastics and this coupled

with the rising awareness among the people regarding the harm that the plastics are doing to the Earth are among the key trends that are fuelling this market. Non-compostable plastics are an issue across the globe now and the best way to deal with it is the manufacture and the use of biodegradable plastics. Biodegradable plastics are formed from the fermentation of sugar or canola oil to produce Polylactic acid (PLA) or Polyhydroxyalkanoates (PHA) which in turn converted into biodegradable plastics.

The market can be segmented on the basis of Material, End-Use, and Regional Outlook.

On the basis of the Material, there can be the following types: Starch-based, PLA-based, Polybutylene Adipate Terephthalate (PBAT), Polybutylene Succinate (PBS), Polyhydroxyalkanoate (PHA), and others. Among these types, the Starch-based bags are set to dominate the market. The segment is poised to expand at a revenue-based CAGR of 10.4% during the same period in terms of revenue. The PLA-based plastics on the other hand are also another popular category and this is mainly due to the low-cost of the products.

On the basis of End-Use the areas include: Packaging, Industrial sector, Agricultural sector, and others. Among them, the packaging sector dominates the market as Biodegradable plastics are used in both flexible and rigid packaging. Replacement of conventional plastics by these products in food packaging such as boxes, wraps, cups, and plates is gaining momentum, which is supporting the growth of the biodegradable plastic market. In the agricultural sector, the use of Biodegradable Mulch Film ensures conservation of water in the soil, suppresses weed growth, and soil temperature maintenance in order to facilitate faster crop development.

As far the regional outlook is considered, the market can be divided into North-America, Europe, Asia-Pacific region, and the rest of the world. Among the above regions, the highest market share in the biodegradable plastics market is hold by Europe since 2019. In the Asia-Pacific region as well, the market is expected to emerge as the fastest growing market.

3. INDUSTRIAL SCENERIO

The major names in the biodegradable plastics market are: BASF SE, NatureWorks LLC, Mitsubishi Chemical Corporation, Carbion, and Biome Technologies plc. On the global scale, the American company NatureWorks leads the PLA sector, operating a

manufacturing facility in Midwestern state of Nebraska with a production capacity of 150,000 tons. They use crops that grow within 50 miles of their US production capacity.

Total Corbion PLA operates the world's second largest PLA plant in Rayong, Thailand. The plant was opened in 2019, with an annual capacity of 75,000 tonnes, using non-Ithe company announced, the company announced its plan for a second PLA plant based in Grandpuits, France,with an annual capacity of 100,000 tonnes. The remaining major PLA producers are mainly from China and most of the companies are small scale companies with a fairly small production capacity of 10, 000 – 50, 000 tons per year. Jiangsu Yunyoucheng operates the largest PLA plant in China, with an annual capacity of 50,000 tonnes.

In India too, there is a high demand for bio-degradable plastics and our country has a huge amount of bio-mass required for their production. Quite a few manufacturing firms like Envigreen, Ecolife, Plastobags, Earthsoul India and Truegreen have come up with different forms of bioplastics, which are already supplying these environment friendly forms of plastics in regional markets.

Truegreen is a firm based out of Ahmedabad that started the manufacturing plant with a production capacity of 5000 MT per year. Ecolife is a firm based out of Chennai that manufactures Bio-plastics for industrial purposes. Bengaluru based firm Envigreen which is the latest startup to enter the Indian bioplastics market has a production capacity of upto 1000 Tons bioplastics per year.

4. PRODUCT DESCRIPTION

4.1 PRODUCT USES

There are various areas of applications of the PLA plastics pellets:

1. Some of the most common areas of application are the manufacture of plastic films, plastic bottles, plastic bags, etc.
2. Secondly, a lot of biodegradable medical devices are made from the PLA plastic pellets (e.g. screws, pins, rods, and plates that are expected to biodegrade within 6-12 months).

3. PLA constricts under heat and hence suitable for use as a shrink wrap material.
4. The ease with which Polylactic Acid melts allows for some interesting applications in 3D printing.

4.2 RAW MATERIAL REQUIREMENT

The raw materials required for the production of PLA pellets are "Crops and Crop resides". While the direct sources of the sugar and starch such as corn, wheat, rice, etc. are termed as the "First-Generation" raw material, the Crop residues are termed as the "Second-Generation" raw materials.

The raw materials are fermented by the bacteria of the *Lactobacillus* genus such as *Lactobacillus delbrueckii*, *L. amylophilus*, *L. bulgaricus* and *L. leichmanni*.

After the Polylactic acid has been prepared, it is mixed with a number of other substances depending on the purpose of the usage of the pellets. These include:

- Plasticizer such as Glycerol, Ethylene Glycol, Polyglycerol, etc. (2 – 30) %
- Flexibility agent like Urea, Citric Acid, Polyvinyl Alcohol. (10 – 40) %
- Binder such as Stearic acid, glycerol monostearate, montmorillonite, etc. (3 – 13) %
- Hydrophobic agent (0.1 – 5) %
- Emulsifier (0.1 – 5) %

4.3 MANUFACTURING PROCESS

There are a number of steps for the formation of PLA which include 1) Direct Condensation Polymerization, 2) Azeotropic Dehydrative Condensation, and 3) polymerization through "lactic acid formation". Currently, direct condensation and polymerization through lactic acid formation are the most used production techniques:

1. The process begins with the procuring of the raw materials from the agricultural fields. This can be sugarcane, corn, wheat, rice, or any other source of starch. If they are seeds then screened properly and then dried in

the oven. They are then chopped into fine pieces or ground into fine particle in a Hammer mill for a higher surface area and better fermentation process. If they are juicy crops then they are crushed in the Milling machine.

2. The starch/ sugar present in the crops are then converted to simple sugar acids (lactic acid). The starch/ sugar of the crops is first converted to glucose by either Acidic or Enzyme hydrolysis. The glucose formed can either be "Crystallized" or used as the liquid concentrate for the conversion to the Lactic Acid.
3. The next step takes place in the Fermentation Tank. The pH and the temperature of the medium are kept in control. The pH ranges from 5.4 – 6.4, while the temperature ranges from 38 – 42 °C. This is an aerobic "Homofermentative reaction", so the process takes in the presence of oxygen in fermentation tanks. In this process, 100 g of glucose produced can give rise to 90 g of Lactic Acid.

   Glycolysis is the first step in this conversion where the glucose is converted into different intermediates and then gets converted to Lactate. Lactic acid is the final product of the hydrolysis of glucose.
4. After the formation of the Lactic acid, the resultant solution is then transferred from the Fermentation tank to the acidifying tank, where the solution is acidified and then it is filtered. The filtrate is then purified. The purification of lactic acid is a difficult process because of the low volatility and the high solubility is water. To overcome these problems, lactic acid is converted to its ester by reacting it with an alcohol to give the "Lactate Ester". The lactate ester is purified by distillation, and then hydrolyzed to obtain pure lactic acid.
5. Polymerization of the Lactic acid can be done by three steps as mentioned earlier at the start of this section. Out of those steps, Direct Polycondensation is the most opted step to carry out the conversation.
6. The process starts with the conversion of the Lactic acid to Oligo-Lactic Acid at 200 – 250 °C for a period of 6 – 8 hours, the Oligo-Lactic Acid is then converted to Lactide by the cyclization reaction. The lactide formed is purified by distillation and crystallization process to get pure Lactide.

Finally the Lactide is converted to Polylactic acid at 200 – 250 °C after 48 hours and this takes place after being fed to a series of loop and plug-flow reactors.

At temperatures above 260 °C, the cyclization reactions starts resulting in the formation of the "Lactide" while at temperatures lower than 200 °C, the amount of water formed is high and this can degrade the quality of the product formed, hence an optimum temperature is very important for the Polycondensation process. The water formed must be continuously removed with the help of a vacuum system.

7. After the formation of the PLA, the remaining volatile components in the medium are separated using the degassing the PLA melt.
8. After the separation, different components are mixed with the PLA melt that includes the plasticizers, binder, flexibility agent, emulsifying agents, and colorants in a static mixer.
9. The mixture is sent through to the Pelletizer to convert the melt into pellets. After they have been pelletized, the PLA pellets are extracted from the pelletizer and then allowed to solidify. They are then sent for the quality check to see if all the properties are okay. They are then filled in plastic bags as per the capacity required, weighed, and stored in the storage area.

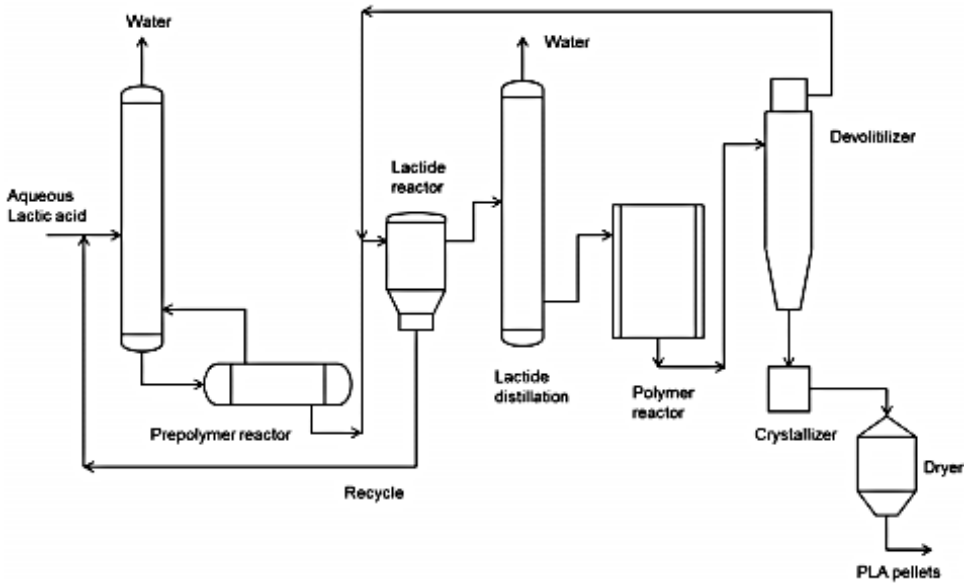


Fig.: Schematic diagram of the manufacturing process.

4.4 YIELD OF PRODUCT/PRODUCTION RATIO

The annual production capacity of this Biodegradable Plastic Pellet Plant is something between 1000 Tonne – 500, 000 Tonne per year depending upon the capacity of the machines used. This project is prepared based upon the new manufacturing startup with a production capacity of 1000-1500 Tonne plastic pellets per annum.

5. INDIAN STANDARDS FOR THE PRODUCT

IS 17088-2008 lays down the Specifications for "Compostable Plastics" specifying the procedures and requirements for the identification and labelling of plastics, and products made from plastics, that are suitable for recovery through aerobic composting.

6. PROJECT COMPONENTS

6.1 Land /Civil Work

An area of almost 6,000 – 8,000 square feet would be required to set up Biodegradable Plastic Pellets Manufacturing plant. This space would be required for raw materials storage mainly, production, packaging, storage of finished goods, and administrative work.

We have not considered the cost of Land purchase & Building Civil work in the project. It is assumed that land & building will be on rent & approx. rental of the same will be Rs. 1,00,000 to 1,20,000 per month.

6.2 Plant & Machinery

The following machineries would be required for the manufacture of the Biodegradable Plastic Pellets:

1. Milling machine for converting the raw materials into a paste form. The material to be milled is fed through hopper, for dry materials, a Hammer mill can be used while for the wet materials, the Pulping machine can be used. Price of the Hammer mill is Rs. 50, 000 – Rs. 2, 00, 000 depending upon the capacity, while that for the Pulping machine is about Rs. 25, 000 – Rs. 1, 50, 000.

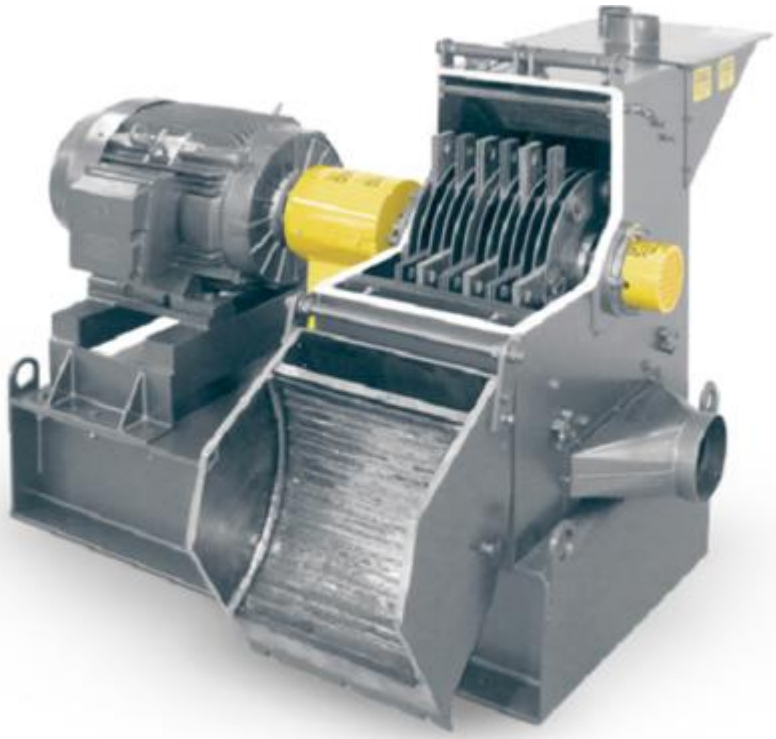


Fig.: Hammer Mill.

Fig.: Pulping machine

2. Industrial mixing vessels made of Stainless steel or any other non-reactive material. These are required for the preparation of the acid solution for the acidic hydrolysis and also for the preparation of the solution before the conversion of starch to glucose. The cost of the machines can be somewhere between Rs. 30, 000 – Rs. 2, 00, 000 depending upon the capacities.

Fig.: Mixing tanks

3. Fermentation vessels for the conversion of the glucose to lactic acid. They should be controlled by a PLC system. The price can be upto Rs. 10 lakhs.

Fig.: Industrial fermentation system

4. Jacketed reaction vessel for the conversion of the synthesized Lactic acid into lactate. As lactate is an ester, and esters decompose at high temperatures, so a constant supply of water is a must during the reaction. Cost of the machine is around Rs. 30, 000 – Rs. 1 lakh depending on the capacity.

Fig.: Jacketed reaction vessel

5. Vacuum Crystallizer, they use a condenser with a booster to maintain a vacuum inside the crystallizer body. The feed slurry is first heated in a heat exchanger, then pumped to the main body of the crystallizer. Vaporization occurs at the top surface of the slurry, while nucleation occurs near the bottom of the crystallizer body. The price can be around Rs. 3 lakhs – Rs. 5 lakhs.

Fig.: Vacuum Crystallizer

6. Polymerization reactor with a stirrer made from Stainless steel (SS 304). In these vessels whose capacities can be upto 10, 000 L, the lactic acid is converted Oligo-Lactic Acid.

   The Oligo-Lactic acid is then converted to the Lactide form in another reactor which is purified in the Crystallizer equipment, mentioned above.

   The price can range from Rs. 1 Lakh to Rs. 5 Lakhs.

Fig.: polymerization reactor

7. SMR (Static Mixer Reactor) or the Plug flow reactor for the conversion of the Oligolactic acid to the lactide and finally to Polylactic acid. These reactors are used to perform the Polymerization reaction without the use of catalysts. Under the conditions inside the reactor, all the materials processed through the reactor must have same residence time.

   The cost of the material is Rs. 1 lakh for the capacity of upto 10, 000 L of reactants.

Fig.: plug flow reactor

8. Vacuum degasser. These machines are used to remove the volatile gaseous matter from the liquid or the melt. Degassers primarily function by one of two basic operating principles: negative pressure (vacuum) and atmospheric degassing. In both cases, fluid is fed through a series of baffles or dispersion plates whereas fluid surface area is increased, allowing the entrained gas to separate either naturally or by the assistance of a vacuum pump.

   Price can start from Rs. 2 lakhs and go upto Rs. 10 lakhs.

Fig.: Vacuum degassing system

9. Pelletizer machine. Underwater pelletizers are probably the most versatile equipment for a wide viscosity range, higher outputs, and pellet size capability. They operate with the die face and rotating cutter fully immersed in water. The produced pellets are carried away with water for further cooling in transit, to the dewatering, screening, and drying equipment.

   The Price can be around Rs. 50 lakh.

Fig.: Underwater pelletizer

10. Plastic pellets packaging machine. The hopper of the machine is filled with the pellets and the pellets drop in the plastics in the fixed amounts and the sealed. This process should be PLC controlled for the exact weighing of the pellets in all the packets.

Fig.: Pellet packing machine

11. Heat exchanger machines for the various condensing processes during crystallization. The price of the machine can be in the range of Rs. 1 Lakh – Rs. 5 lakh depending upon the capacity.

Fig.: heat exchanger

12. Centrifugal pumps for the transfer of the liquids from one reactor vessel to another and also for the crystallization processes. Price can start from Rs. 30, 000 and go upto Rs. 2 lakhs.

Fig.: Centrifugal pumps

Machine Name	**Price**	**Quantity**	Amount
Milling machine	1,50,000	2	300000
Pulping machine	1,20,000	2	240000
Mixing Vessels	1,50,000	2	300000
Fermentation vessel	7,50,000	1	750000
Jacketed reaction vessel	70,000	4	280000
Vacuum Crystallizer	4,00,000	2	800000
Polymerization reactor	3,50,000	1	350000
SMS (static mixer reactor)	1,00,000	1	100000
Vacuum Degassing system	8,00,000	1	800000
Pelletizer machine	50,00,000	1	5000000
Pellets packaging machine	4,00,000	1	400000
Heat exchanger	3,50,000	2	700000
Centrifugal pumps	1,70,000	2	340000
Other equipment's			200000
Sub-total			**10560000**
GST @ 18%			**1900800**
TOTAL			**12460800**

6.3 Misc. Assets

The miscellaneous assets include Spare parts for all the machineries, Bacteria breeding tanks, Storage tanks, Water circulation pumps, Sealing machine, Coding and printing machine, safety equipment, instrument chart and accessories, cleaning materials of the plants, furniture, and other electrical equipments.

6.4 Power Requirement

The machineries in a Biodegradable Plastic pellets manufacturing plant can work with a 3 phase AC power supply.

The daily operation of the machineries would require 150 - 200 kW power.

6.5 Manpower Requirement

The total manpower required for the operation of Biodegradable Plastic Pellets unit is about 25-30.

7. LICENSE & APPROVALS

To start the biodegradable plastic pellets manufacturing process the different licenses and registrations from the different authorities regarding the area and machineries must be obtained initially. These laws vary from one state to the other. Besides them, the other certificates that must be obtained are:

1. MSME Udyam Online registration
2. The GST (Goods and Service Tax) certification.
3. A “No-objection Certificate” from the Pollution Control Board.
4. A “No-objection Certificate” from the Fire Board.
5. Labour license.
6. Trademark (optional)

8. SWOT ANALYSIS

Strengths: On one hand when plastics take somewhere between 20 to 500 years for their degradation, Biodegradable plastics can be degraded by the natural forces within 5 years which is a major advantage over the normal plastics. The issue of Global Warming and rising levels of pollution are also spreading awareness among the people thus motivating them to use the biodegradable variety.

Another major advantage of the Biodegradable plastic products manufacturing is the fact that the raw materials are not sourced from petroleum.

Weaknesses: Despite several environmental advantages, the Biodegradable plastics have a range of shortcomings too. Segregation of the plastics and the biodegradable plastics is a major drawback as they look very similar. Moreover, they take a long amount of time to get decomposed and some of them even do not degrade under normal conditions and specified conditions are required for their degradation. Some of the biodegradable plastics release greenhouse gases during decomposition, which is counterproductive to the environmental cause, thus restraining the market growth.

Opportunities: With the rising awareness among the people regarding the different environmental concerns, the biodegradable plastics are to find a huge market and hence market in the near future.

Threats: The major threat to the market is the fact that the PLA products take a lot of time to decompose which might lead ways to other faster degrading materials.

9. FINANCIALS

COST OF PROJECT	
	(in Lacs)
PARTICULARS	**AMOUNT**
Land & Building	Owned/rented
Plant & Machinery	124.61
Miscellaneous Assets	4.00
Furniture	2.00
Working capital	40.00
Total	**170.61**

MEANS OF FINANCE	
PARTICULARS	**AMOUNT**
Own Contribution @ 25%	42.65
Term Loan @ 75%	97.96
Working Capital (Bank Finance)	30.00
Total	**170.61**

PROJECTED BALANCE SHEET **(in Lacs)**

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
Liabilities							
Capital							
Opening Balance		44.62	49.65	54.65	61.58	72.59	86.05
Add:- Own Capital	42.65						
Add:- Retained Profit	6.97	11.04	12.99	15.93	20.51	26.46	30.21
Less:- Drawings	5.00	6.00	8.00	9.00	9.50	13.00	14.00
Closing Balance	**44.62**	**49.65**	**54.65**	**61.58**	**72.59**	**86.05**	**102.27**
Term Loan	90.42	75.35	60.28	45.21	30.14	15.07	-
Working Capital Limit	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Sundry Creditors	10.42	15.45	18.57	23.68	31.66	36.23	41.05
Provisions & Other Liabilities	4.00	4.50	5.40	6.48	8.10	9.72	11.66
TOTAL :	**179.46**	**174.96**	**168.89**	**166.95**	**172.48**	**177.07**	**184.98**
Assets							
Fixed Assets (Gross)	130.61	130.61	130.61	130.61	130.61	130.61	130.61
Gross Depriciation	19.49	36.07	50.17	62.16	72.36	81.04	88.42
Net Fixed Assets	**111.12**	**94.54**	**80.44**	**68.45**	**58.25**	**49.57**	**42.19**
Current Assets							
Sundry Debtors	30.08	34.93	35.03	38.51	41.46	47.47	53.81
Stock in Hand	31.13	38.49	46.04	54.16	62.62	71.39	80.72
Cash and Bank	1.12	2.00	3.38	0.84	3.16	2.64	1.76
Loans & Advances/Other Current Assets	6.00	5.00	4.00	5.00	7.00	6.00	6.50
TOTAL :	**179.46**	**174.96**	**168.89**	**166.95**	**172.48**	**177.07**	**184.98**

PROJECTED CASH FLOW STATEMENT **(in Lacs)**

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
SOURCES OF FUND							
Own Margin	42.65						
Net Profit	7.77	12.55	15.35	19.55	26.08	34.59	39.95
Depriciation & Exp. W/off	19.49	16.58	14.10	11.99	10.20	8.68	7.38
Increase in Cash Credit	30.00	-	-	-	-	-	-
Increase In Term Loan	97.96	-	-	-	-	-	-
Increase in Creditors	10.42	5.03	3.12	5.11	7.98	4.57	4.82
Increase in Provisions & Other liabilities	4.00	0.50	0.90	1.08	1.62	1.62	1.94
TOTAL :	**212.29**	**34.66**	**33.46**	**37.73**	**45.88**	**49.46**	**54.09**
APPLICATION OF FUND							
Increase in Fixed Assets	130.61						
Increase in Stock	31.13	7.36	7.56	8.11	8.47	8.76	9.34
Increase in Debtors	30.08	4.85	0.10	3.48	2.95	6.01	6.34
Repayment of Term Loan	7.54	15.07	15.07	15.07	15.07	15.07	15.07
Loans & Advances/Other Current Assets	6.00	- 1.00	- 1.00	1.00	2.00	- 1.00	0.50
Drawings	5.00	6.00	8.00	9.00	9.50	13.00	14.00
Taxation	0.80	1.52	2.35	3.61	5.57	8.13	9.73
TOTAL :	**211.16**	**33.79**	**32.08**	**40.28**	**43.56**	**49.97**	**54.98**
Opening Cash & Bank Balance	-	1.12	2.00	3.38	0.84	3.16	2.64
Add : Surplus	1.12	0.87	1.39	-2.55	2.32	-0.52	-0.88
Closing Cash & Bank Balance	**1.12**	**2.00**	**3.38**	**0.84**	**3.16**	**2.64**	**1.76**

PROJECTED PROFITABILITY STATEMENT **(in Lacs)**

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
Capacity Utilisation %	**25%**	**30%**	**35%**	**40%**	**45%**	**50%**	**55%**
SALES							
Gross Sale							
BIODEGRADABLE PLASTIC PELLETS	451.25	582.21	700.56	825.21	956.76	1,095.50	1,241.73
Total	**451.25**	**582.21**	**700.56**	**825.21**	**956.76**	**1,095.50**	**1,241.73**
COST OF SALES							
Raw Material Consumed	312.50	386.25	464.14	546.36	633.11	724.55	820.93
Electricity Expenses	25.20	30.24	36.29	43.55	52.25	62.71	75.25
Depreciation	19.49	16.58	14.10	11.99	10.20	8.68	7.38
Wages & labour	23.04	27.65	33.18	39.81	47.78	57.33	63.06
Repair & maintenance	4.51	11.64	15.76	18.57	21.53	24.65	27.94
Consumables	10.60	13.68	16.46	19.39	22.48	25.74	29.18
Packaging cost	18.95	26.20	31.53	39.20	43.05	41.08	43.46
Cost of Production	414.30	512.24	611.45	718.87	830.40	944.74	1,067.20
Add: Opening Stock	-	20.72	25.61	30.57	35.94	41.52	47.24
Less: Closing Stock	20.72	25.61	30.57	35.94	41.52	47.24	53.36
Cost of Sales	393.59	507.34	606.49	713.50	824.83	939.02	1,061.08
GROSS PROFIT	**57.66**	**74.86**	**94.07**	**111.71**	**131.93**	**156.47**	**180.65**
Salary to Staff	18.12	21.74	26.09	31.31	37.57	45.09	54.11
Interest on Term Loan	9.70	9.19	7.53	5.87	4.21	2.56	0.90
Interest on working Capital	3.30	3.30	3.30	3.30	3.30	3.30	3.30
Rent	12.00	14.40	17.28	20.74	24.88	29.86	35.83
Selling & Administration Expenses	6.77	13.68	24.52	30.95	35.88	41.08	46.56
TOTAL	**49.89**	**62.31**	**78.72**	**92.16**	**105.85**	**121.88**	**140.70**
NET PROFIT	7.77	12.55	15.35	19.55	26.08	34.59	39.95
Taxation	0.80	1.52	2.35	3.61	5.57	8.13	9.73
PROFIT (After Tax)	6.97	11.04	12.99	15.93	20.51	26.46	30.21

CALCULATION OF D.S.C.R

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
CASH ACCRUALS	26.46	27.61	27.09	27.93	30.71	35.14	37.60
Interest on Term Loan	9.70	9.19	7.53	5.87	4.21	2.56	0.90
Total	36.16	36.80	34.62	33.80	34.92	37.70	38.49
REPAYMENT							
Instalment of Term Loan	7.54	15.07	15.07	15.07	15.07	15.07	15.07
Interest on Term Loan	9.70	9.19	7.53	5.87	4.21	2.56	0.90
Total	17.24	24.26	22.60	20.94	19.28	17.63	15.97
DEBT SERVICE COVERAGE RATIO	**2.10**	**1.52**	**1.53**	**1.61**	**1.81**	**2.14**	**2.41**
AVERAGE D.S.C.R.							**1.87**

COMPUTATION OF PRODUCTION OF BIODEGRADABLE PLASTIC PELLET		
Items to be Assembled		
BIODEGRADABLE PLASTIC PELLETS		
Machine capacity Per day	10	Tonne
Total working Hours	8	hours
Tortal shifts in a Day	1	Shift
operational capacity per day (taken)	3.33	Tonne
Working days per annum	300	
Production capacity per annum (taken)	1000	Tonne
Production capacity per annum (in KG)	1000000	KG

Production of BIODEGRADABLE PLASTIC PELLETS		
Production	**Capacity**	**KG**
1st year	25%	2,50,000
2nd year	30%	3,00,000
3rd year	35%	3,50,000
4th year	40%	4,00,000
5th year	45%	4,50,000
6th year	50%	5,00,000
7th year	55%	5,50,000

Raw material cost			
Year	**Capacity Utilisation**	**Rate (per KG)**	**Amount (Rs. in lacs)**
1st year	25%	125.00	312.50
2nd year	30%	128.75	386.25
3rd year	35%	132.61	464.14
4th year	40%	136.59	546.36
5th year	45%	140.69	633.11
6th year	50%	144.91	724.55
7th year	55%	149.26	820.93

COMPUTATION OF SALE

Particulars	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
Op Stock	-	12,500	15,000	17,500	20,000	22,500	25,000
Production	2,50,000	3,00,000	3,50,000	4,00,000	4,50,000	5,00,000	5,50,000
Less : Closing Stock (15 Days)	12,500	15,000	17,500	20,000	22,500	25,000	27,500
Net Sale	**2,37,500**	**2,97,500**	**3,47,500**	**3,97,500**	**4,47,500**	**4,97,500**	**5,47,500**
sale price per KG	190.00	195.70	201.60	207.60	213.80	220.20	226.80
Sales (in Lacs)	451.25	582.21	700.56	825.21	956.76	1,095.50	1,241.73

BREAK UP OF LABOUR CHARGES

Particulars	Wages Rs. per Month	No of Employees	Total Salary
Skilled	18,000	6	1,08,000
Unskilled	14,000	6	84,000
Total salary per month			**1,92,000**
Total annual labour charges	**(in lacs)**		**23.04**

BREAK UP OF Staff Salary CHARGES

Particulars	Salary Rs. per Month	No of Employees	Total Salary
Helper	7,000	4	28,000
Supervisor	20,000	2	40,000
Accountant	19,000	2	38,000
Administartive staff	15,000	3	45,000
Total salary per month			**1,51,000**
Total annual Staff charges	**(in lacs)**		**18.12**

Utility Charges (per month)

Particulars	value	Description
Power connection required	150	KWH
consumption per day	1200	units
Consumption per month	30000	units
Rate per Unit	7	Rs.
power Bill per month	210000	Rs.

COMPUTATION OF CLOSING STOCK & WORKING CAPITAL							(in Lacs)
PARTICULARS	**1st year**	**2nd year**	**3rd year**	**4th year**	**5th year**	**6th year**	**7th year**
Finished Goods							
(15 Days)	20.72	25.61	30.57	35.94	41.52	47.24	53.36
Raw Material							
(10 Days)	10.42	12.88	15.47	18.21	21.10	24.15	27.36
Closing Stock	**31.13**	**38.49**	**46.04**	**54.16**	**62.62**	**71.39**	**80.72**

COMPUTATION OF WORKING CAPITAL REQUIREMENT					
TRADITIONAL METHOD					(in Lacs)
Particulars	**Amount**	**Own Margin**		**Bank Finance**	
Finished Goods & Raw Material	31.13				
Less : Creditors	10.42				
Paid stock	**20.72**	**25%**	**5.18**	75%	**15.54**
Sundry Debtors	**30.08**	**25%**	**7.52**	**75%**	**22.56**
	50.80		**12.70**		**38.10**
MPBF					**38.10**
WORKING CAPITAL LIMIT DEMAND (from Bank)					**30.00**

COMPUTATION OF DEPRECIATION				(in Lacs)
Description	**Plant & Machinery**	**Miss. Assets**	**Furniture**	**TOTAL**
Rate of Depreciation	**15.00%**	**15.00%**	**10.00%**	
Opening Balance	-	-		-
Addition	124.61	4.00	2.00	130.61
Total	124.61	4.00	2.00	130.61
Less : Depreciation	18.69	0.60	0.20	19.49
WDV at end of Year	**105.92**	**3.40**	**1.80**	**111.12**
Additions During The Year	-	-	-	-
Total	105.92	3.40	1.80	111.12
Less : Depreciation	15.89	0.51	0.18	16.58
WDV at end of Year	**90.03**	**2.89**	**1.62**	**94.54**
Additions During The Year	-	-	-	-
Total	90.03	2.89	1.62	94.54
Less : Depreciation	13.50	0.43	0.16	14.10
WDV at end of Year	**76.53**	**2.46**	**1.46**	**80.44**
Additions During The Year	-	-	-	-
Total	76.53	2.46	1.46	80.44
Less : Depreciation	11.48	0.37	0.15	11.99
WDV at end of Year	**65.05**	**2.09**	**1.31**	**68.45**
Additions During The Year	-	-	-	-
Total	65.05	2.09	1.31	68.45
Less : Depreciation	9.76	0.31	0.13	10.20
WDV at end of Year	**55.29**	**1.77**	**1.18**	**58.25**
Additions During The Year	-	-	-	-
Total	55.29	1.77	1.18	58.25
Less : Depreciation	8.29	0.27	0.12	8.68
WDV at end of Year	**47.00**	**1.51**	**1.06**	**49.57**
Additions During The Year	-	-	-	-
Total	47.00	1.51	1.06	49.57
Less : Depreciation	7.05	0.23	0.11	7.38
WDV at end of Year	**39.95**	**1.28**	**0.96**	**42.19**

REPAYMENT SCHEDULE OF TERM LOAN							
					Interest		11.00%
Year	Particulars	Amount	Addition	Total	Interest	Repayment	Closing Balance
ist	Opening Balance	-					
	1st month		97.96	97.96	-	-	97.96
	2nd month	97.96	-	97.96	0.90	-	97.96
	3rd month	97.96	-	97.96	0.90	-	97.96
	4th month	97.96		97.96	0.90	-	97.96
	5th month	97.96	-	97.96	0.90	-	97.96
	6th month	97.96	-	97.96	0.90	-	97.96
	7th month	97.96	-	97.96	0.90	1.26	96.70
	8th month	96.70	-	96.70	0.89	1.26	95.45
	9th month	95.45	-	95.45	0.87	1.26	94.19
	10th month	94.19	-	94.19	0.86	1.26	92.93
	11th month	92.93	-	92.93	0.85	1.26	91.68
	12th month	91.68	-	91.68	0.84	1.26	90.42
					9.70	7.54	
2nd	Opening Balance						
	1st month	90.42	-	90.42	0.83	1.26	89.17
	2nd month	89.17	-	89.17	0.82	1.26	87.91
	3rd month	87.91	-	87.91	0.81	1.26	86.65
	4th month	86.65	-	86.65	0.79	1.26	85.40
	5th month	85.40	-	85.40	0.78	1.26	84.14
	6th month	84.14	-	84.14	0.77	1.26	82.89
	7th month	82.89	-	82.89	0.76	1.26	81.63
	8th month	81.63	-	81.63	0.75	1.26	80.38
	9th month	80.38	-	80.38	0.74	1.26	79.12
	10th month	79.12	-	79.12	0.73	1.26	77.86
	11th month	77.86	-	77.86	0.71	1.26	76.61
	12th month	76.61	-	76.61	0.70	1.26	75.35
					9.19	**15.07**	
3rd	Opening Balance						
	1st month	75.35	-	75.35	0.69	1.26	74.10
	2nd month	74.10	-	74.10	0.68	1.26	72.84
	3rd month	72.84	-	72.84	0.67	1.26	71.58
	4th month	71.58	-	71.58	0.66	1.26	70.33
	5th month	70.33	-	70.33	0.64	1.26	69.07
	6th month	69.07	-	69.07	0.63	1.26	67.82
	7th month	67.82	-	67.82	0.62	1.26	66.56
	8th month	66.56	-	66.56	0.61	1.26	65.30
	9th month	65.30	-	65.30	0.60	1.26	64.05
	10th month	64.05	-	64.05	0.59	1.26	62.79
	11th month	62.79	-	62.79	0.58	1.26	61.54
	12th month	61.54	-	61.54	0.56	1.26	60.28
					7.53	**15.07**	

4th	1st month	60.28	-	60.28	0.55	1.26	59.03
	2nd month	59.03	-	59.03	0.54	1.26	57.77
	3rd month	57.77	-	57.77	0.53	1.26	56.51
	4th month	56.51	-	56.51	0.52	1.26	55.26
	5th month	55.26	-	55.26	0.51	1.26	54.00
	6th month	54.00	-	54.00	0.50	1.26	52.75
	7th month	52.75	-	52.75	0.48	1.26	51.49
	8th month	51.49	-	51.49	0.47	1.26	50.23
	9th month	50.23	-	50.23	0.46	1.26	48.98
	10th month	48.98	-	48.98	0.45	1.26	47.72
	11th month	47.72	-	47.72	0.44	1.26	46.47
	12th month	46.47	-	46.47	0.43	1.26	45.21
					5.87	**15.07**	
5th	Opening Balance						
	1st month	45.21	-	45.21	0.41	1.26	43.96
	2nd month	43.96	-	43.96	0.40	1.26	42.70
	3rd month	42.70	-	42.70	0.39	1.26	41.44
	4th month	41.44	-	41.44	0.38	1.26	40.19
	5th month	40.19	-	40.19	0.37	1.26	38.93
	6th month	38.93	-	38.93	0.36	1.26	37.68
	7th month	37.68	-	37.68	0.35	1.26	36.42
	8th month	36.42	-	36.42	0.33	1.26	35.16
	9th month	35.16	-	35.16	0.32	1.26	33.91
	10th month	33.91	-	33.91	0.31	1.26	32.65
	11th month	32.65	-	32.65	0.30	1.26	31.40
	12th month	31.40	-	31.40	0.29	1.26	30.14
					4.21	**15.07**	
6th	Opening Balance						
	1st month	30.14	-	30.14	0.28	1.26	28.88
	2nd month	28.88	-	28.88	0.26	1.26	27.63
	3rd month	27.63	-	27.63	0.25	1.26	26.37
	4th month	26.37	-	26.37	0.24	1.26	25.12
	5th month	25.12	-	25.12	0.23	1.26	23.86
	6th month	23.86	-	23.86	0.22	1.26	22.61
	7th month	22.61	-	22.61	0.21	1.26	21.35
	8th month	21.35	-	21.35	0.20	1.26	20.09
	9th month	20.09	-	20.09	0.18	1.26	18.84
	10th month	18.84	-	18.84	0.17	1.26	17.58
	11th month	17.58	-	17.58	0.16	1.26	16.33
	12th month	16.33	-	16.33	0.15	1.26	15.07
					2.56	**15.07**	

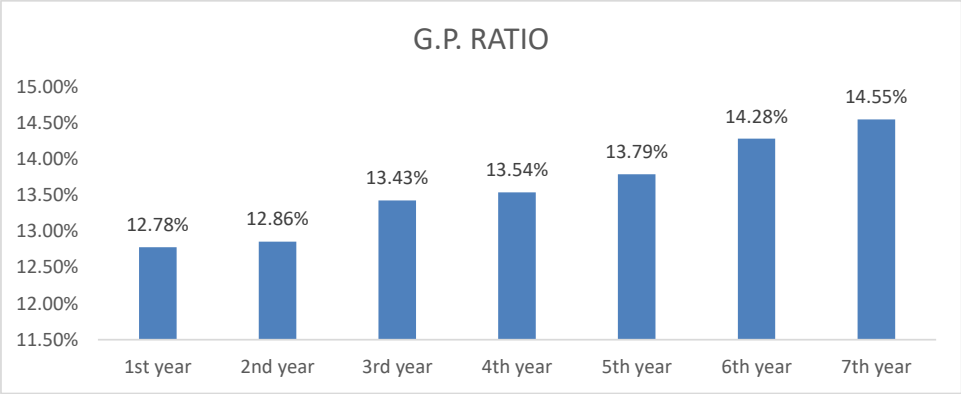
7th	Opening Balance						
	1st month	15.07	-	15.07	0.14	1.26	13.81
	2nd month	13.81	-	13.81	0.13	1.26	12.56
	3rd month	12.56	-	12.56	0.12	1.26	11.30
	4th month	11.30	-	11.30	0.10	1.26	10.05
	5th month	10.05	-	10.05	0.09	1.26	8.79
	6th month	8.79	-	8.79	0.08	1.26	7.54
	7th month	7.54	-	7.54	0.07	1.26	6.28
	8th month	6.28	-	6.28	0.06	1.26	5.02
	9th month	5.02	-	5.02	0.05	1.26	3.77
	10th month	3.77	-	3.77	0.03	1.26	2.51
	11th month	2.51	-	2.51	0.02	1.26	1.26
	12th month	1.26	-	1.26	0.01	1.26	-
					0.90	**15.07**	

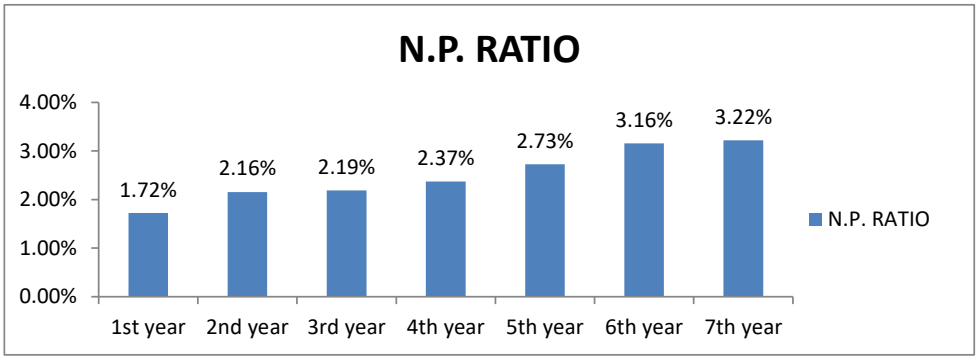
DOOR TO DOOR	84	MONTHS
MORATORIUM PERIOD	6	MONTHS
REPAYMENT PERIOD	78	MONTHS

BREAK EVEN POINT ANALYSIS							
Year	**I**	**II**	**III**	**IV**	**V**	**VI**	**VII**
Net Sales & Other Income	451.25	582.21	700.56	825.21	956.76	1,095.50	1,241.73
Less : Op. WIP Goods	-	20.72	25.61	30.57	35.94	41.52	47.24
Add : Cl. WIP Goods	20.72	25.61	30.57	35.94	41.52	47.24	53.36
Total Sales	**471.97**	**587.10**	**705.52**	**830.58**	**962.33**	**1,101.21**	**1,247.85**
Variable & Semi Variable Exp.							
Raw Material Consumed	312.50	386.25	464.14	546.36	633.11	724.55	820.93
Electricity Exp/Coal Consumption at 85%	21.42	25.70	30.84	37.01	44.42	53.30	63.96
Wages & Salary at 60%	24.70	29.64	35.56	42.67	51.21	61.45	70.30
Selling & adminstrative Expenses 80%	5.42	10.95	19.62	24.76	28.70	32.86	37.25
Interest on working Capital	3.30	3.30	3.30	3.30	3.30	3.30	3.30
Repair & maintenance	4.51	11.64	15.76	18.57	21.53	24.65	27.94
consumables	10.60	13.68	16.46	19.39	22.48	25.74	29.18
Packaging	18.95	26.20	31.53	39.20	43.05	41.08	43.46
Total Variable & Semi Variable Exp	**401.40**	**507.36**	**617.21**	**731.26**	**847.80**	**966.94**	**1,096.32**
Contribution	**70.56**	**79.74**	**88.31**	**99.32**	**114.53**	**134.27**	**151.53**
Fixed & Semi Fixed Expenses							
Electricity Exp/Coal Consumption at 15%	3.78	4.54	5.44	6.53	7.84	9.41	11.29
Wages & Salary at 40%	16.46	19.76	23.71	28.45	34.14	40.97	46.87
Interest on Term Loan	9.70	9.19	7.53	5.87	4.21	2.56	0.90
Depreciation	19.49	16.58	14.10	11.99	10.20	8.68	7.38
Selling & adminstrative Expenses 20%	1.35	2.74	4.90	6.19	7.18	8.22	9.31
Rent	12.00	14.40	17.28	20.74	24.88	29.86	35.83
Total Fixed Expenses	**62.79**	**67.19**	**72.96**	**79.77**	**88.45**	**99.68**	**111.58**
Capacity Utilization	**25%**	**30%**	**35%**	**40%**	**45%**	**50%**	**55%**
OPERATING PROFIT	**7.77**	**12.55**	**15.35**	**19.55**	**26.08**	**34.59**	**39.95**
BREAK EVEN POINT	**22%**	**25%**	**29%**	**32%**	**35%**	**37%**	**40%**
BREAK EVEN SALES	**419.99**	**494.70**	**582.91**	**667.11**	**743.19**	**817.54**	**918.87**

FINANCIAL INDICATORS

PARTICULARS	1st year	2nd year	3rd year	4th year	5th year	6th year	7th year
TURNOVER	451.25	582.21	700.56	825.21	956.76	1,095.50	1,241.73
GROSS PROFIT	57.66	74.86	94.07	111.71	131.93	156.47	180.65
G.P. RATIO	**12.78%**	**12.86%**	**13.43%**	**13.54%**	**13.79%**	**14.28%**	**14.55%**
NET PROFIT	7.77	12.55	15.35	19.55	26.08	34.59	39.95
N.P. RATIO	**1.72%**	**2.16%**	**2.19%**	**2.37%**	**2.73%**	**3.16%**	**3.22%**
CURRENT ASSETS	68.34	80.42	88.45	98.50	114.24	127.50	142.79
CURRENT LIABILITIES	44.42	49.95	53.97	60.16	69.76	75.95	82.71
CURRENT RATIO	**1.54**	**1.61**	**1.64**	**1.64**	**1.64**	**1.68**	**1.73**





10. IMPLEMENTATION SCHEDULE

Implementation Schedule

S.N.	Activity	Time Required (in Months)
1	Acquisition Of premises	1
2	Procurement & installation of Plant & Machinery	1-2
3	Arrangement of Finance	2-3
4	Requirement of required Manpower	1-2
	Total time Required (some activities shall run concurrently)	4-5 Months

11. ASSUMPTIONS

- Production Capacity of Biodegradable Plastic Pellets is 1000 Tonne Per annum. First year, Capacity has been taken @ 25%.
- Working shift of 8 hours per day has been considered.
- Raw Material stock is for 10 days and finished goods Closing Stock has been taken for 15 days.
- Credit period to Sundry Debtors has been given for 15-20 days.
- Credit period by the Sundry Creditors has been provided for 13-16 days.
- Depreciation and Income tax rates has been taken as per the Income tax Act, 1961.
- Interest on working Capital Loan and Term loan has been taken at 11%.
- Arrangement for labour wages has been made as per the prevailing market rates, which may vary from place to place and the minimum wages fixed by the concerned authorized from time to time.

- Selling Prices & Raw material costing has been increased by 3% & 3% respectively in the subsequent years.
- The rental value of the workshop shed and other built up/covered areas has been taken as per the prevailing market rates, which may vary from place to place and time to time.
- The rates quoted in respect of machines, equipment and raw materials are those prevailing at the time of preparation of this project profile, and are likely to vary from supplier to supplier and place to place.
- This project profile is prepared for guidance; hence, entrepreneurs are advised to check all the parameters while intending to put up such unit.

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