Brief Project Report on

BIODEGRADABLE AND COMPOSTABLE BAG DEVELOPED BY DRDO

For replacement of Polyethylene bags

Compiled by

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Brief about the product

Polythene bags/bottles have become persistent threats to environment. The pollution caused by all pervasive polyethylene based packing material is having inadvertent impact on nature. Plastics and polyethylene takes about 200-300 years to decompose on its own. The efforts to recycle plastic by collection and segregation are tedious and costly.

Keeping in view of ill effects of pervasive usage of plastics and polyethylene bags, various options are being researched to replace these hazardous materials. In such effort, scientists from DRDO have developed bio-degradable bags to replace single use polyethylene bags. The single use bags is based on a formulation developed using starch and food graded materials. During feasibility studies, the final product is realized in collaboration with M/s Ecolastic Products, Hyderabad.

DRDO has developed two types of bags i.e. Water soluble bags (for sea applications) and water resistant bags (for land application)

The salient features of the product are:

- An alternate to conventional single use plastic
- Eco friendly, Bio-degradable and Home compostable
- Do not contain conventional plastic
- No harm to animals/aquatic life by disposal/consumption
- Bio-degradability within 60 days and completely turns into manure after 80 days
- Good tensile strength and elongation
- Fully tested and certified from CIPET
- Printable in multiple colors based on user requirement
- Cost effective

DRDO is willing to transfer the technology to industries for mass production to the benefit of society and mankind.

The existing polythene bag manufacturers can migrate to these bags manufacturing with minimum change in plant and machinery.

Raw Material used for Biodegradable bag

The formulations have been developed by DRDO– ASL using

. Starch

. Vegetable Oil

. 100% Home Compostable polymer

The properties of ingredients are mentioned as below:

a) Starch
   - No toxic and 100% bio compostable
   - Impact strength and flexural modulus(stiffness)
   - Opacity and surface gloss to improve surface finish

a) PB AT (Poly butylenes Adipate Terepthalate)
   - Non vetting and home compostable (as per ISO 17088, ASTM- D6400, EN 13432)
   - It is fully biodegradable greater than 90%,
   - it provides flexibility and resilience

b) Additives

Two types of formulations are developed by DRDO:

Water Soluble bags	Water Resistant bags
PVA + Starch Polymer + Additives	PBAT + Starch polymer + Additives

Manufacturing process for Biodegradable bag

The process of manufacturing is same as like polythene bag involving following processes:

i) Extrusion, Blowing process& printing
ii) Bottom sealing and D punching

Extrusion & blowing process with printing is combined in one machine for manufacturing of bio degradable bag. The carry bag is made of blown film process. The film form as bubble and then rolled on a spool. Regulation of film width & thicknesscan be controlled by volume of air in the bubble,the output of extruder and the speed of the haul-off. Minimum 20 micron size can be manufactured for biodegradable bags.

No extra expenditure is required for bag manufacturing.There is a minor change in the settings of temperature, flow rate etc. parameters in the extrusion&blowing process of the existing process adopted for polythene bag manufacturing.

Dana/Granules/Pellets which is raw material for these bags is readily available through DRDO. The details of suppliers and approximate price are as below:

Raw Material	Availability / Suppliers	Approx. Cost /Ton
Granules	1.M/s. Ecolastic Products Pvt.Ltd Hyderabad	Rs.2.16 lakhs

For Dana/Granules/Pellets manufacturing separate plant is required.

Estimated Economy of Project

A. For production of Bags by existing manufacturers already engaged in polythene bag making:

Minimum expenditure is required for bag manufacturing. The plant capacity will be according to its existing plant capacity. Granules can be purchased from DRDO/ their authorized vendors.

B. Production of bags by new unit

For setting up of plant for Biodegradable bags following machines are required:

i)Extrusion, Blowing process& printing

ii)Bottom sealing and D punching

Granules will be taken from DRDO/ their authorized vendors.

Estimated approximate expenditure and other details of machineryare mentioned as below:

Name of Machine	**Approx. Cost in Rs. Lakhs**	**Capacity**	**Power requirement**	**Area required for one machine**
Extruder	166	500 ton/month	For 260 tons production the consumption is 8000 units	**1.Size of building/shed** (25 ft height is must required) **2. Manpower** (14 for 2 shifts)
Blow eqpt	24	150 Ton/12 Hour		
Printer	29	1 Ton/12 Hour		
Bottom sealing and D punching	37	7000 Pouches /Minutes		
Transformer 500KV +Chiller	29+15= 44	500KV		
Total	300 Lakhs	--	--	Half acre

NOTE: The cost may vary based on the make and model

C. DANA/ Granules making plant: Existing MSMEs or new units can also produce granules by themselves by using DRDO formulation/ technology.

Quality Control & Quality Assurance of Product

If any new Unit/ existing Unit require ToT, it needs QC lab set-up as per the Technology transfer document given by DRDO.

Following testing is essential for quality control and certifications:

- **For Raw Materials**
- Moisture content
- Viscosity
- Ash content
- Density
- Melt flow index(MFI)

- **In process Parameters ((Granules and Blow equipment)**
- Melt point
- MFI

- **Final product (On bags)**

- Color delta
- Tensile strength
- % elongation
- Film thickness

Quality standards applicable:

For Bag : ISO 17088,

For PBAT : ASTM- D6400, EN 13432

Approx. cost for setting up QC lab is Rs. 20 lakhs (Mandatory to firms to obtain ToT from DRDO).

One-time certification if required from CIPET. Approximate cost of testing is Rs. 5 lakhs, Presently Certification for biodegradable bag is presently done at CIPET, kochi / Aurangabad.

Terms and Conditions for Technology Transfer

a) For existing firms
   - TOT fees is Nil
   - Royalty on net sale to export market and domestic market is 2 % of invoice value. Export is subjected to due approval for DRDO/MOD.
   - 10 year license
   - DRDO emblem can be used.
   - QA policy to be met
   - License can be cancelled if the T&C are not met

b) For New firm
   - Infrastructure as per requirement
   - QC lab requirement to be met
   - Inspection will be done by DRDO team and go ahead will be given

Technology Partner:

M/s Ecolastic Products Pvt. Ltd., Phase–I, plot No. 35/2,IDA, Cherlapolly, Hyderabad-500051.

Cost comparison of biodegradable bag with single use plastic bags

30 % cheaper as compare to polyethylene bag of 120 micron or more size.
Biodegradable bags can be made of 20 microns onward of any size, lower the thickness and more number of bags can be produced.
The bags can be made of less micron size since there is no restriction on size hence less material consumption.
Also with more scale of production the price will come down.

Machine Suppliers details

If any firm require new machineries, can contact DRDO for Source or they can explore individually.

For queries & further assistancethe Entrepreneurs/MSMEs may contact

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