



SIMPLE AND BIG WASTE BUSINESS OPPORTUNITIES



Innovative Thought Forum (ITF) is an India centric “think +act “tank. It holds deliberations in several vital areas from which a few ideas are to be taken up for piloting.

To bring focus, ITF follows a 5S framework (simple, smart, sensible, sustainable and scalable/spreadable) in selection of pilotable projects.

Swachhta (safai) is the biggest area for business interventions.

In this booklet, 20 ideas are presented that are worth working on.

1. Dry solid Waste Management
2. Proper Disposal and Conversion of Municipal Solid Waste
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Dry solid Waste Management

Description-

Collection and Segregation of inorganic solid dry waste

Raw Materials-

Dry solid and recyclable waste such as plastic, paper, metal, glass, garment, rubber and others.

Finished Products-

Highest degree segregated waste that realizes higher price and being environmentally compliant.

Process-

- 1) Screening of mixed waste
- 2) Primary segregation
- 3) Secondary segregation

Plant and Machinery-

Conveyor, Shredder and Collection vehicle

Business Model-

Selling segregated waste to recyclers

Revenue Model-

- 1) Price realization on sales to recyclers
- 2) Price realization on reuse/refurbish

Market Potential-

India generates 62 million tonnes of waste every year, of which less than 60% is collected and around 15% processed. This leaves a huge gap to be bridged, creating an opportunity for entrepreneurs in waste management.

Useful links-

- 1) <https://www.wowvans.com/>
- 2) <https://www.forbes.com/sites/suparnadutt/2017/06/21/this-startup-is-making-indias-garbage-its-business/>
- 3) <https://www.downtoearth.org.in/news/waste/how-plastic-producing-companies-can-make-waste-recycling-viable-61272>
- 4) <https://www.epw.in/engage/article/institutional-framework-implementing-solid-waste-management-india-macro-analysis>

Proper Disposal and Conversion of Municipal Solid Waste

Description-

Treatment of Municipal Solid Waste and conversion into less hazardous and useful products.

Raw Materials-

Municipal Solid Waste- Wet and Dry

Finished Products-

Refused Derived Fuel, RDF Oil and Compost

Process-

Pre-sorting into wet and dry waste

Later, the sorted wet and dry waste is converted into the following-

Wet waste-

Converted into Compost

Leachate can be fed to Biomethanation Plant

Dry waste-

Screening into various grades of RDF

Plastic into oil

Plant and Machinery-

Trommels (100mm, 16mm and 4mm)

Biogas Plant, Plastic to Oil plant, Composting unit and Cranes/Hydra, Weighing Bridge

Business Model-

Site owned and developed by Local Municipal corporations, whereby operated and maintained by a separate party (mostly PPP model)

Revenue Model-

- 1) Tipping fee from Municipal Corporation
- 2) Price realization from sale of Compost
- 3) Price realization from sale of RDF
- 4) Price realization from sale of oil
- 5) Horticulture waste is sold to Briquetting plants

Market Potential-

Scientific waste disposal is the need of the hour in all the major cities.

Useful links-

<https://www.mailhem-ikos.com/>

Bins as Billboards

Description-

Using Waste collection bins as advertising avenues.

Using available spaces for advertising or publicity is a well-known service. In Municipal Solid Waste Management, bins are essential for segregation, collection, transfer and management. A service revolving around use of bins as a billboard or advertising media provides an excellent business opportunity.

Entrepreneur can set up business to service local governments or private sector.

Plant and Machinery-

Bins, Transfer vehicles, Segregation machines and bale pressers.

Business Model-

- 1) Signing with the customers for the waste collection and management service.
- 2) Signing with the advertisers for use of bins as billboards on agreed terms.
- 3) Engagement of staff to collect, transfer and aggregate waste
- 4) Sensitize the producers of waste with proper systems of waste management for efficient service.
- 5) Linkage with different agencies to sell the collected waste

Revenue Model-

- 1) Revenue from advertisements on the bins
- 2) Waste collection charges from the producers of waste
- 3) Sale of waste in various forms
- 4) Refurbishing/ Upcycling of waste into useful forms

Market Potential-

The service offers a huge potential. The competition is absent or negligible as the concept is new. It can be spread through franchising anywhere in the state or the country.

Supreme court came up with Solid waste management rules in 2016 allowing free charges for waste management, penalties etc

Decentralised Organic Waste Converters

Description-

Composting of Food waste, Garden waste using decentralized Organic Waste Converters (OWCs)

Raw Materials-

Garden waste, Food waste, Water and bacteria culture.

Finished Products-

Homogeneous odour free compost

Process-

The Organic Waste Converter (OWC) plant works on the principle of Aerobic Microbial decomposition of solid waste into compost. This is a Bio Mechanical process which produces a homogeneous odour free output that is used for soil conditioning.

Plant and Machinery-

Crushers and Organic Waste converters

Business Model-

- 1) Organic Waste management as a service
- 2) Sale of machines

Revenue Model-

- 1) Tipping fee for waste management
- 2) Price realization through sale of machines
- 3) Price realization through sale of compost

Market Potential-

Segregation of waste source and treatment of waste at source are the two ideas being floated to tackle the menace caused by waste.

Decentralised waste converters can be installed in small establishments, Institutions, Residential and Commercial buildings where the waste produced is itself converted into a natural and useful product which is environment friendly.

Many Municipal corporations are transferring the responsibility of disposal of waste by the users themselves, OWCs provide an excellent business opportunity for those who want to sell the machines or provide waste conversion as a service.

Useful links-

<http://www.durogreen.in/>

Conversion of Waste into Electricity

Description-

Conversion of Municipal Solid Waste into Energy using Biomethanation

Raw Materials-

Food waste and Septic waste

Finished Products-

Electricity and compost

Process-

- 1) Waste collection and sorting to remove undesired materials
- 2) Biomethanation
- 3) Scrubbing to remove Hydrogen Sulphide
- 4) Gas based Electricity production

Plant and Machinery-

Biogas plant, Gas refining unit, Electricity generating unit

Business Model-

Site and Infrastructure developed by Government. Operated and Maintained by Private companies
Usually under PPP models.

Revenue Model-

- 1) Tipping fee
- 2) Electricity sold to discoms
- 3) Sale of Compost

Market Potential-

Proper disposal of MSW is the biggest concern of Government at all levels. A large number of cities have been or have started facing the heat as heaps of garbage have now become mountains covering large tracts of land. They are also causing a lot of pollution and responsible for many diseases born out of non-scientific disposal of waste.

Disposal of Food waste by small waste producers

Description-

Biogas Plant for Restaurants, Institutions and for small communities

Raw Materials-

Food waste, water and bacteria

Finished Products-

- 1) Slurry
- 2) Biogas used for heating

Process-

The various steps under Biomethanation are listed as below-

- 1) Feeding
- 2) Crushing
- 3) Mixing with water in 1:1 ratio
- 4) Primary and Secondary Digestion
- 5) Collection of Gas and Slurry

Plant and Machinery-

Crushing machine, Primary and Main Digesters, Lifting pumps, PVC/ Neoprene Balloon

Business Model-

Own and operate Biogas Plant

Revenue Model-

- 1) Savings on use of Biogas for heating
- 2) Price realization by sale of Slurry/ Compost

Market Potential-

Municipal Corporations in many cities have stopped collecting Food waste and the onus lies on the producers to dispose scientifically.

This necessitates the producers of waste to find innovative and cost-effective ways of disposing off the food waste and produce useful by-products.

Briquette manufacturing from Biomass and Agro Waste

Description-

Conversion of Agricultural waste and other biomass into Briquettes for heating.

Raw Materials-

Biomass and Agricultural waste such as Cotton stalk, Cotton flower, Sugarcane bagasse, Castor seed shell, Castor stick, Coconut wasters, coffee husk, Coir Pitch, Corn cobs, Corn dental stick, Groundnut shell, Rice husk, Saw dust, Paddy straw, Soybean husk, Jute waste, Cashew husk, Rice straw and others can be used.

Finished Products-

Briquettes with (but not limited to) the following characteristics-

- 1) Diameter- 50-90 mm
- 2) Length- 6-8 inches
- 3) GCV- 3800-4200 kcal/kg
- 4) Ash content- less than 8%
- 5) Moisture content- less than 10%

Process-

- 1) Drying of Biomass
- 2) Crushing of Biomass
- 3) Briquette formation by heat generated by compression
- 4) Cutting of Briquettes to get fixed length

Plant and Machinery-

- 1) Drying machine
- 2) Cutting machine
- 3) Briquetting machine

Business Model-

Manufacturing briquettes and supplying to Industries

Revenue Model-

Price realization from sale of Briquettes

Market Potential-

Useful links-

- 1) <http://www.jkbriquettingplant.com/index.htm>
- 2) <https://www.jaykhodiyar.com/comparison-of-briquettes-with-other-fossil-fuels/>
- 3) <http://www.eisco.co/burner/FUELS%20HIGHER%20CALORIFIC%20VALUES.pdf>

Enrichment of Manure and LBF

Description-

Enrichment of manure and Liquid Bio Fertilizer (Case Study- PROM)

Raw Materials-

Organic matter, Rock phosphate and Bacterial (PSB and Nitrogen Fixing)

Finished Products-

Phosphate Rich Organic Manure

Process-

Co-composting rock phosphate with Organic matter and Bacteria

Plant and Machinery-

Business Model-

- 1) B2B and B2C
- 2) PROM production as a service

Revenue Model-

- 1) Price realization from sales
- 2) Fee against service

Market Potential-

Globally Organic Fertilizer consumption was 18.23 million tonnes (~\$5.87 billion) and growing at CAGR 7% per annum.

Expected to reach \$8.25 billion by 2023

Useful links-

<https://www.youtube.com/watch?v=A5vPImlt63w>

Energy from Renewable sources and Waste

Description-

Renewable energy-based power units of 10 KVA/ 25 KVA

Raw Materials-

Depending on one of the following routes, the raw material shall change

- 1) Solar PV
- 2) Biogas to power
- 3) Biomass to power

Sunlight becomes the only raw material for Solar PV. For Biogas and Biomass- Animal, Food, human, septic, agro waste etc can be used.

Finished Products-

Electricity

Process-

After producing electricity from any of the routes, sub units procured from vendors can be integrated using proper technology.

Plant and Machinery-

PV unit, Biogas plant, Scrubber and Generator and integrated sub units.

Business Model-

B2B or B2C

Revenue Model-

- 1) Price realization by sale of equipment
- 2) Price realization by sale of electricity

Market Potential-

This can be marketed in all remote, rural, decentralised areas in India and abroad.

Also, can be promoted as an environment friendly alternative to diesel and gas generators.

Building material using Plastic waste

Description-

Construction of building materials using Plastic waste

Raw Materials-

Plastic waste containing PET, HDPE, PP or ABS

Finished Products-

Containing walls, Earthenware, Mezzanines and Thermic roofs

Process-

Segregation of collected waste, Shredding and Grinding to form flakes, Melt extrusion and Compression moulding

Plant and Machinery-

- 1) Shredding and Grinding machine
- 2) Melt Extruder
- 3) Compression moulding machine

Business Model-

B2B and B2C

Revenue Model-

Price realization through sale of building materials or by construction of buildings with these materials

Market Potential-

With the rise in demand for low cost housing and the need to find out innovative ways to dispose the plastic waste, it opens up a great window of opportunity for use of plastic waste

Useful links-

<https://www.thehindubusinessline.com/scaling-up/low-cost-housing-from-recycled-plastics/article25598009.ece>

Use of Plastic Waste in Roads

Description-

Using plastic waste along with conventional materials to construct roads

Raw Materials-

Plastic waste, aggregate and bitumen

Finished Products-

Motorable road of accepted standards

Process-

The plastic waste material is first shredded to a particular size using a shredding machine. The aggregate mix is heated at 165°C and transferred to the mixing chamber, and the bitumen is heated to 160°C to result in good binding.

The shredded plastic waste is then added to the aggregate. It gets coated uniformly over the aggregate within 30 to 60 seconds, giving an oily look.

The plastic waste coated aggregate is mixed with hot bitumen and the resulting mix is used for road construction at a temperature between 110°C to 120°C.

A roller of capacity of 8 tons is recommended for laying the road.

Plant and Machinery-

- 1) Plastic shredding machine.
- 2) Bitumen and Aggregate heating arrangement.
- 3) Aggregate mixer and laying mechanism.
- 4) Roller

Business Model-

B2G or B2C

Revenue Model-

Revenue earned through service or by provisions under PPP model for B2G business model

Useful links-

- 1) <https://www.thebetterindia.com/43685/plastic-waste-in-road-construction-plastic-man-india-prof-vasudevan/>
- 2) <https://www.theguardian.com/sustainable-business/2016/jun/30/plastic-road-india-tar-plastic-transport-environment-pollution-waste>

Use of C&D waste for making concrete

Description-

Use of Construction and Demolition (C&D) waste as aggregate in concrete

Raw Materials-

Ordinary Portland Cement, water, natural sand, natural coarse aggregates (≤ 20 mm) and C&D waste aggregates (≤ 20 mm)

Finished Products-

Concrete having upto 25% recycled coarse aggregates

Process-

- 1) Preparation of cement
- 2) Aggregates (natural and recycled), admixtures (chemical additives), any necessary fibers, and water—are mixed together with the cement under specific conditions to make concrete

Plant and Machinery-

Concrete mixer, pavers, heavy duty pumps, crushers, road rollers and others depending on the application

Business Model-

B2B

Revenue Model-

- 1) Tipping fee for waste collection and utilization
- 2) Price realization through sale of concrete mix

Market Potential-

CPCB estimated the solid waste generation about 48 million tonnes per annum of which 25% is from the construction industry (~12-14.7 million tonnes).

An average of 500 kg/ sq. m waste is produced from a pucca building and 300 kg/ sq. m from a semi-pucca building.

Useful links-

<http://www.bmtpc.org/>

Sanitary ware waste into Tiles

Description-

Use of sanitary ware waste for making acid resistant tiles

Raw Materials-

- 1) Broken ceramic aggregate (~10-15 mm)
- 2) Polymer blend based on epoxy resin, phenolic resin, amino resin etc
- 3) Additives- Reactive diluents, thickening agents, surface modifiers etc.
- 4) Colouring materials- Polymer compatible pigments and dyes

Finished Products-

Acid resistant tiles called "polycera" tiles

Process-

- 1) Development of Polymer blend
- 2) Mixing of ceramic aggregate with the polymer blend
- 3) Casting of tiles

Plant and Machinery-

The machines required can be categorised into two different sets-

- 1) Preparation of polymer blend
- 2) Tile manufacturing

Business Model-

B2C and B2B

Revenue Model-

Price realization through sale of polycera tiles.

Market Potential-

Indian ceramic industry is the size of 4.9 billion euros and poised to grow at 9% CAGR. Of this sanitary ware is around 11%. Almost 20% of the total sanitary ware production is a waste in the form of de-shaped, damaged and broken sanitary ware.

This waste is the most biological, chemical and physical degradation resistant of all wastes. Therefore, recycling the waste in itself is a 100 million euros industry.

Useful links-

- 1) [https://www.indian-ceramics.com/wp-content/uploads/2018/10/ Ceramics_Industry_Report.pdf](https://www.indian-ceramics.com/wp-content/uploads/2018/10/Ceramics_Industry_Report.pdf)
- 2) Book- "Waste to wealth", BMTPC published

Manufacturing of AAC blocks using Fly Ash

Description-

Making Autoclaved Aerated Concrete (AAC) blocks using Fly Ash

Raw Materials-

Fly Ash, Cement, Lime, Water, Aluminium powder and Aerating agent

Finished Products-

Autoclaved Aerated Concrete (AAC) blocks

Process-

The raw materials are first tested, graded and stored separately. They are then metered and conveyed in a programmed sequence into the batch mixer. The mixture is then poured into moulds and set, trimmed and cut to shape and size. In Autoclaves, they are steamed for upto 12 hours.

Plant and Machinery-

Raw material storage (silos), Mixers, Moulds, cutters and autoclave machine.

Business Model-

B2C

Revenue Model-

Price realization through sale of AAC blocks

Market Potential-

With the increase in demand for built up dwelling units and pressure of urbanization, construction industry has witnessed a tremendous growth in demand.

Also, since 72% of India's power plants are coal based, they produce millions of tonnes of Fly Ash.

This data provides a base for the use of Fly Ash in applications useful for the construction industry, at the same time solving the problem of safe disposal of

Fly Ash produced in the power plants.

Useful links-

<http://www.bmtpc.org/>

Fly Ash in Building materials

Description-

Use of Fly ash in making building material

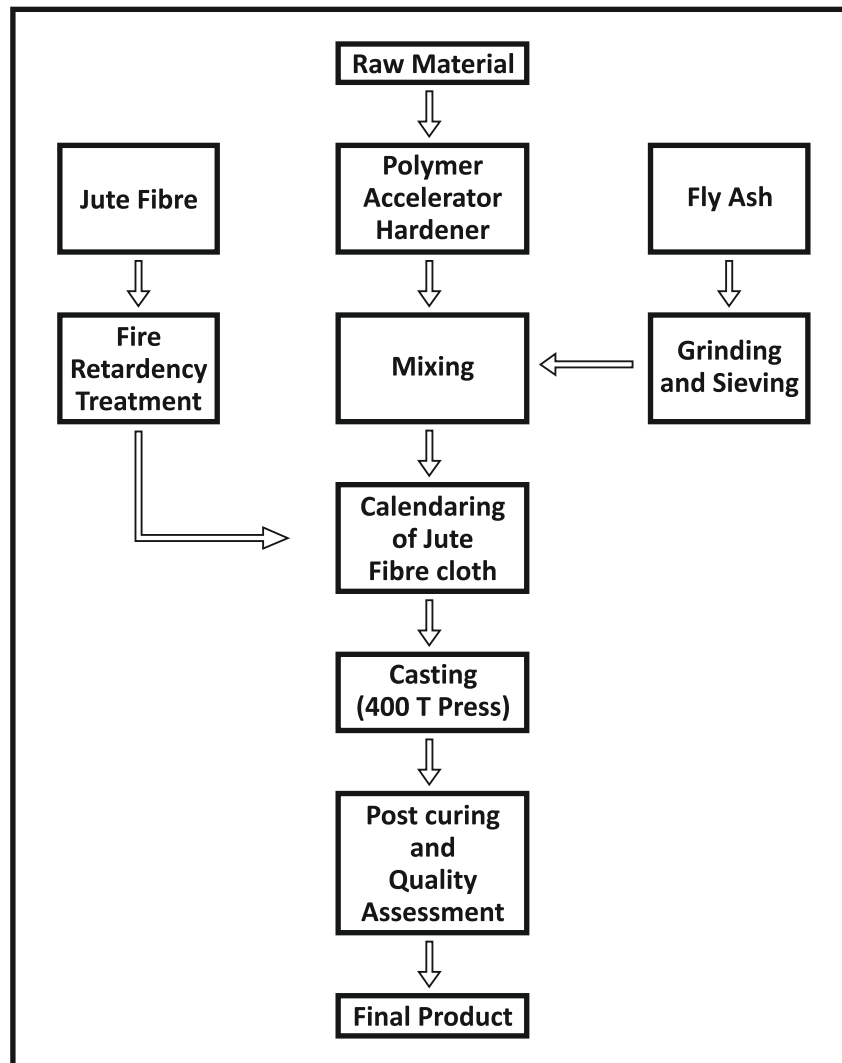
Raw Materials-

Jute fabric, Polymer Accelerator Hardener and Fly Ash

Finished Products-

Fly Ash Polymer jute reinforced composite (FPC) that can be used as wood substitute materials

Process-



...Cont.

Plant and Machinery-

Polymer mixer, calendaring machine and casting machine

Business Model-

B2C

Revenue Model-

Price realization by sale of FPC building materials

Market Potential-

More than 200 million tonnes of fly ash is produced by thermal power plants in India, whose safe disposal is a big challenge for these plants.

The shortage of traditional materials such as cement, bricks, timber, steel and aggregate for concrete, necessitates the use of such novel materials like fly ash to bridge the demand-supply gap.

Useful links-

<http://www.bmtpc.org/>

Refurbishing Electronic Waste (e-Waste)

Description-

Refurbishing Electronic waste into useful products that serve the same purpose as they did when originally manufactured

Raw Materials-

IT e-Waste, White Goods, home appliances, communication devices et al

Finished Products-

Refurbished IT materials like laptops, desktops, servers, printers and others that serve the same functionality as when originally manufactured.

Process-

- 1) Detailed screening- To ascertain the degree of damage and accordingly decide if the product can be refurbished or should be broken down completely.
- 2) Repairing- Replacing the hardware or improving the condition and aesthetics of the present hardware. Similar approach is taken for software, if required.
- 3) Improving the overall aesthetics of the repaired product by polishing, cleaning, painting et cetera.

Plant and Machinery-

Tools to work on the hardware, multi meter, cleaning equipments etc

Business Model-

Sourcing of material through bulk waste generators (corporates) and individual/ retail users and retailing the refurbished products

Revenue Model-

Sale proceeds from the refurbished materials.

Market Potential-

Following points highlight the importance and rise in the acceptance of the refurbished materials-

- 1) Environment friendly since no new manufacturing is done.
- 2) Cost effective - can help push technology to lesser fortunate section of the society. Use of these materials also helps the startups, students and businesses to cut their investments in buying them.
- 3) Durable – refurbishing the material infuses new life in the electronic good which ensure the life of the material is extended reasonably.
- 4) Availability - refurbished material is easily available and available in bulk in developing markets like India.

Useful links-

www.cerebragreen.com

Recycling and Refurbishing of Textile waste

Description-

Recycling and refurbishing of discarded textile materials

Raw Materials-

Discarded garments, upholstery fabrics and manufacturing waste

Finished Products-

Clothing and Yarn

Process-

Clothing-

If there is no major damage, the garments are thoroughly washed and are made ready to use.

Yarn-

This approach is followed for very high degree damaged garments.

Process followed is- segregation, shredding, combing (for converting into fibres) and spinning (usually rotor/ Open end) to produce yarn.

Plant and Machinery-

For refurbished clothing- Washing, ironing and packaging machines

Yarn formation-

Breaker comber and conventional rotor spinning line.

Business Model-

B2C and B2B

Revenue Model-

Price realization by sale of Garments and Yarn

Market Potential-

Useful links-

<https://www.fibre2fashion.com/industry-article/7279/recycling-and-upcycling-in-the-apparel-industry>

<https://www.bbc.com/news/business-40352910>

https://www.youtube.com/watch?v=_JZUOCsnQqY

Logistics as a service for waste collection

Description-

Logistics for collection of solid inorganic dry waste

Raw Materials-

Dry solid and recyclable waste such as plastic, paper, metal, glass, garment, rubber and others.

Finished Products-

Primary segregated and recyclable dry solid waste

Process-

Primary segregation at point of collection and transporting to the users/ buyers of waste

Plant and Machinery-

Commercial vehicle, Electronic weighing balance and weighing scale

Business Model-

Collection of waste from source and sell to the recyclers.

Revenue Model-

- 1) Price realization by sale of primary segregated waste.
- 2) Revenue from co- branding on the vehicle
- 3) Service charge for collection and transportation of waste

Market Potential-

India generates 62 million tonnes of waste every year, of which less than 60% is collected and around 15% processed. This data points towards a huge gap in the production and scientific disposal/ conversion of waste. Logistics being the backbone of any business, presents an opportunity in itself.

Useful links-

<https://www.wowvans.com/>

<https://www.epw.in/engage/article/institutional-framework-implementing-solid-waste-management-india-macro-analysis>

Mobile Toilets

Description-

Mobile/ portable sanitation service

Raw Materials-

Cleaning chemicals, Toilet blocks.

Finished Products-

Satisfactory service, organic fertiliser

Process-

Sanitation service has to be provided by placing suitable and clean sanitation/ toilet blocks at the required place. These are to be maintained and cleaned as per the standards and to be moved back to the workshop after the contract is over.

Plant and Machinery-

Toilet blocks of different types, vacuum truck, cleaning tools and equipment and transport vehicles.

Business Model-

- 1) Providing sanitation as a service
- 2) Conversion of human waste collected into usable resources through Biomethanation

Revenue Model-

- 1) Fee received for the service offered
- 2) Sale of Organic Fertiliser and Slurry

Market Potential-

The service can be availed at-

- 1) Events and functions where people are expected in large numbers
- 2) Exhibitions
- 3) Sports tournaments
- 4) Constructions sites
- 5) Slums and unauthorized clusters

As the local government imposes restrictions on the use of public place for sanitation, a higher demand for these services shall arise.

Conversion of Flower waste into Incense sticks

Description-

Using flower waste to produce incense sticks (dhoop batti)

Raw Materials-

Leftover or discarded flowers

Finished Products-

Incense sticks with or without custom fragrance

Process-

Drying the flowers, conversion into powder, formation of paste by adding water and pre-mixes and drying.

Plant and Machinery-

Grinding machine and compression moulding

Business Model-

B2C

Revenue Model-

Price realization by sale of incense sticks

Market Potential-

8 million tonnes of flowers are wasted in India every year. Engaging women groups or underserved sections of the society creates good employment opportunity too.

Useful links-

- 1) <https://www.youtube.com/watch?v=erIRisNTNiQ>
- 2) <https://www.youtube.com/watch?v=Y70oGOF2zo>