



WASTE
PLASTIC  FUEL

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WASTE PLASTICS TO SOLID BRIQUETTE FUEL PILOT PROJECT IN CEBU, PHILIPPINES

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Key Factors in Selecting Pilot Project



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- local situation of waste plastics as available feedstock,
- stakeholder issues and concerns,
- assessment of potential waste plastics to solid fuel technologies
- technology cost to determine scale of the technology piloting
- how it best suits local conditions

Feedstock Availability



- estimated that waste plastic is available at 3.146 tons from the households of the six barangays
- if only PE, PP and PS will be used as feedstock for solid fuel, an estimate of 1.22 metric tons of waste plastics can be generated
- auxiliary feedstock such as paper and wood, daily available feedstock amounts to an estimate of 3.262 metric tons.
- steady increase of waste generation with about 5 tons increase in a period of ten years for these villages.

Features of Cebu City Pilot Project



- converts waste plastics with paper and wood as auxiliary raw materials to produce solid fuel; refuse plastic fuel (RPF) as coal substitute
- daily production capacity of one (1) metric ton weight of solid fuel briquettes
- consideration counterparting from its implementing partners
- procurement of locally fabricated equipment and machines

Pilot Project Technical Aspects



- ❑ **Proximity to market:** pilot plant is preferably located 2 to 5 km away from the commercial/market district.
- ❑ Site must be accessible by any mode of transportation.
- ❑ **Production Capacity: daily production capacity of one (1) metric ton weight of solid fuel briquettes** using a plastic extrusion briquetting machine equipped with metal die as per desired specification of the product output.
- ❑ The plant operates 16 hour - operation working in 2 shifts daily from Mondays through Saturdays.

Pilot Project Technical Aspects



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- **Production Processes:** involves sorting and segregation, shredding, separation, drying, batching, mixing, and briquetting/pelletizing by extrusion, finishing, packaging and marketing/delivery of finished products.
- **Product Line:** about 4,000 pieces solid briquettes (approx. 2” diam x 6” long) from waste plastics (i.e., PE, PP and PS) for use as fuel for cement kilns, power plants, industrial heat/steam boilers, stoves, etc. out of waste plastics collected from municipal and industrial sources
- Blending the plastic materials with other combustibles such as wood chips/sawdust, natural fibers, etc., to obtain the desired calorific value will be considered as pilot production progresses.

Pilot Project Technical Aspects



- Type, volume, value of Raw Materials:
 - ▣ Polyethylene (PE),
 - ▣ Polypropylene (PP) – plastic carry bags, flexible plastic packaging materials, etc.
 - ▣ Polystyrene (PS) (disposable styrofoams/styropor, protective packaging (EPS), disposable cups, food service utilities, etc.
- For a 1 metric ton production capacity, the daily volume requirement of waste plastics is at least 1.2 MT.

Pilot Project Technical Aspects



- **Source of Raw materials:** The waste plastics (pre-sorted) will be supplied by the nearby Local Government Unit (LGU), specifically, collected and sorted by their respective materials recovery facilities (MRF's).
 - ▣ Other sources include: junkshops, manufacturing companies from the industrial processing zones, factories, etc.
- **Packaging Materials:** Plastic bags and sacks for small volume and bulk delivery, respectively.
 - ▣ 2-5Kg. briquettes - plastic bag;
 - ▣ 30kg pack – carton box;
 - ▣ 25-50kg- sacks

Pilot Project Technical Aspects



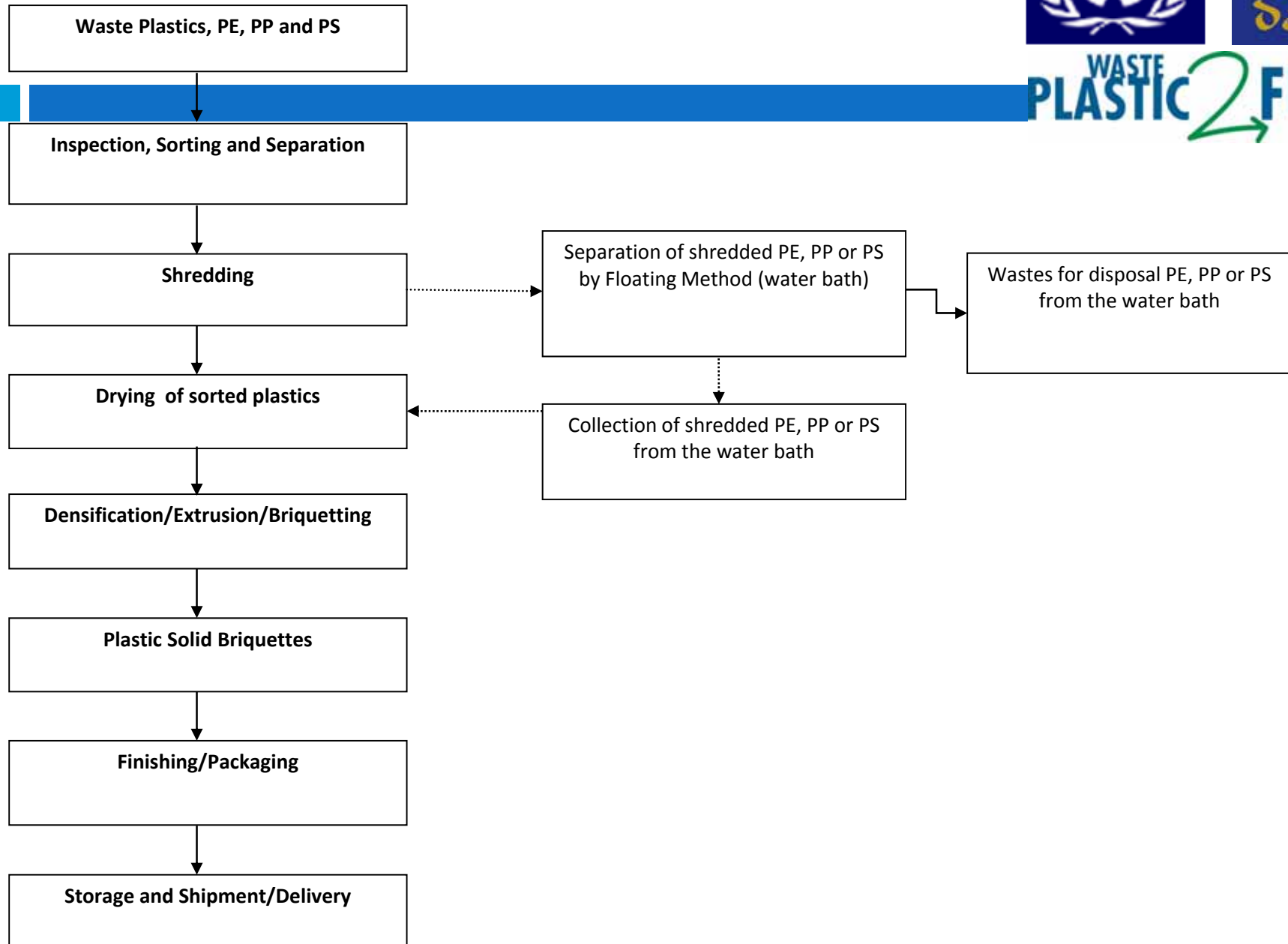
- Working Schedule: Six (6) days a week, 2 working shifts – 8 hours per shift.
 - Electrical/Power Requirement
 - One (1) unit of 75-100KVa Transformer and Installation costs
 - Electrical Installation (single and 3-phase, electrical lines, main circuit breaker/power box, etc.) (plant, office, site)

Pilot Project Technical Aspects



- Equipment Requirement
 - ▣ **One (1) unit Plastic Shredding /Grinding Machine**
(local supplier/fabricator) 250-300kg/hr
Power Drive: 13-15HP, 3 phase , 220V
 - ▣ **One (1) unit Briquetting Extrusion Machine 75 – 100 kg/hr**
Screw (L/D):
 - ▣ Auxiliary Equipment
- Assistance from the LGU and provincial government; concerned NGO's; concerned industry chamber/associations; individual companies
- Infrastructure/Civil Works : Recommended Land Area: 1,000 sq. m. (preferably with perimeter fence

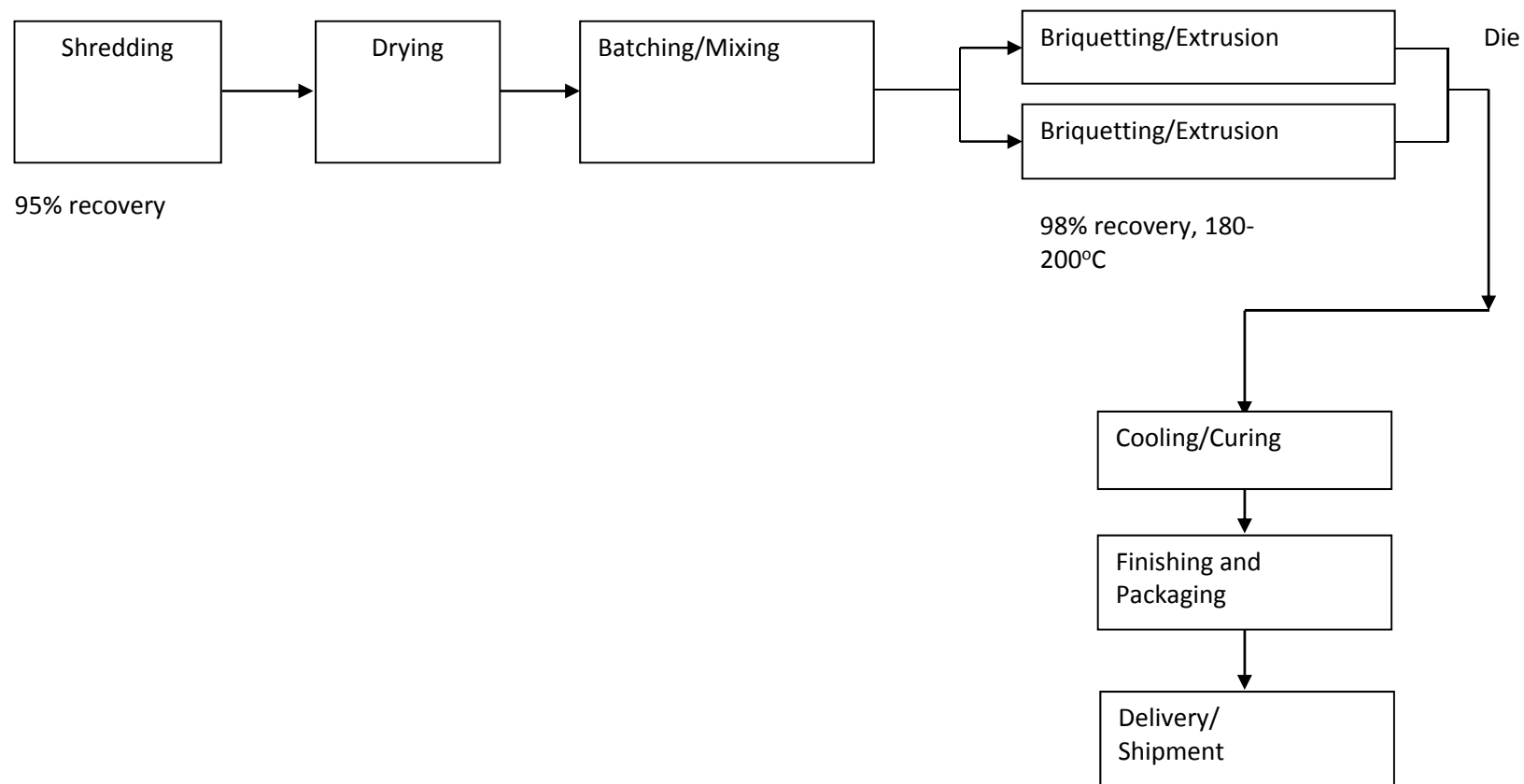
Process Flow



Material Balance



Below is a schematic diagram showing the different process levels and potential percentage of recovery.



Financial Aspects



- under pilot implementation
- primarily intended to demonstrate that waste plastics has great potentials for resource conservation such as fuel production.
- piloting of such technology will first and foremost focus on technical, environmental, and social viability with its financial returns as the least priority.
- However, it is proposed that once the piloting is in progress, a more detailed financial feasibility be done to be able to determine potential profits and return of investments especially when such technology is to be scaled up in the next stages of implementation.

Financial Aspects



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- It will also help determine market potentials of solid fuel briquettes in terms of price and demand as potential coal substitute in the local area and possibly beyond the pilot site
- The financial viability of the technology coupled with lessons learned from the piloting will facilitate in the development of an appropriate business model that can be utilized by industries that will be the primary market of solid fuel briquettes from waste plastics.

Social Aspects



- Also of primary concern is the readiness of the waste sources to provide source segregated, uncontaminated waste raw materials for solid fuel conversion.
- Initial stages will include intensive information and education campaign to various sectors to help ensure that wastes are being separated at source.
- segregated collection must also be in effect.

Social Aspects



- The most labor intensive sections of the process are waste collection, inspection, sorting and separation, packaging, shipment and delivery. Manpower for these sections may be sourced from waste pickers that might be displaced by the implementation of the city's integrated solid waste management plan and the P2F pilot project as well.
- Less people needed for pre-treatment or further segregation indicate a higher level of source-level segregation, which is more advantageous to the project and the city's solid waste management performance as a whole.

Implementing Partners



- UNEP-IETC, DAP, and City Government of Cebu
- Possible involvement of local academe will be explored specifically in tapping technical support on emission testing and other technical requirements that may be deemed necessary as piloting is in progress.
- Cebu LGU demonstrate/model waste plastics recovery technologies among its villages and constituents.

Implementing Partners



- Partnership with the Cebu Chamber of Commerce, Inc. (CCCI) will pursue along the line of developing an appropriate business model based on demonstration experience of the technology and lessons that can be learned as the demonstration/piloting progresses.
- The CCCI can help the project assess further the viability of the technology that will suit the private sector needs and interest as well as in its corporate social responsibility perspective.
- CCCI can assist the project in terms of providing inputs on the type and demand of the market on who will be the end users of the solid fuel briquettes, as final products, out of the waste plastic conversion technology.
- dissemination of availability and options for waste plastics conversion technologies and applications of the solid fuel briquettes as coal substitute to its industry members, and to the wider industrial community based in Cebu City.