International Expert Group Workshop
on Compendium of EST
for Converting Waste Plastics into a Resource

Data Collection for technology selection
技術選定のためのデータ収集

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Introduction　はじめに

- There are many tasks to do in technology transfer. This presentation is a preliminary preparation for it.
- This presentation roughly describes the features of the technologies for waste plastics conversion and the types of data for planning the technologies to be transferred in a local community.

- 技術移転にあたっては、様々な検討事項がある。本発表はその第一段階にあたる。
- 本発表では、廃プラスチック資源化技術の特徴と地域への技術移転を計画するのに必要な各種データについての概要を述べる。

Business planning strategy for waste conversion

Example

Define Administrator of a Project
Private company or public organization

Define Geographical Boundaries
Business area to collect wastes
and supply products

Clarify Purpose of
Fuel Production from Waste Plastics
Benefits for public or expecting business return. Economic and environmental benefits.

Design a conversion facility
Collection plan of feedstock
Sales strategy and fuel distribution system
Consideration required in treatment of by−products, local regulation and business risk.

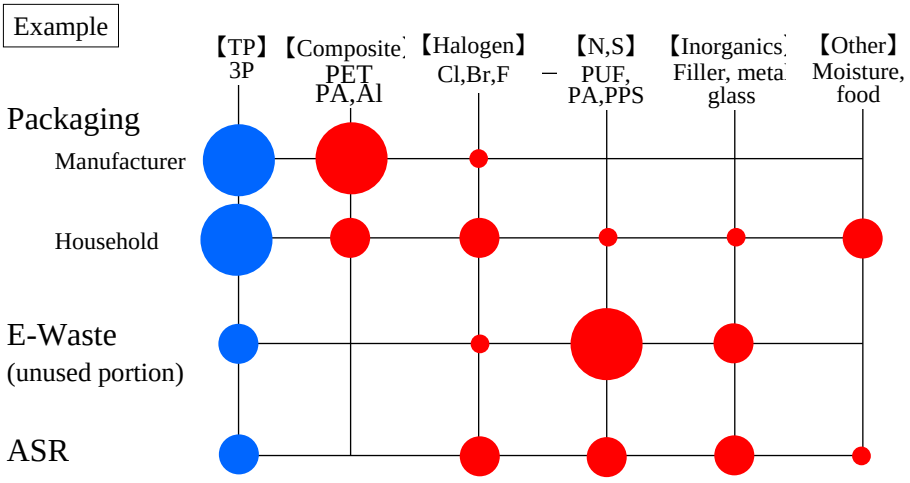
Data Collection of Waste Plastics
Quantification and characterization of target resources in waste generators.

Data Collection of Fuel Users
Market analysis of fuel consumed
in a designated business area.

Technology selection
Estimate economic feasibility and analyze other factors

Waste plastics composition depending on a waste source

Example



Depending on a waste source, some types of plastics such as PET are generated and collected as a sole component.

Required data on wastes for starting recycling business

- If you are a waste generator.
  - Waste composition: By using a certain technology, how much resources can we get from it?
  - Waste quantity: Business scale determines economic feasibility.
  - Economical balance: Can you count any benefits like cost reduction in waste disposal and use as a resource.
- If you want to be a recycler with a specific tech.
  - Where is a target waste and how much are there?
  - Can you get a target waste, hopefully, separated one? Or can you force waste generators to separate wastes? Otherwise can you have an economical process for it?

Type of data required for technology selection
プラスチック資源化技術の選択に必要なデータ
-We have to coordinate the three data sets-

Waste 廃棄物	Technology 技術	Product 製品
Composition Generation rate Source location/logistics Fluctuation/Changes	Target material Type of product Production efficiency Cost	Market value (Quality, Price, Number of users) Competitive product
組成、発生量、発生元、輸送、およびその変動	対象物、製品、処理・生産効率、コスト	製品の市場価値（品質、価格、ユーザー数）

Case No. 1 A target waste is fixed.

Thermoplastics
Thermoplastics, paper and wood
Thermoplastics and kitchen wastes

Case No. 2 A target product is fixed.

Recycled resin, solid fuel, Liquid fuel

Recycler accepts a certain composition of plastics -Cases of industrial wastes-

Clean waste of thermoplastics

Melting/extruding

Combustibles, no inorganics, N- and Cl-containing plastics.

Crushing/ briquette preparation

Limited types of thermoplastics in the generator

Pyrolysis

Waste ⟷ Technology ⟷ Product

Plastics – Suitable and not suitable for recycle

Plastics	Typical application and remarks
Good for Recycling	Mixable with virgin pellets, fuel use.
Polyethylene	Film, wrap, container
Polypropylene	Bottle, package
Polystyrene	Container
PET	Bottles, brister package; Not liquefied.
Careful for troubles	
PA (Nylon) , PUR	Rope, cushion; NO_x generation upon combustion
PVC, PVDC	Various products, soft and rigid ; Lowering resin quality. Corrosion of a fuel production plant and a boiler.

Properties of waste plastics and influences on conversion process

Process	Properties	Influences on economy
Transportation	Bulk density	Transportation cost
Pretreatment-separation, crush	Impurity contents-PVC, metal, glass, etc	Cost, mechanical trouble, treatment capacity, maintenance cost
Conversion	Target plastics content Moisture content	Product yield and quality Energy consumption
	Halogen content	Apparatus corrosion Product quality
Product evaluation	Recycled resin: foreign plastics, moisture, chlorine, bromine	Product quality – durability, properties of molding and coloring
	Fuel: inorganic contents, halogen, nitrogen, sulfur contents	Heat of combustion NOx and SOx emission upon combusion
Business scale	Collectable amount and qualities of waste plastics, sales volume	Break-even line

Production of recycled resin and articles

—Mechanical recycling considering properties of waste plastics—

Waste plastics Type and composition	Technology	Commercial process
Thermoplastics, sole component: Ex. PE, PP, PS, PET, ABS, PMMA, etc.	Melt-molding or fiber production	Yes
Thermoplastics, mixture, laminate or composite	Separation / Melt and mixing	Depends on types of the components.
Thermosetting	None	None

Thermoplastics melt at 120 – 240 ° C. Clean waste plastics can be mixed
with virgin plastics to give plastic products in high quality of durability and coloring.

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Example of technology selection 1

Collectable plastics	Product
Polyethylene (PE) or polypropylene (PP)	Bag, sheet, film and rigid articles
Mixture of the above	Bag, sheet Film and rigid articles of lowered durability
Mixture of PE, PP with trace amounts of polystyrene (PS)	Thick bag and sheet Film and rigid articles of lowered durability
Mixture of PE, PP with PS	Not suitable for any recycled articles. Recommended for fuel production.

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Example of technology selection 2

Collectable plastics	Product
Typical thermoplastics (PE, PP, PS) with small amounts of aluminum laminates	Solid fuel is an ordinary choice.
Small contamination of polyvinyl chloride (PVC) with the above.	Incineration Typical users prohibit chlorine-containing solid fuel due to boiler corrosion.
Serious contamination of PVC	Landfill

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Summary and additional comments

- Various features of wastes, such as types of plastics and impurities, relates to a type of technology and cost.
- Careful matching between waste composition and technology is required.
  - Separation cost: thermoplastics and moisture removal
  - Economic benefits: scale, sales of products, saving resources
  - But data are often different from the real conditions in the practical scenes. Demonstration using real waste samples is necessary.
  - In some cases, waste management sectors took a year to get enough performance of newly-installed processing facilities. Skillful workers are often needed.