Waste Management

إدارة المخلفات

Prepared by

Dr. Karim Emara

Associated Professor of Heat Engines, Combustion, Energy and Environmental Science.

Mechanical Power Engineering Department-

Faculty of Engineering, Mataria- Cairo- Helwan University

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Lecture Strategy

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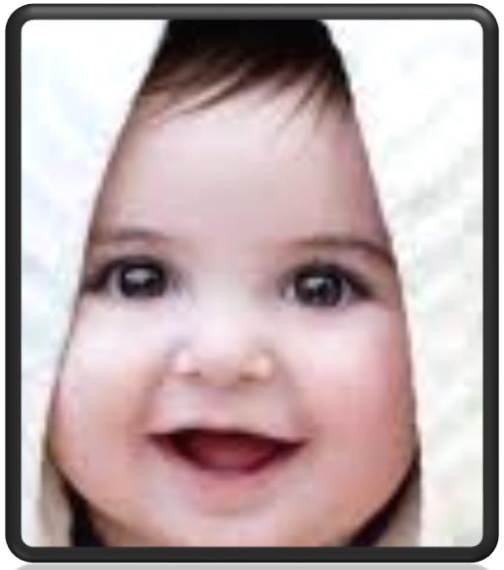


1- Smile

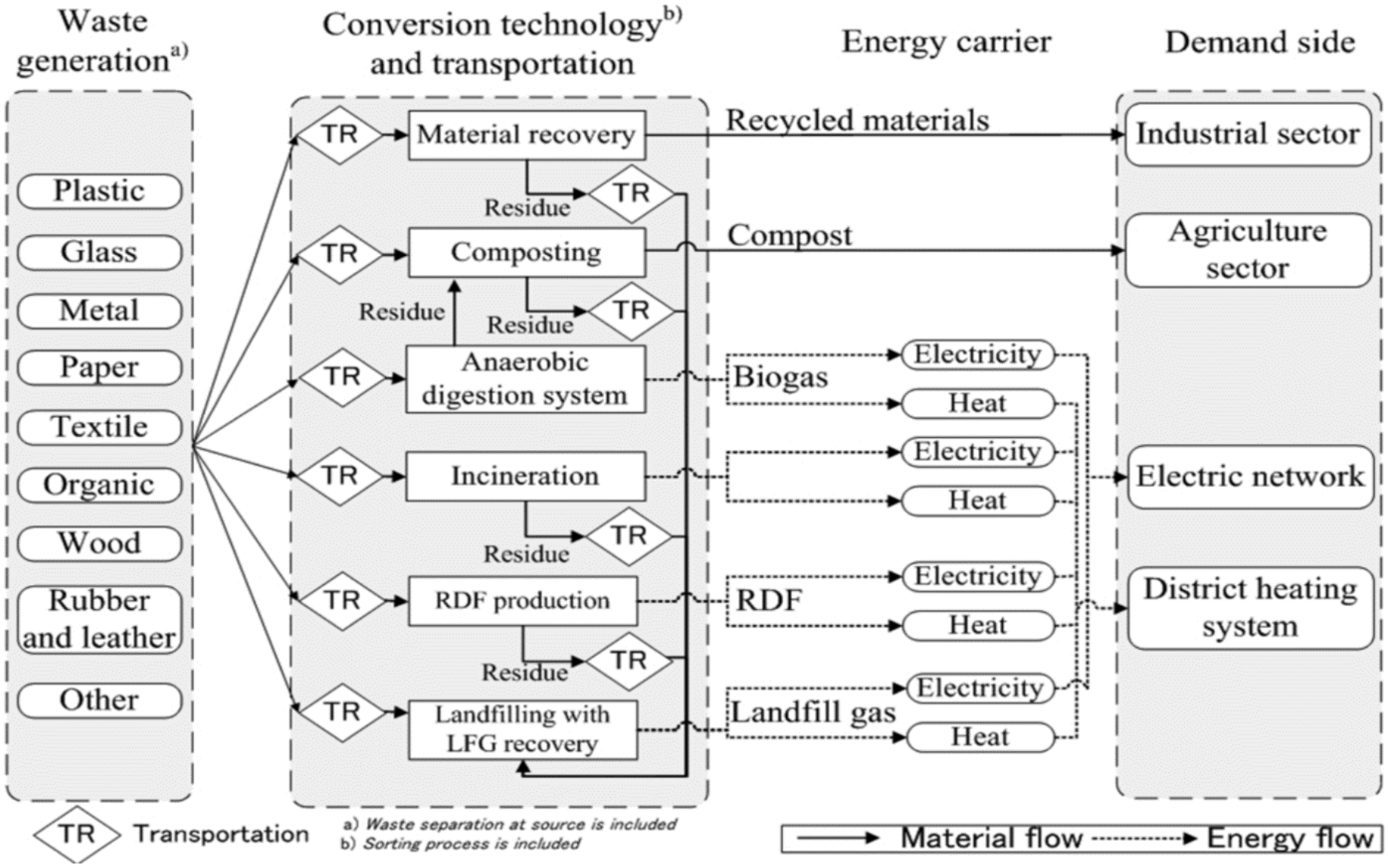
2- Respect the lecture time

3- Make your mobile Silent

Quiz 1

What factors contribute to the variability in the composition of waste?

Treatment of MSW



CHAPTER (2)

Mechanical Biological Treatment

MBT

What is meant by MBT?

Mechanical Biological Treatment (MBT) is a generic term for an integration of several mechanical processes commonly found in other waste management facilities such as Materials Recovery Facilities (MRFs), composting or Anaerobic Digestion plant. MBT plant can incorporate several different processes in a variety of combinations. Additionally, MBT plant can be built for a range of purposes. This section provides an overview of the range of techniques employed by MBT processes.

The Aim of the MBT Processes

A key advantage of MBT is that it can be configured to achieve several different aims. Some typical aims of MBT plants include the:

- Pre-treatment of waste going to landfill;
- Diversion of non-biodegradable and biodegradable MSW going to landfill through the mechanical sorting of MSW into materials for recycling and/or energy recovery as refuse derived fuel (RDF);
- Diversion of biodegradable MSW going to landfill by:
- - Reducing the dry mass of BMW prior to landfill;
- - Reducing the biodegradability of BMW prior to landfill;
- Stabilization into a compost-like output for use on land;
- Conversion into a combustible biogas for energy recovery; and/or
- Drying materials to produce a high calorific organic rich fraction for use as RDF.

Component of the MBT

Mechanical Biological Treatment MBT

مخزن RDF
٤٢٥ م٢

الخط الميكانيكي
٣٤٨٠ م٢

منطقة الاستقبال
٥٠٠ م٢

جراج المعدات
٤٣٠ م٢

غرفة الميزان
٧٤ م٢

غرفة المحولات
٨٠ م٢

جراج السيارات
١٠٠ م٢

غرفة الحارس
٨٠ م٢

المبنى الإداري
٣٥٠ م٢

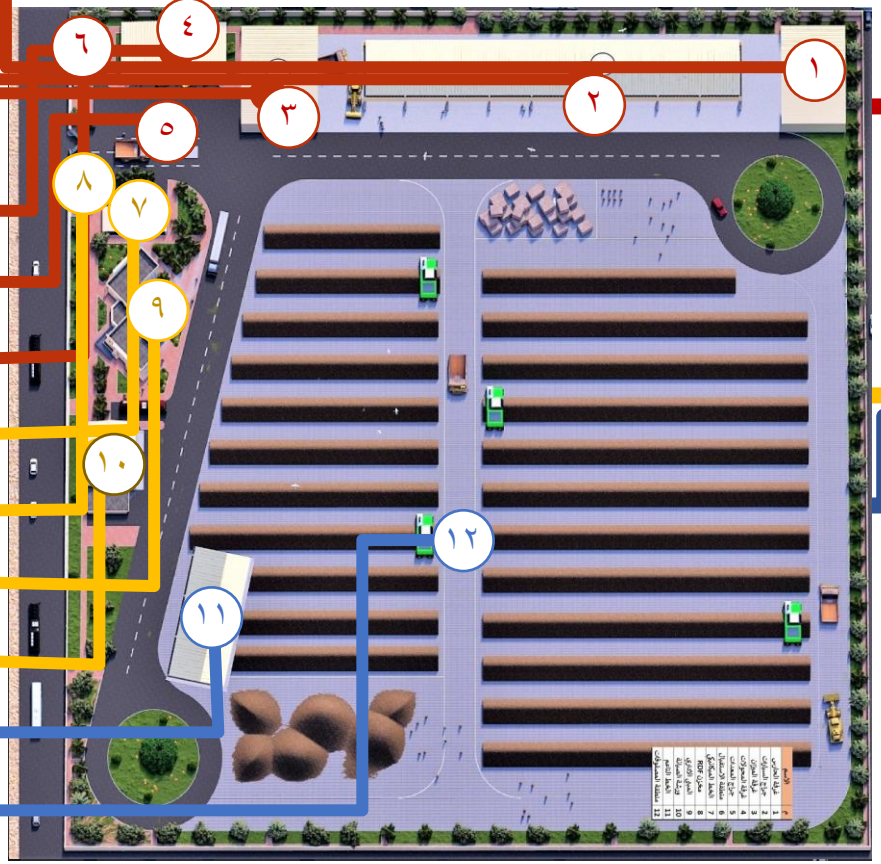
الورشة
٣٥٠ م٢

الخط الناعم
٢٦٠ م٢

منطقة المعالجة
٢٤٦٧٠ م٢

٢ المخطط العام

١. مخزن RDF - ٤٢٥ م٢
٢. الخط الميكانيكي - ٣٤٨٠ م٢
٣. منطقة الاستقبال - ٥٠٠ م٢
٤. جراج المعدات - ٤٣٠ م٢
٥. غرفة الميزان - ٧٤ م٢
٦. غرفة المحولات - ٨٠ م٢
٧. جراج السيارات - ١٠٠ م٢
٨. غرفة الحارس - ٨٠ م٢
٩. المبنى الإداري - ٣٥٠ م٢
١٠. الورشة - ٣٥٠ م٢
١١. الخط الناعم - ٢٦٠ م٢
١٢. منطقة المعالجة - ٢٤٦٧٠



منطقة المعالجة الميكانيكية

منطقة المعالجة البيولوجية

منطقة المباني والخدمات

٢ المخطط العام

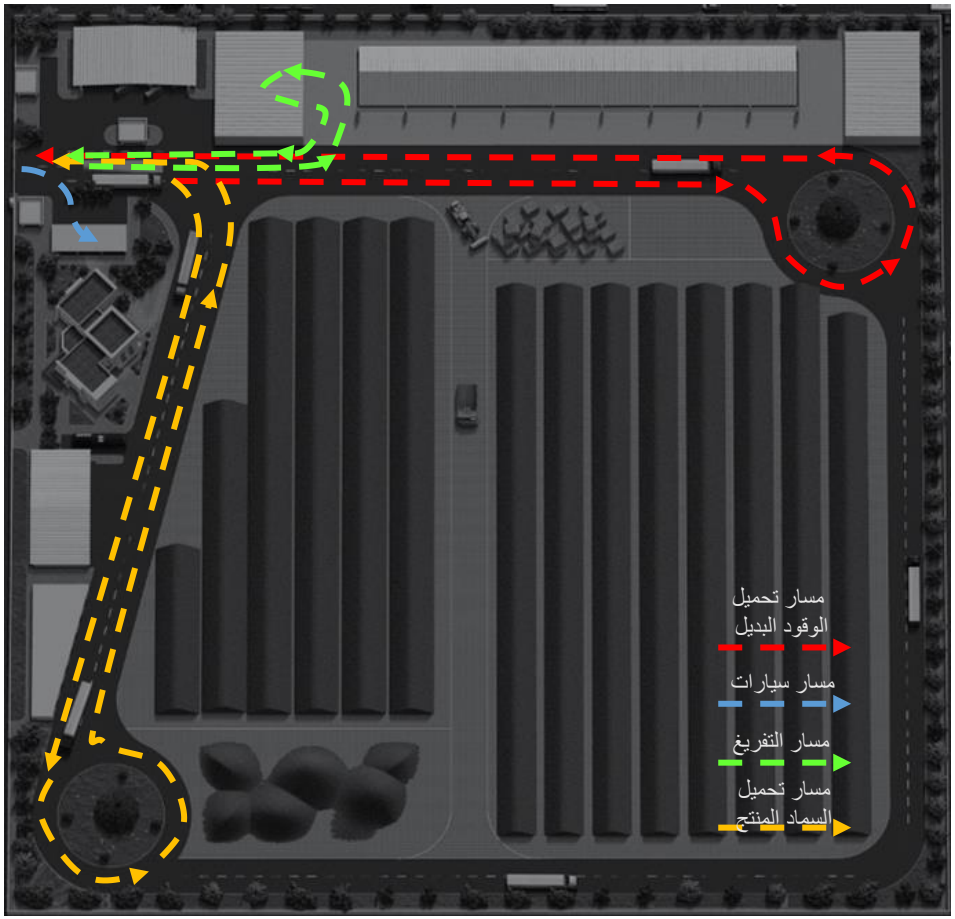
المساحات

Parameter	Assumption	Unit	Value
Daily Capacity of Facility		t/day	320
holidays / year	0	days	
Working Days / Year	365	days	
Annual Capacity of Facility		t/a	**116,800**
Input Biological treatment (0-80mm)	64.0%	t/a	74,752
Daily input		t/day	204.8
Density	0.5	t/m3	
Annual Volume		m^3	149,504
Phase-I: Windrow composting plant Feremintation & decomposition			
Width of compost windrow (Wm)	4	m	
Compost Windrow side buffer (Ws)	2	m	
Slope of Windrows height to width (H:W)	1/2	(Recommended by code 2-31)	
Compost Windrow side height (H)		m	2.00
Density	0.5	t/m3	
Capacity		m^3/a	149,504
cross-section area of windrow		m^2	4.00
Total length of compost windrows		m/a	37,376
Process length	6	weeks	
Processing Weeks/ year		weeks	8
Length of compost windrows in process		m/process	4,672
Area of compost windrows required		m^2	28,032
process Loss %	42%		
Mass after box aeration process		t/a	43,356

Phase-II: Windrow composting plant Maturation			
Width of compost windrow (Wm)	4	m	
Compost Windrow side buffer (Ws)	2	m	
Slope of Windrows height to width (H:W)	1/2	(Recommended by code 2-31)	
Compost Windrow side height (H)		m	2.00
Density	0.65	t/m3	
Capacity		m^3/a	66,702
cross-section aera of windrow		m^2	4.00
Total length of compost windrows		m/a	16,675
Process length	4	weeks	
Processing Weeks/ year		weeks	12
Length of compost windrows in process		m/process	1,390
Area of compost windrows required		m^2	8,338
Total Composting area required		m^2	**36,370**
		Feddans	**9**
		Ha	**3.64**

Total process length		Weeks	10
Total Premises area		**m^2**	**8,938**
Approximate Reception areas	600.00	m^2	
Sorting area (Mechanical Line) including its	1,400.00	m^2	
Maintenace Workshop	350.00	m^2	
Garages (Equipment & cars)	300.00	m^2	
Buildings (Admn, Lab, Guard, weighbridge	1,000.00	m^2	
Roads and Maneouvering	2,000.00	m^2	
RDF and Recycables Storage	500.00	m2	
Grean area	1,000.00	m^2	
Others	1,787.50	m2	
Total area required		m^2	**45,307**
		Feddans	**10.8**

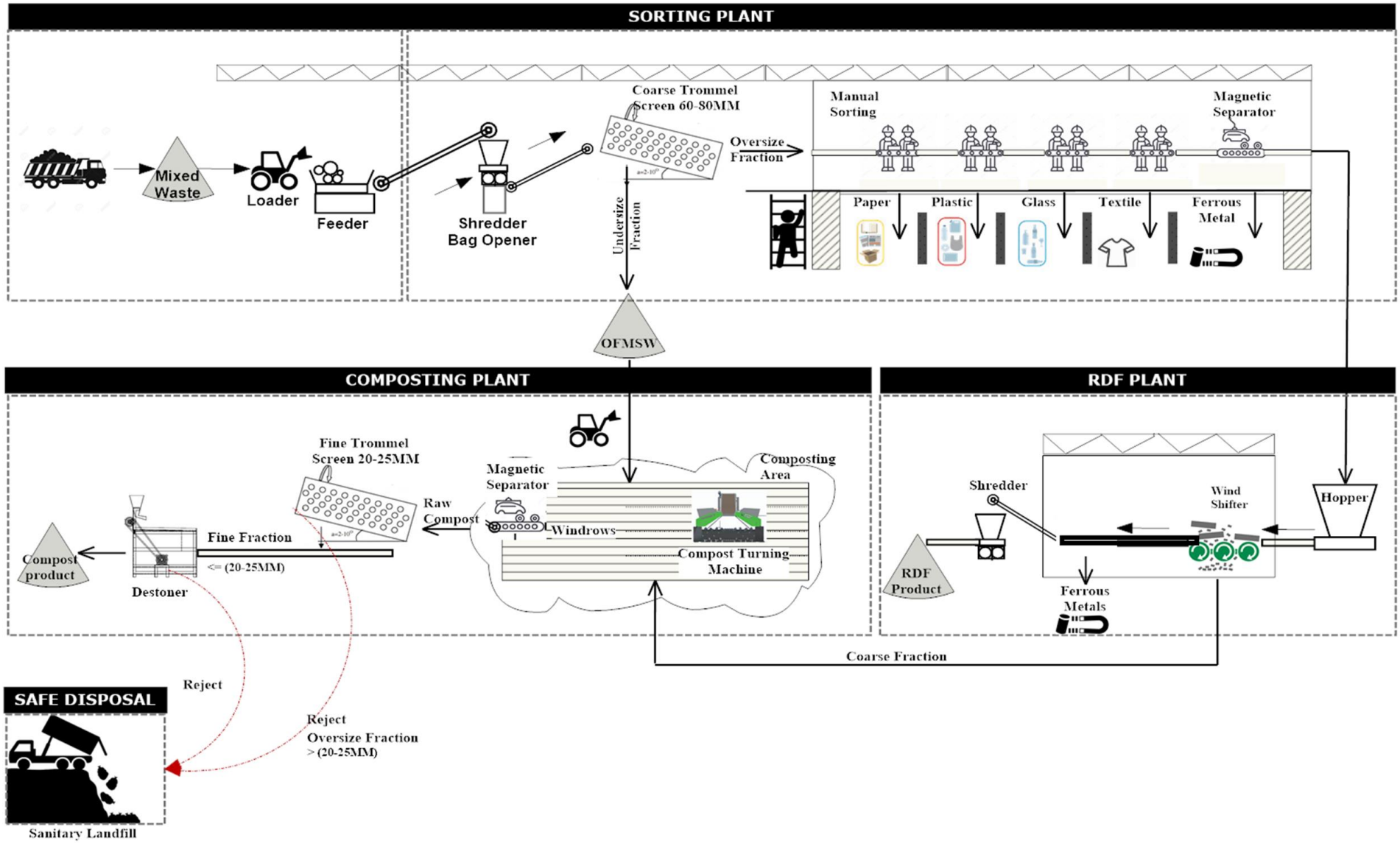
٢ المخطط العام



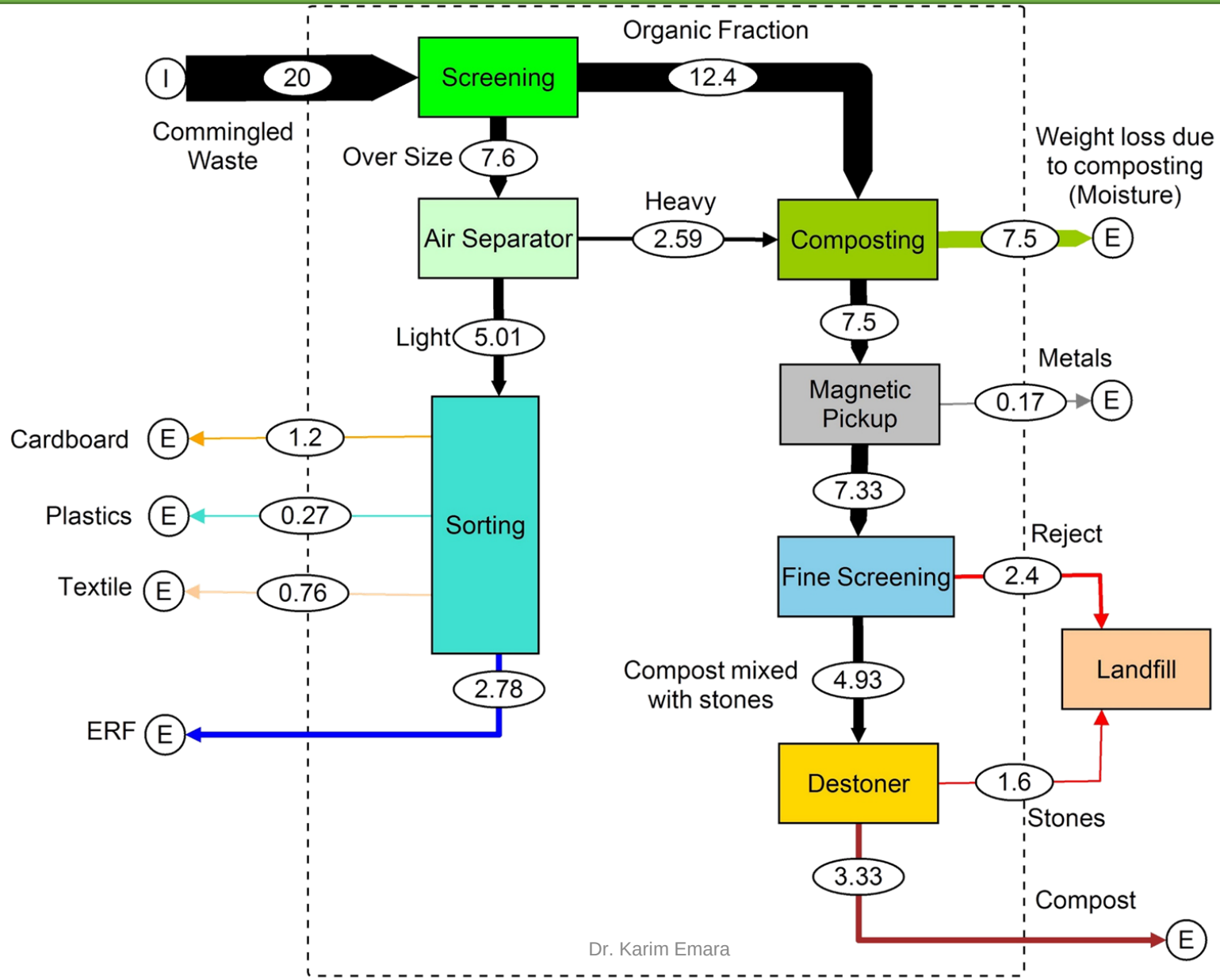
المسارات المرورية

Mechanical line

MBT Mechanical line process flow

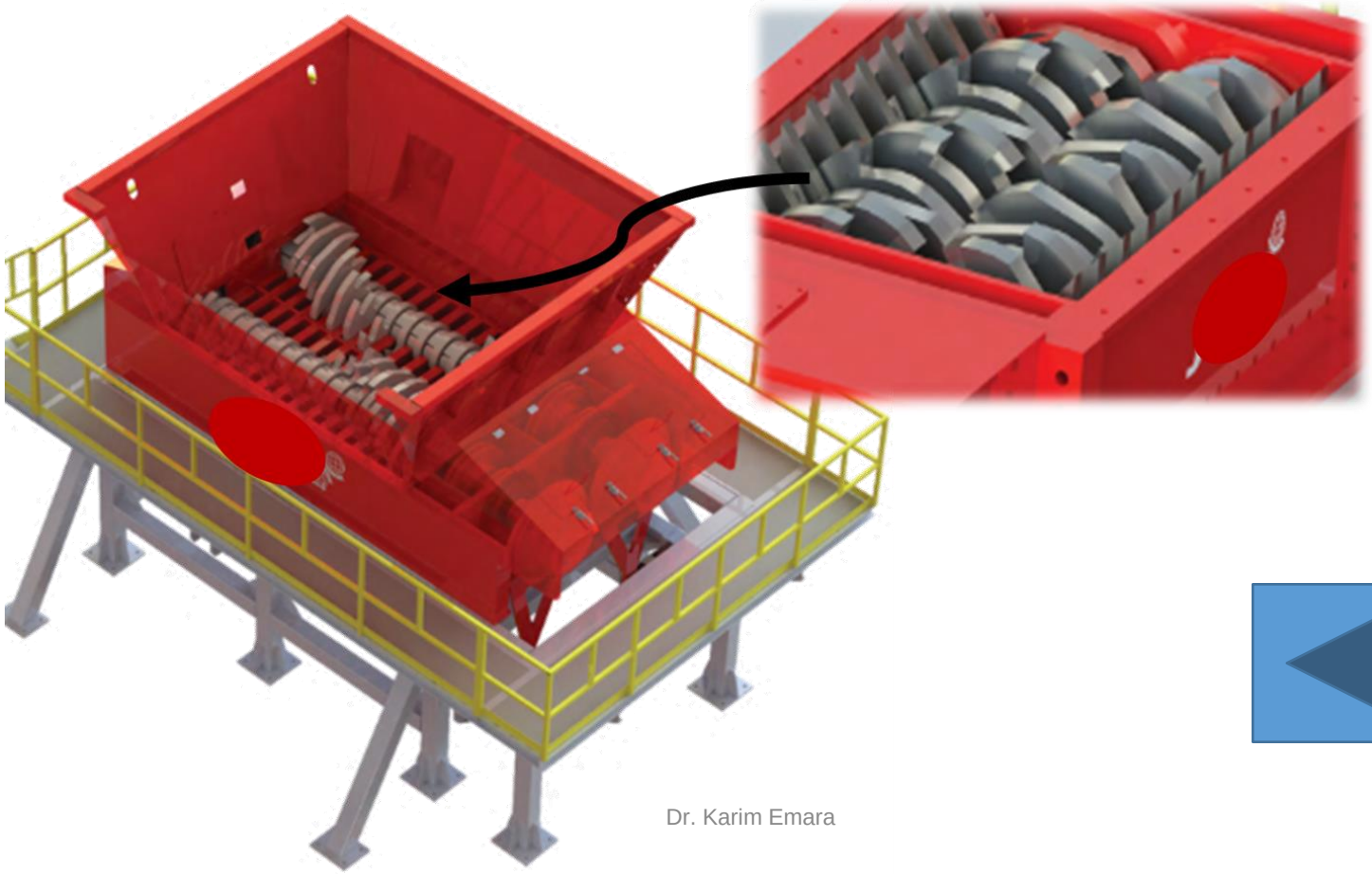


Mass balance



Bag opener (Shredder)

Opening the bags is an important step in the processing of MSW because it allows for more efficient separation and sorting of the waste. Without the bag opener, the bags would need to be manually opened, which is time-consuming and labor-intensive. Additionally, leaving the bags unopened can result in inefficient processing,

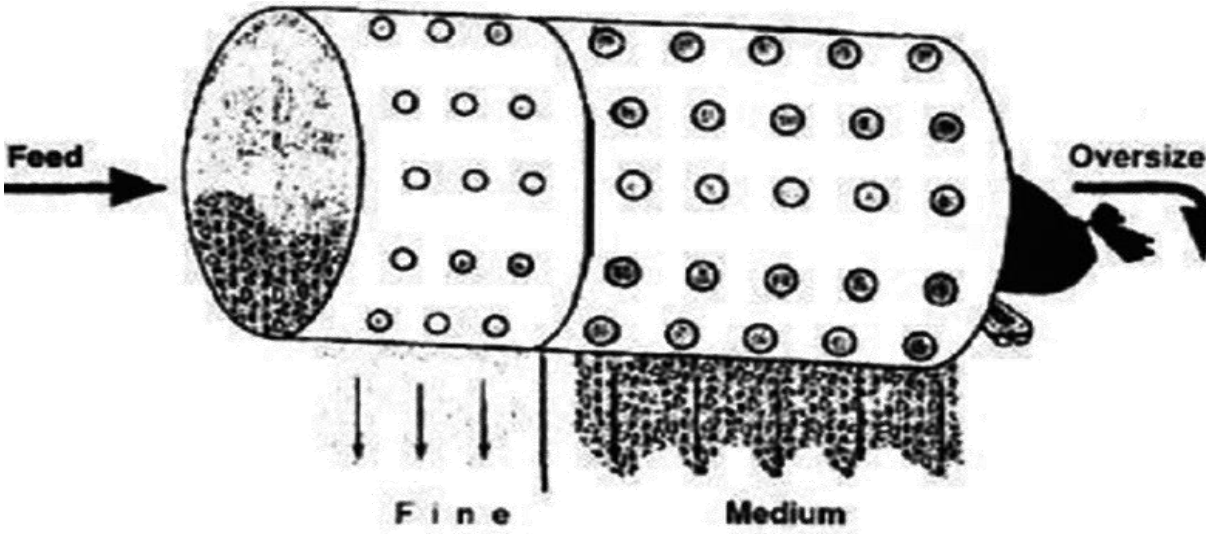


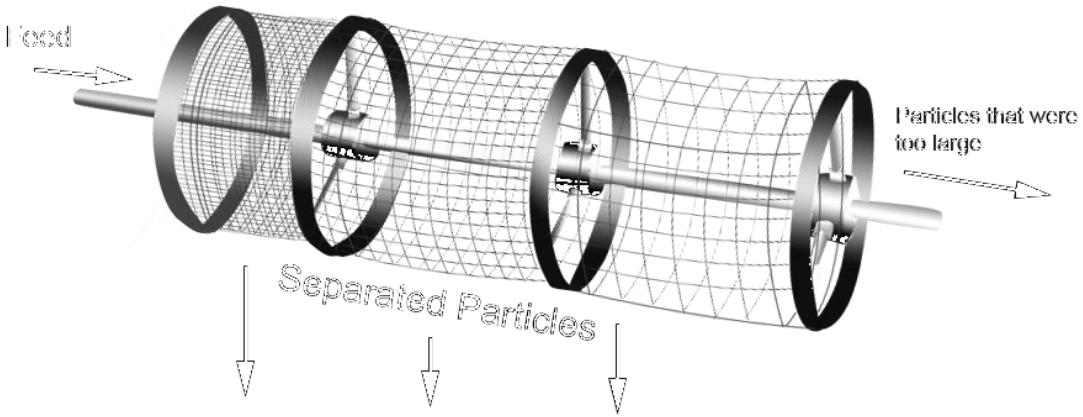
Organic Separation (Size Screen)

1. Screening is a process of separating material of various sizes into specific particle size ranges.
2. It is commonly used in waste management to separate and classify different materials based on their size.
3. The screening process is performed by passing the material over a screened surface with openings of a specific size.
4. Particles smaller than the screen openings fall through and are classified as the fine fraction, while those that are too large to pass through the openings are considered the oversize fraction.

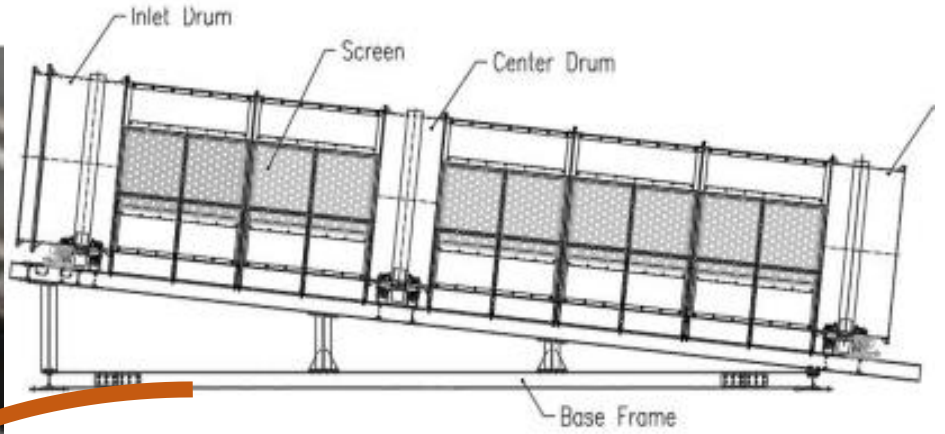
1- Trommel screen

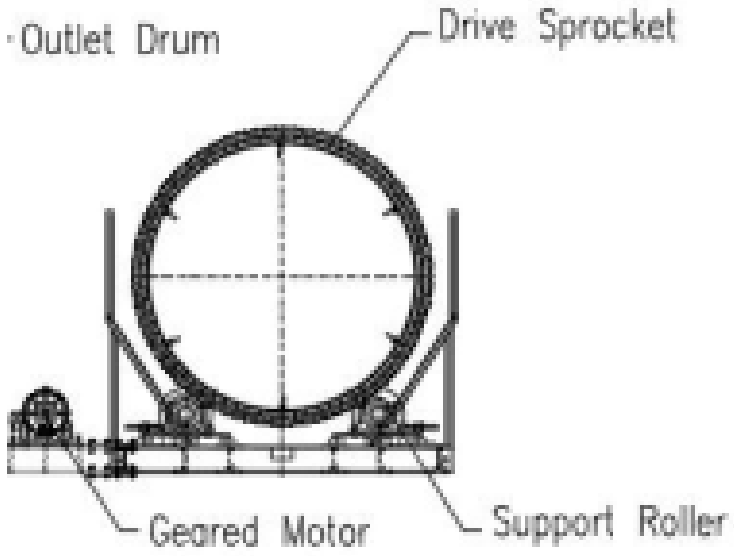
The trommel screen is a proven technology and can be used for primary as well as final size screening





1- Trommel screen

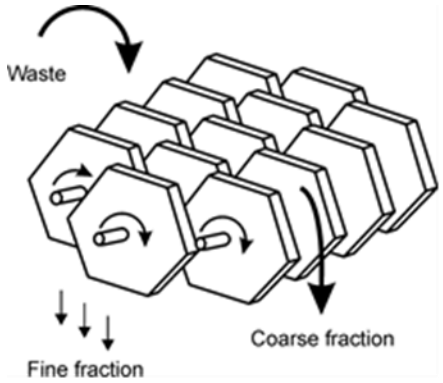




Sorting Line

1- Disc screen

A disc screen is a type of screening method used in waste management that consists of sorting grates with partially screened surfaces comprised of rows of six-sided discs mounted on shafts

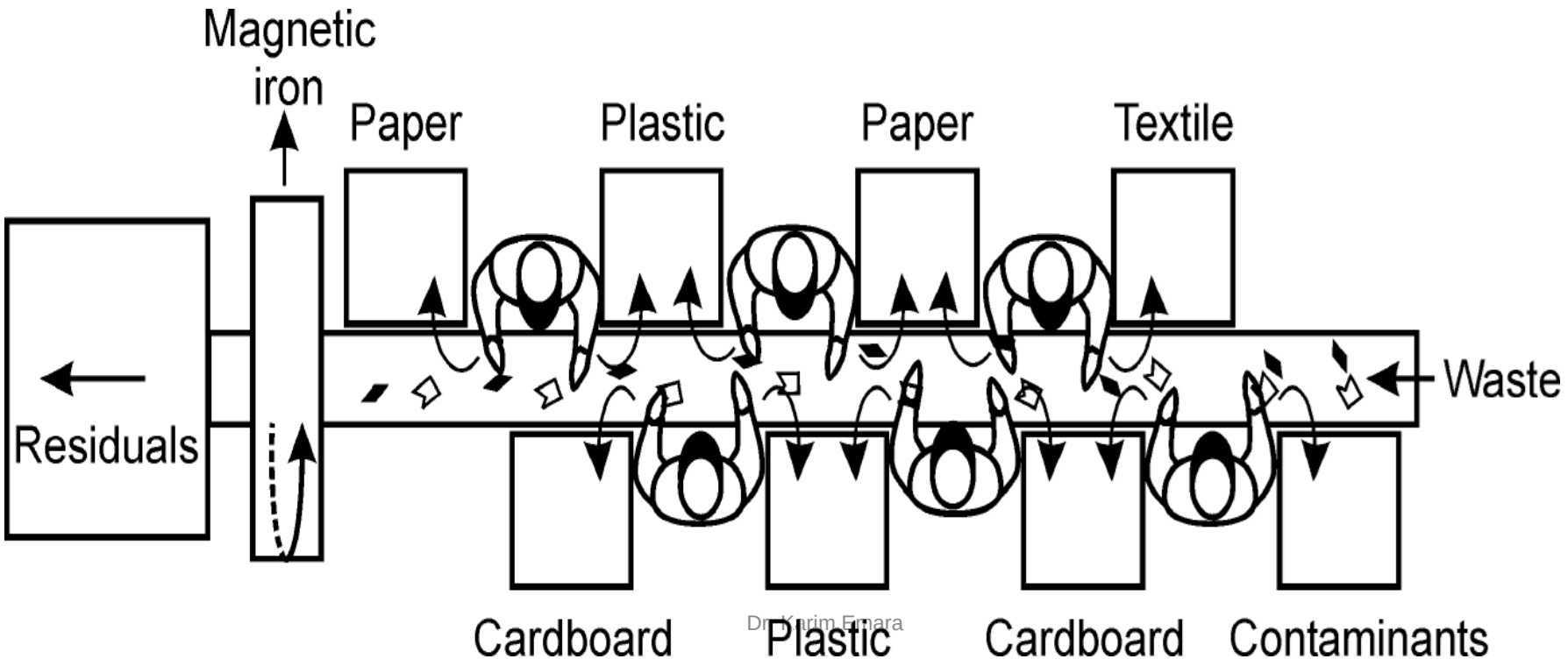


1- Star screen

It is designed to separate larger waste materials such as wood, plastic, and metal from smaller materials such as soil and organic waste. The star screen consists of a series of rotating shafts with multiple star-shaped discs attached to them.

Manual sorting

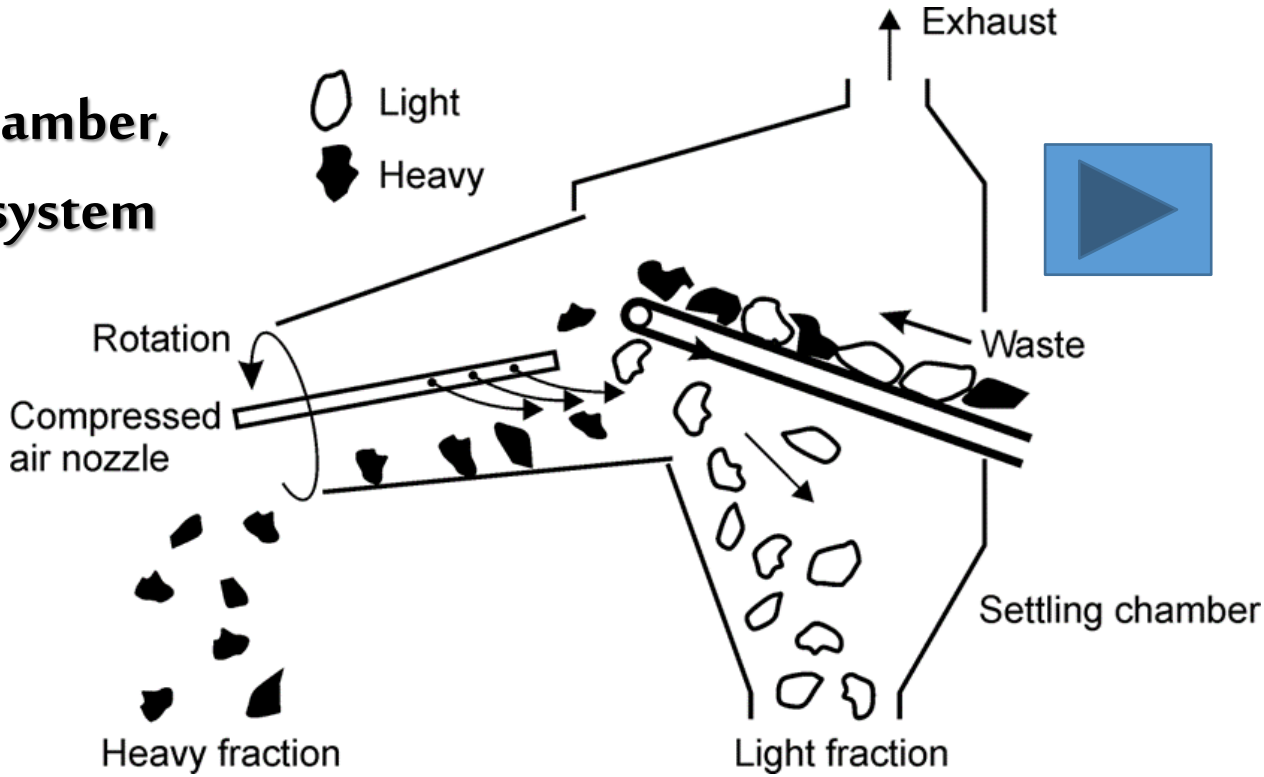
Manual sorting is a waste management method that involves the use of human labor to physically separate different types of waste materials from a mixed waste stream. This process is typically performed in waste sorting facilities, where workers sort through the waste by hand to identify and separate recyclable and non-recyclable materials.



Wind shifter

The rotary air classifier consists of three basic components:

- a rotating drum,
- a screened settling chamber,
- and a compressed air system

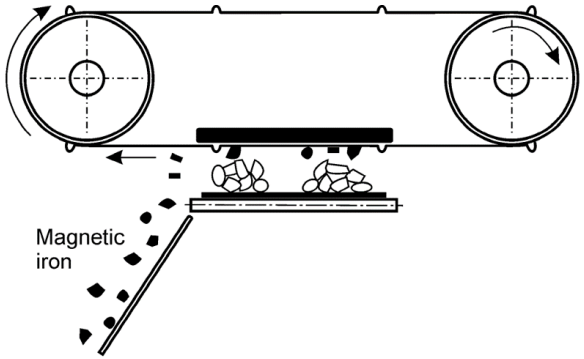


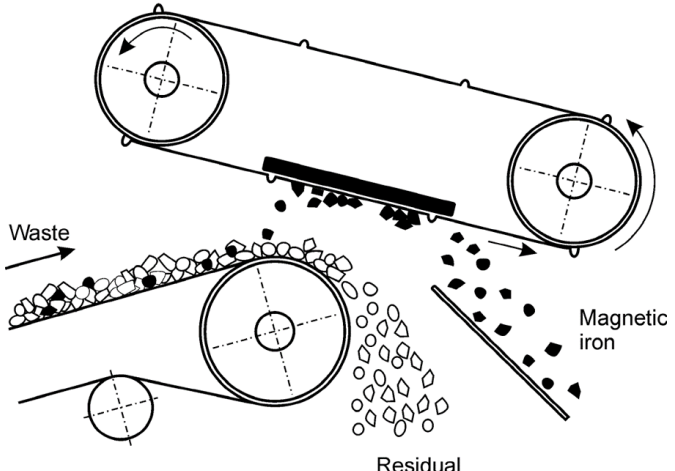
Compressed air is injected parallel to the axis of the drum. Lightweight material becomes airborne and is blown down toward the settling chamber. Heavy particles are further transported and dropped from the drum's smaller, lower end

Magnetic Separator

Magnetic separators are commonly used in waste management to separate magnetic ferrous metals from other waste materials. This technology involves an overhead magnetic separation system that attracts ferrous material and conveys it away either perpendicular or parallel to the waste transport direction.

The ideal particle size for magnetic separation ranges from 10 to 100 mm. However, this size range is rarely generated from conventional size reduction equipment.

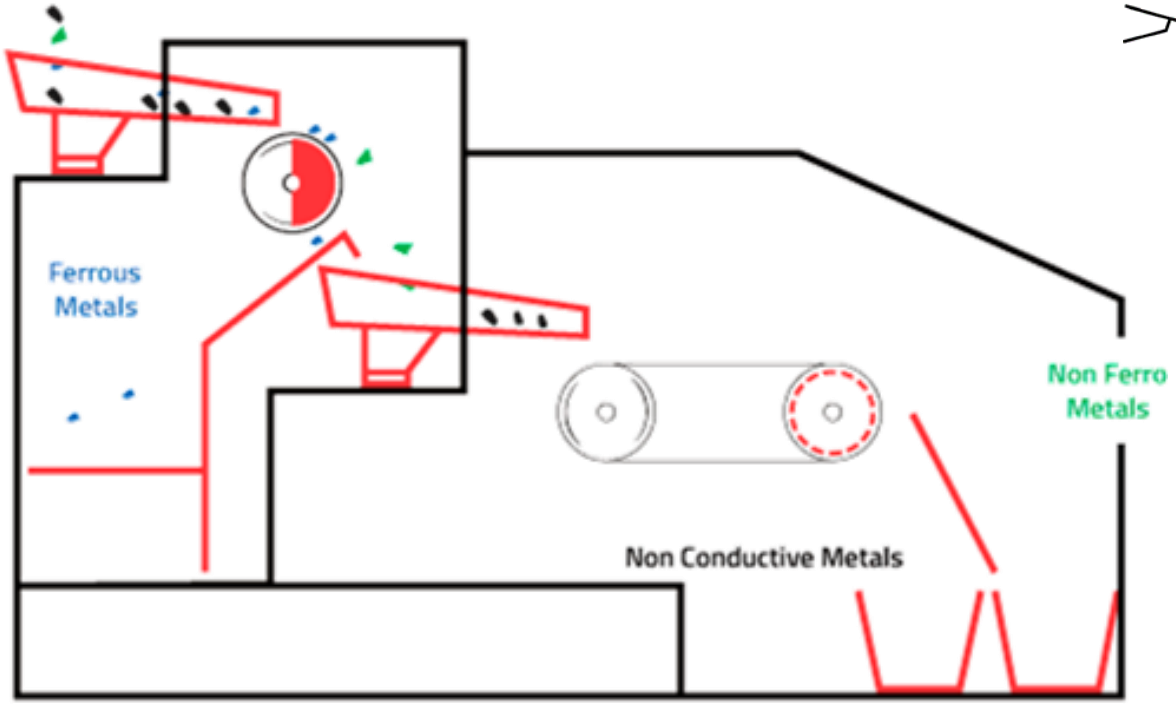


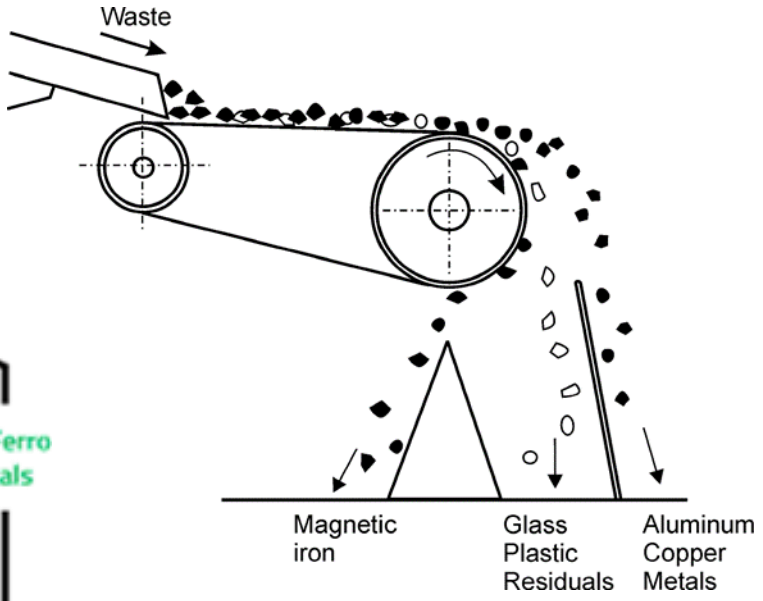


Magnetic Separator

Eddy Current separator

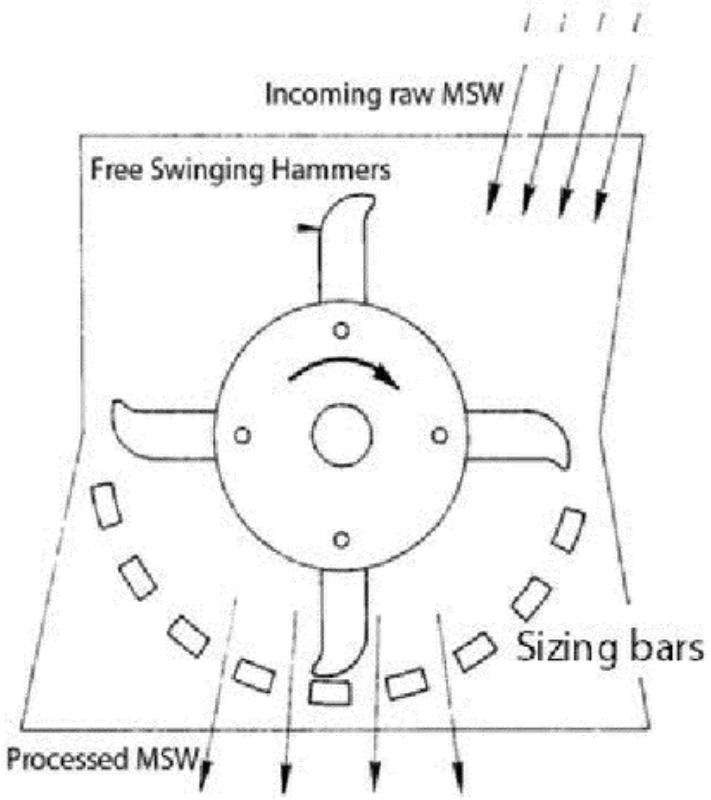
An eddy current separator is a type of magnetic separator that is used to separate non-ferrous metals from other waste materials. This technology works by inducing a magnetic field into a rotating drum, which generates eddy currents in the non-ferrous metal particles.





RDF Shredder

An RDF (Refuse-Derived Fuel) shredder is a type of industrial shredder used to reduce the size (5cm x 5cm) of RDF material




Thank
you