eKOLOKIUM : PENILAIAN KEPADA LAPORAN EIA

Fokus Aktiviti:

Pemerolehan Kembali Buangan Terjadual

Mazriah Ayu Abu Bakar
Bahagian Bahan Berbahaya
Jabatan Alam Sekitar

2 Jun 2021

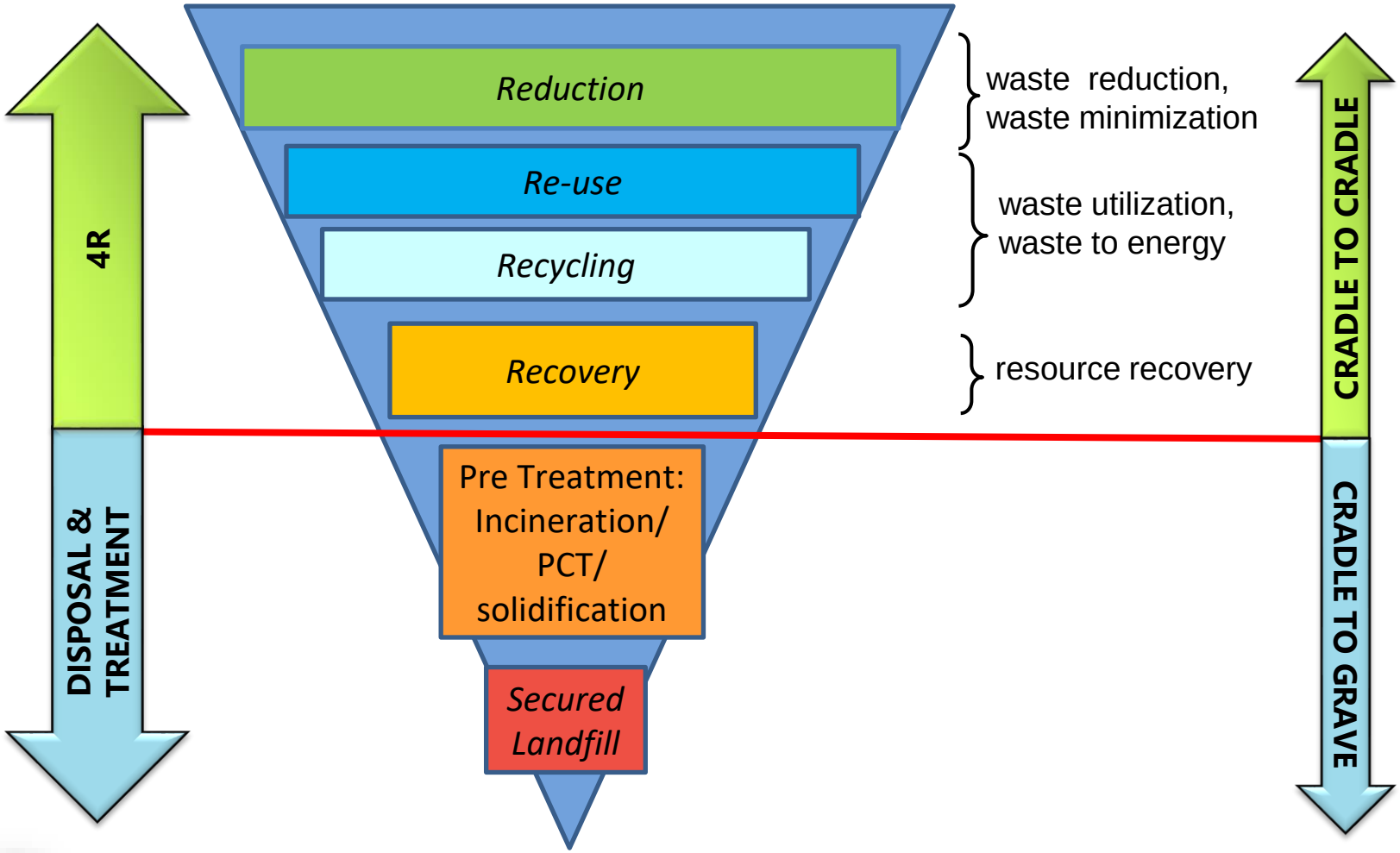
TOPIK

Senarai Tajuk

1	KENALI TEKNOLOGI PEMEROLEHAN KEMBALI
2	WASTE ACCEPTANCE CRITERIA
3	ASAS MASS BALANCE
4	KAJIAN KES DAN SIMULASI

PENGENALAN

Scheduled Wastes Management Hierarchy

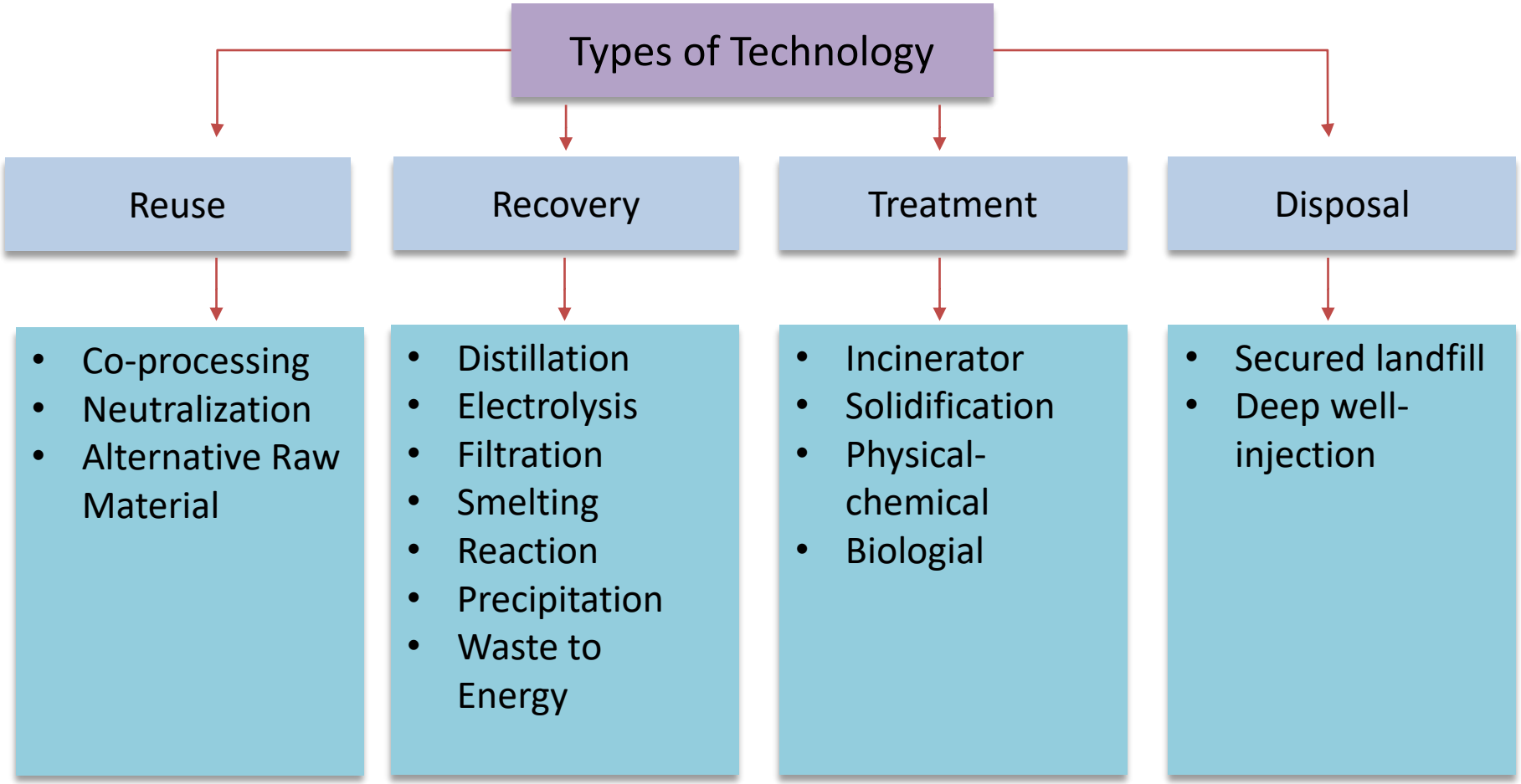


Prescribed Premises Vs Prescribed Activities

Prescribed Premises	Prescribed Activities
Off-Site Storage Facilities	Construction of Storage Facility (Off-Site)
Off-Site Treatment Facilities	
Off-Site Recovery Facilities	Construction of Recovery (Off-Site)
Scheduled Waste Incinerators	Construction of Thermal Treatment
Land Treatment Facilities	
Secure Landfills	Construction of Secure Landfill Facility

KENALI TEKNOLOGI PEMEROLEHAN KEMBALI BUANGAN TERJADUAL

Technology In Scheduled Wastes Management



RECOVERY PROCESS

- Extraction of useful material or energy which may be reused

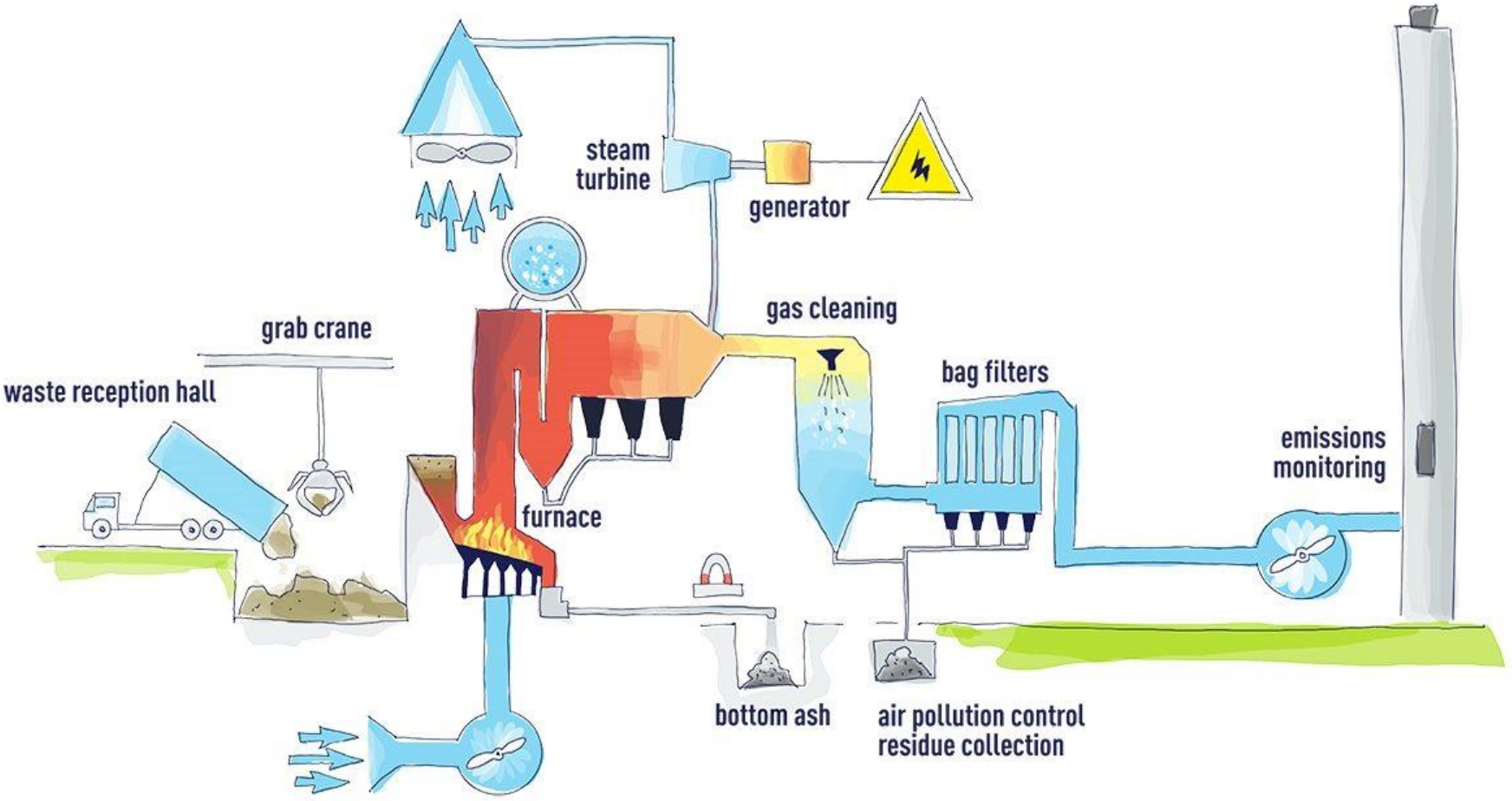
- Resource recovery can be attractive both for economic and environmental reasons. This option is becoming an increasingly viable option.

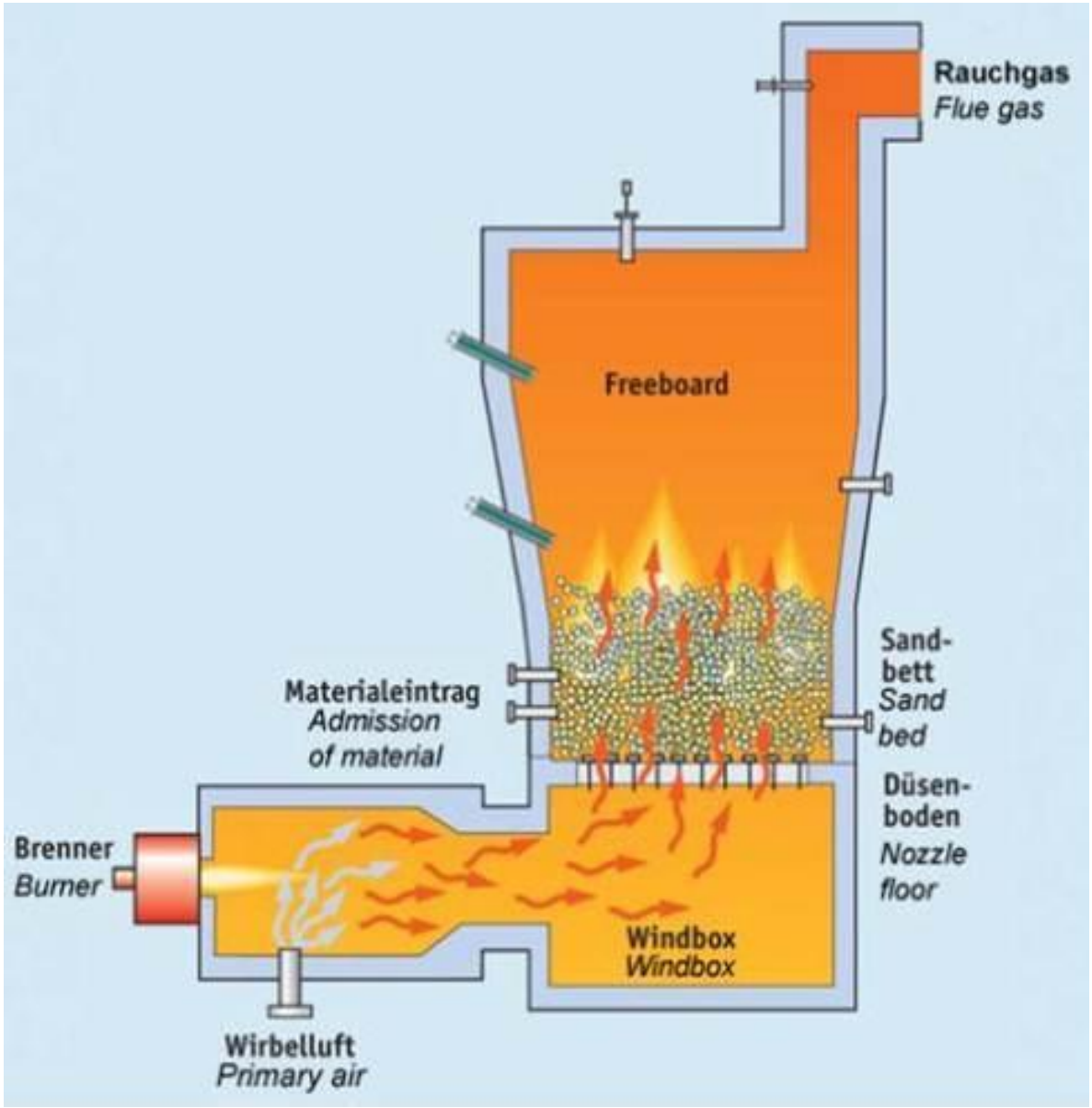
- Two type of recovery:
  1. Energy recovery
  2. Material recovery

Energy Recovery:

- Suitable for waste:
  1. Containing organic matter
  2. Have sufficient energy (calorific) value to enable recovery of energy to be economically viable.

WTE vs **incineration** vs **alternative fuel**


steam turbine
generator
gas cleaning
grab crane
waste reception hall
bag filters
emissions monitoring
furnace
bottom ash
air pollution control residue collection

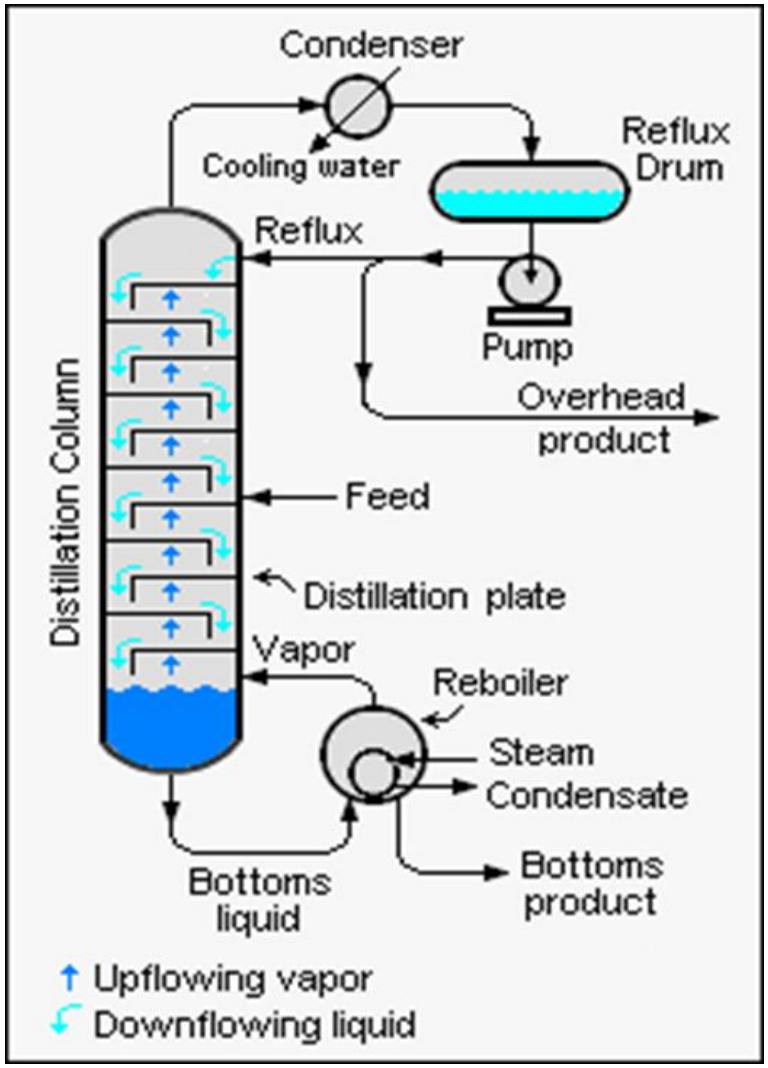

Rauchgas
Flue gas
Freeboard
Sand-
bett
Sand
bed
Materialeintrag
Admission
of material
Düsen-
boden
Nozzle
floor
Brenner
Burner
Windbox
Windbox
Wirbelluft
Primary air

Material Recovery:

- Resource recovery is using wastes as an input material to create valuable products as new outputs
- Recovery facilities are directly dependent on the specific nature, volume and composition of the waste to be treated
- Resource recovery is part of a circular economy

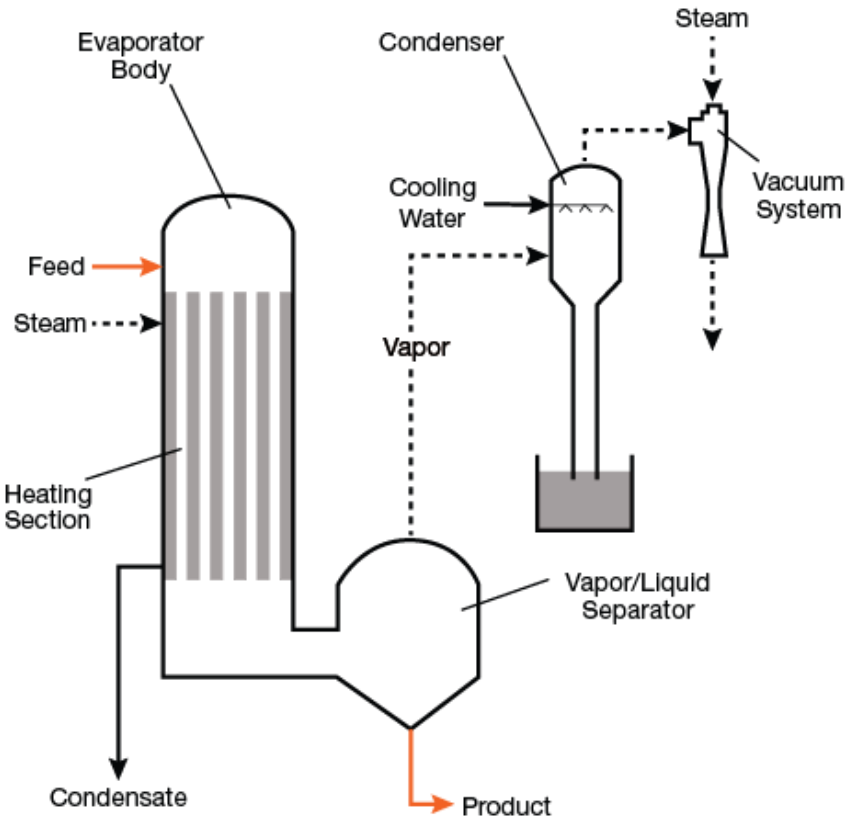
Distillation

- Distillation (or Fractionation) is the physical separation of components of lubricating oil by boiling range.
- The boiling ranges can produce gases to heavy lubricating oil.
- Prior to distillation used oil need to be pre-treated:
  - ✓ Filtration - to remove any solids material such as dirt, sand etc.
  - ✓ Heating process - to remove water
  - ✓ Centrifuge – to remove solids materials and water.
- Two types of Distillation:
  1. Vacuum Distillation
  2. Atmospheric distillation – require further refining process such as vacuum distillation



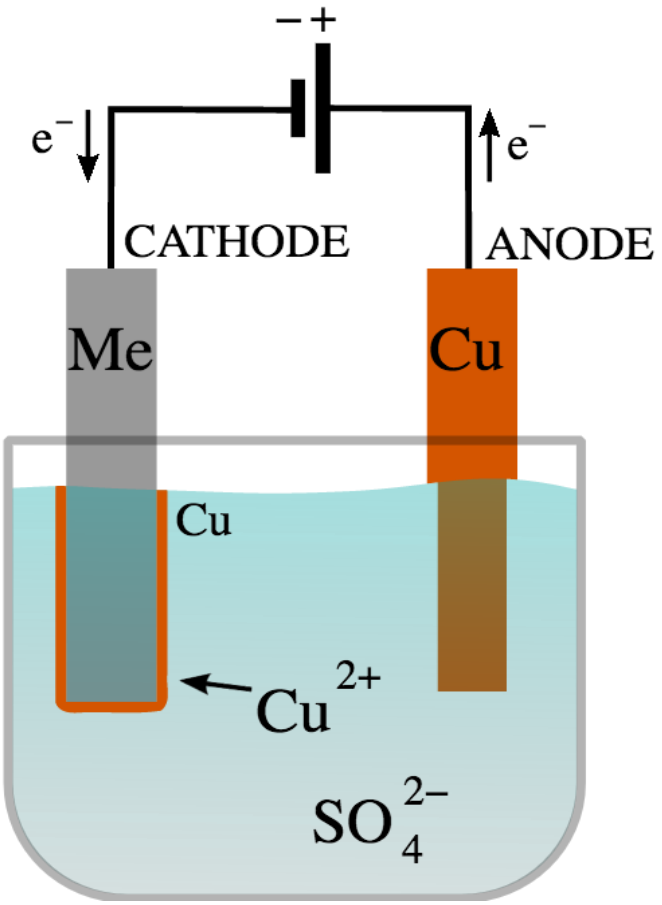
Vacuum Evaporator

- Evaporation is a unit operation that separates a liquid from solids by means of heat transfer via vaporization or boiling.
- All evaporators are comprised of two sections:
  - ✓ Heating section
  - ✓ Vapor/liquid separation section.
- Evaporator bodies are typically operated under vacuum to reduce the temperature of boiling.



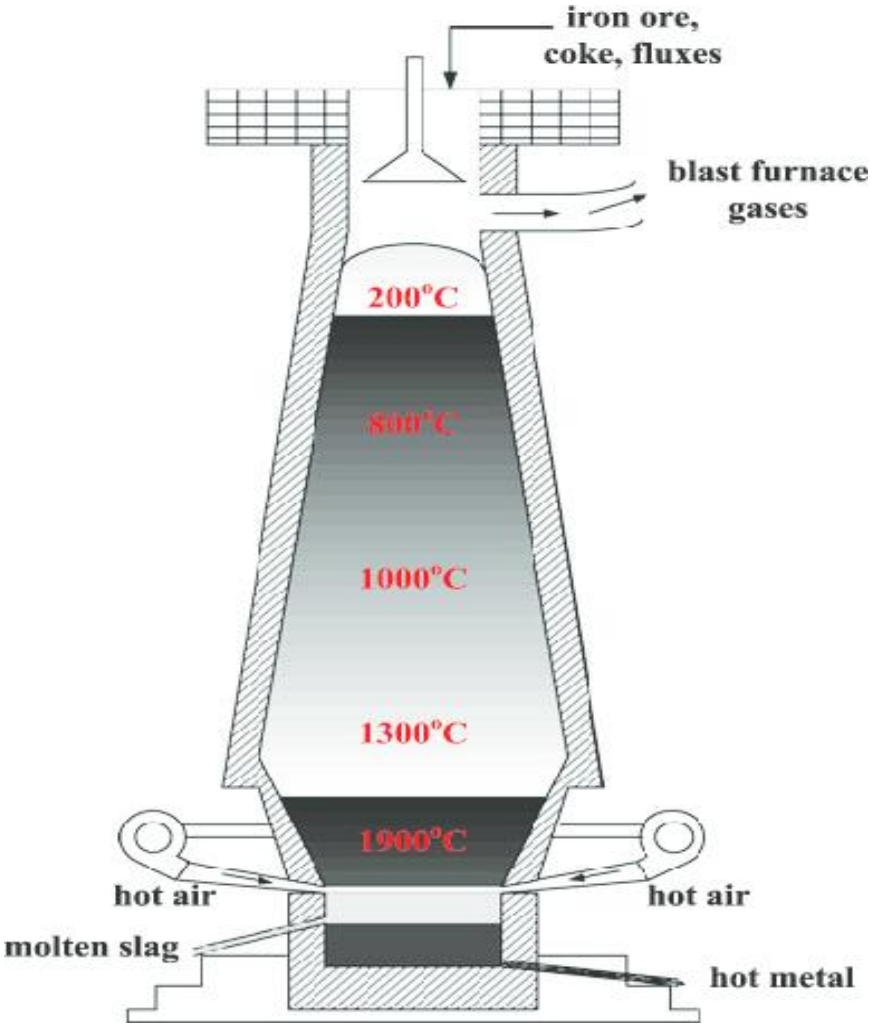
Electrolysis

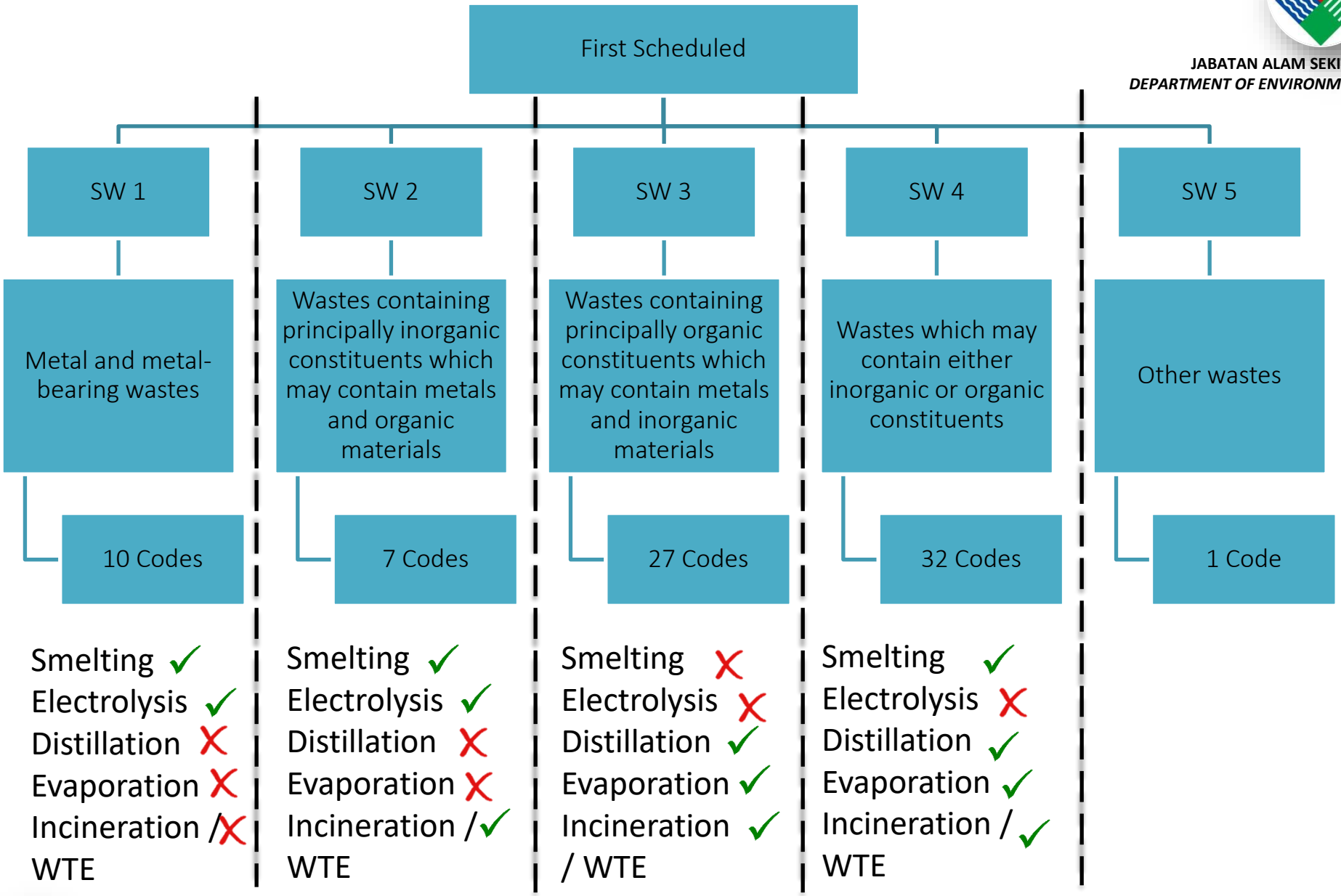
- Electrolysis is a process that uses electricity to separate or extract metal from solution.
- In waste recovery, the process is called electroplating which is similar to electrolysis process.
- Electroplating is surface plating operations where the metal is dipped in an electroplating solution containing metal and then rinsed.
- Involve oxidation and reduction reactions
- Important parameter for electroplating process:
  - ✓ Electrolyte – waste dissolved in acid solution known as leaching process
  - ✓ Electrode – plating for metal to deposit



Smelting

- Smelting is a process of applying heat in order to extract metal.
- Smelting uses heat and a chemical reducing agent to decompose the waste, driving off other elements as gases or slag and leaving the metal base behind




First Scheduled
SW 1
SW 2
SW 3
SW 4
SW 5
Metal and metal-bearing wastes
Wastes containing principally inorganic constituents which may contain metals and organic materials
Wastes containing principally organic constituents which may contain metals and inorganic materials
Wastes which may contain either inorganic or organic constituents
Other wastes
10 Codes
7 Codes
27 Codes
32 Codes
1 Code
Smelting ✓
Electrolysis ✓
Distillation ✗
Evaporation ✗
Incineration /✗
WTE
Smelting ✓
Electrolysis ✓
Distillation ✗
Evaporation ✗
Incineration /✓
WTE
Smelting ✗
Electrolysis ✗
Distillation ✓
Evaporation ✓
Incineration ✓
/ WTE
Smelting ✓
Electrolysis ✗
Distillation ✓
Evaporation ✓
Incineration / ✓
WTE

WASTE TYPES	RECOVERY PROCESS	RECOVERED PRODUCT
• Mineral Oil • Oily water mixture/ oil emulsions	**Oil Water Separation** • Gravity separation • Coalescence separation • Emulsion splitting • Ultra-filtration • Air floatation	Oil reuse as fuel supplement
• Waste oil	**Refining** • Distillation	Oil reuse for original purpose
• Organic solvents	Distillation	• Alcohol solvent recovery in Flexographic Printing • Thinner solvent recovery at Motor and panel Repair Workshop
• Paint solvents	Spent solvent utilization (used in low grade paint)	Mainly white spirit

WASTE TYPES	RECOVERY PROCESS	RECOVERED MATERIAL
Electroplating wastes	Metal precipitation	Cr, Cu, Al, Zn, Cd
Electroplating wastes	Ion exchange	Cr, Cu, Al, Zn, Cd
Photo-finishing wastes Spent catalyst Electronic wastes	Electrolytic metal recovery	• Silver • Ni, Cr, Pt, Pd, Cu • Precious metals
Dross containing metal	Smelting Pyrometallurgy	Al, Zn, Pb, Cu

Cadangan Kapasiti (MT/bulan) bagi Cadangan 'Incinerator'

Waste Code	Description [as in EQ (Scheduled Waste) Reg. 2005]	Capacity, MT/month
SW 311	Waste of oil or oily sludge	1400
SW 309	Oil-water mixture such as ballast water	900
SW 308	Oil tanker sludges	900
SW 314	Oil or sludge from oil refinery plant maintenance operation	500
SW 310	Sludge from mineral oil storage tank	400
SW 408	Contaminated soil, debris or matter resulting from cleaning up of a spill of chemical, mineral oil or scheduled wastes	350
SW 315	Tar or tarry residues from oil refinery or petrochemical plant	300
SW 204	Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium	150
SW 304	Press cake from pretreatment of glycerol soap lye	150
SW 312	Oily residue from automotive workshop, service station oil or grease interceptor	150
SW 313	Oil contaminated earth from re-refining of used lubricating oil	150
SW 104	Dust, slag, dross, or ash containing aluminium, arsenic, mercury, lead, cadmium, chromium, nickel, copper, vanadium, beryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory	100
SW 410	Rags, plastics, papers or filters contaminated with scheduled wastes	100
SW 411	Spent activated carbon excluding carbon from the treatment of potable water and process of the food industry and vitamin production	100
SW 421	A mixture of scheduled wastes	100
SW 422	A mixture of scheduled and non-scheduled wastes	100
TOTAL		5850

Apakah pandangan anda berkaitan proses dan senarai buangan yang dicadangkan

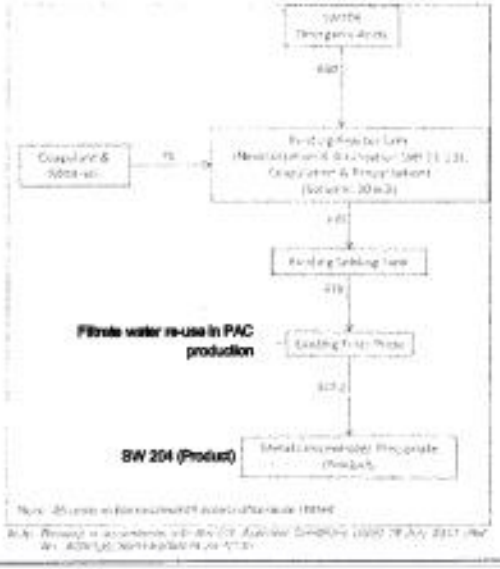
SW206 : CHEMICAL PRECIPITATION PROCESS

CHEMICAL PRECIPITATION

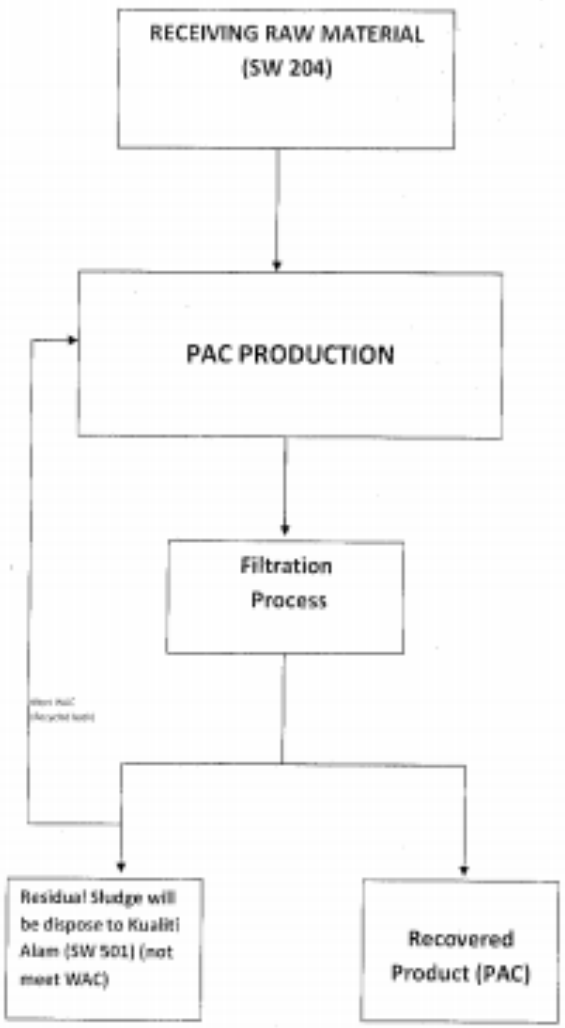
- Scheduled Waste Involved: SW 206
- In the chemical precipitation, scheduled waste that fall under SW206 (inorganic Acid), will undergo chemical recovery involving **neutralization, alkalinisation, coagulation, precipitation and filtration.** The recovered product is in the form of metal concentrate sludges (to be used in PAC production line)

SECTION 1: INTRODUCTION

Figure 1-16 ... Flowchart for Chemical Precipitation Process



SIMPLIFIED PROCESS FLOW IN XANTARA S/B FOR SW 204



RAW MATERIAL HAULING

- Raw material SW204 is inspected by personnel
- The SW204 material is feed into reactor by screw conveyor
- Equipment involved:
  - Weighing bridge
  - Weighing Hopper with Screw Conveyor

PAC PRODUCTION

- A CHEMICAL treatment will be performed to produce
- Equipment involved:
  a) Reactor, Settling Tank & Dump Tank
  b) Wet scrubber system
  c) HCl Acid storage tank
  d) Platforms

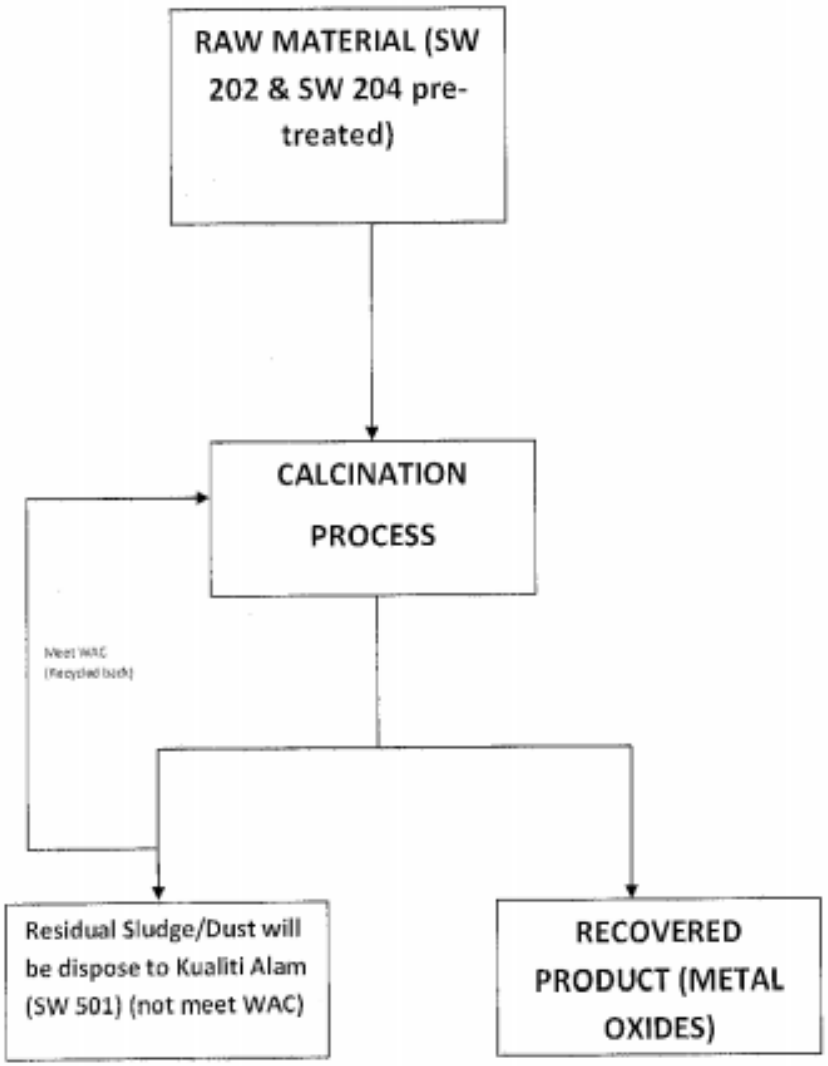
FILTRATION PROCESS

- The product in slurry form will pumped into filter press to recover liquid PAC
- Equipment involved:
  - Compressed Air Equipment
  - Filter Press
  - Filter Housing

RECOVERED PRODUCT

- The product is to be used by wastewater treatment plant (WWTP) industry respectively
- Equipment involved:
  - Compressed Air Equipment
  - PAC Storage Tank
  - Weighing Bridge

SIMPLIFIED PROCESS FLOW IN XANTARA S/B FOR RECOVERY OF SW202



RAW MATERIAL HAULING

- Each raw material is inspected by personnel
- Equipment involved:
  - Weighing bridge

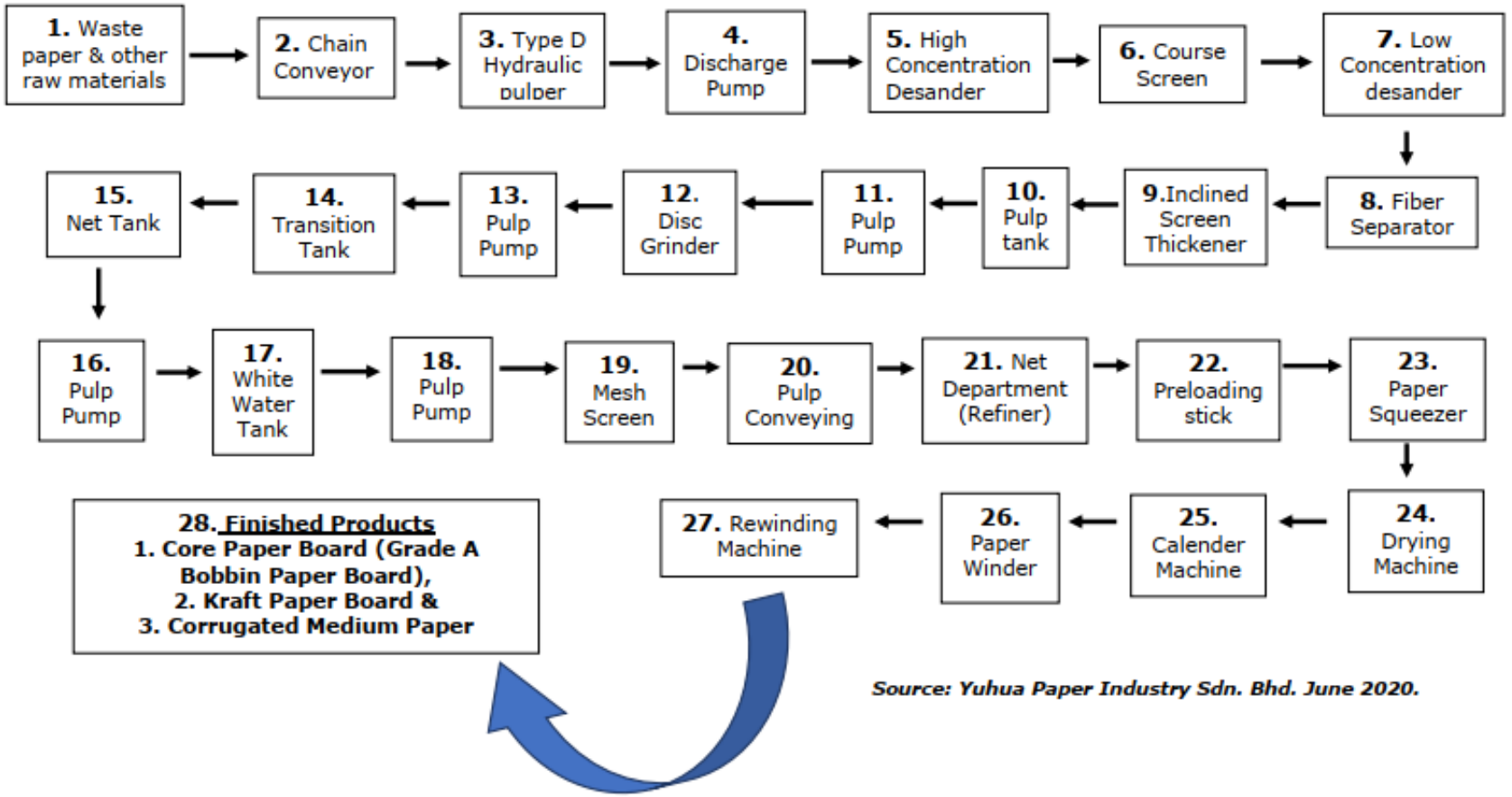
CALCINATION PROCESS

- One of the heat treatment applies to remove organic carbons and impurities
- Equipment involved:
  - Calcination System
  - Air Pollution Control Equipments

RECOVERED PRODUCT

- The product is to be used by mills / refiners / chemical industry respectively
- Equipment involved:
  - Weighing Bridge

Diagram 5.1(a): General Description of the Overall Production and Paper Making Process



Source: Yuhua Paper Industry Sdn. Bhd. June 2020.

IMPORTANT!!!

The selection of a recovery process depends on the specific **character of the waste** and requires careful consideration

WC and **WAC**

WASTE ACCEPTANCE CRITERIA (WAC)

- Waste Acceptance Criteria (WAC) is an instrument designed to determine a waste generated by a waste generator that is acceptable to a waste recipient to undergo any processing:
  - ✓ Reuse
  - ✓ Recovery
  - ✓ Treatment
  - ✓ Disposal at secured landfill

- WAC applications are being used not only for disposal purposes but also for the purpose of recovery

Relationship between WC And Wac

Waste

- Any material or byproduct that will be disposed of or discarded or useless or no longer necessary for the purpose of the original material and acquired after the completion of an activity or process.

Criteria

- A measure which is the basis of the evaluation or determination of a particular method or processing based on the state of a material such as phase, shape, composition, constituents, properties of the properties of the material.

Acceptance

- A description of the act of acquiring or obtaining something that meets the criteria

Waste Generator
CRADLE

WC

WC

Waste Contractor

Waste Receiver – Recovery Facility

WAC

Waste Contractor

WC

Waste Contractor

Waste Receiver – Reuse Facility

WAC

WAC

WC

WC

Waste Contractor

Waste Receiver – Disposal Facility
GRAVE

Waste Contractor

WAC

WAC

How To Determine WC And WAC

WAC

- Proposed / Processed scheduled wastes code
- Name of the component / material wanted or want to process
- Content of the component / material required or processed
- Contents component / contaminants that is a limitation / restriction to the technology used
- Processing technologies and pollution control systems proposed or installed

WC

- Process knowledge
- Chemical Analysis

- **WC** determine the composition of the waste
- Important to analysis the composition in dry basis (mg/kg)
- 2 types of lab analysis:
  1. Toxicity Characteristics Leaching Procedure (TCLP)
     - ✓ Test methods used to determine whether a waste is a toxic hazardous waste.
     - ✓ Simulate what happens to a waste in a landfill setting with simulated landfill leachates and are both reported in (mg/l)
  2. Total Threshold Limit Concentration (TTLC)
     - ✓ Test method to determine the composition in the waste in mg/kg

- Waste generator need to perform TTLC in order to prepare WC

- **WAC** can be determined via mass balance of the process.

- Important issues to take into account to set WAC are
  1. The efficiency of the technology installed to process the waste – determine the main component to be recovered or extracted
  2. The limitation of the process technology – determine the impurities content inside the waste
  3. The pollution control system installed to treat effluent or flue gas generated from the recovery process.

- The range should not
  - ✓ Too wide as it will effect the system including pollution control system
  - ✓ Too stringent as it will effect the waste received

Kajian Kes WAC

Table 3-1 Existing Waste Acceptance Criteria (WAC) for SW204 (Waste Containing Metal & Aluminium)

No.	Parameter	Minimum Value (% w/w)	Maximum Value (% w/w)
	Chemical		
1.	Aluminium Oxide as Al_2O_3	> 4.8	-
2.	Silica as SiO_2	-	65.0
3.	Iron (III) Oxide as Fe_2O_3	-	75.0
4.	Arsenic	-	5.0
5.	Cadmium	-	10.0
6.	Ferum (Fe)	-	70.0
7.	Lead (Pb)	-	70.0
8.	Manganese (Mn)	-	46.8
9.	Mercury (Hg)	-	0.3
10.	Nickel (Ni)	1.0	-
11.	Tin (Sn)	1.0	-
12.	Other Heavy Metals	1.0	-
	Physical		
13.	Moisture Content	-	80.0
14.	pH	5.5	12.0

WASTE ACCEPTANCE CRITERIA FOR SW 202 (SPENT CATALYST)

PARAMETER	MINIMUM VALUE (%w/w)	MAXIMUM VALUE (%w/w)
CHEMICAL:		
1. Base Transition Metals:		
a. Cobalt	20.0	-
b. Copper	10.0	-
c. Iron (Fe)	25.0	-
d. Lanthanum	50ppm	-
e. Manganese	7.0	-
f. Molybdenum	5.0	-
g. Niobium	50ppm	-
h. Nickel	5.0	-
i. Titanium	5.0	-
j. Vanadium	5.0	-
k. Zinc	20.0	-
l. Tungsten	5.0	-
2. Precious/Platinum Group Metals:		-
a. Gold	0.05	-
b. Silver	2.5	-
c. Palladium	1.0	-
d. Platinum	0.2	-
3. Other metals:		
a. Aluminum	4.8	-
b. Antimony	5.0	-
c. Indium	500ppm	-
d. Lead	25.0	-
e. Lithium	2.0	-
f. Tin	3.0	-
PHYSICAL:		
1. pH :	5.5	8.5
2. Moisture Content:	-	75.0
3. Phase:	Solid phase	
4. Form:	Granular/Irregular/Various shapes	
5. Packaging:	-Open-top metal drums with clamp lid and covers - Open-top plastic drums with clamp lid and covers	

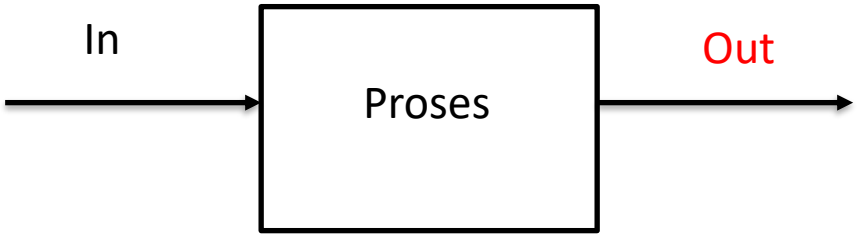
WASTE ACCEPTANCE CRITERIA FOR SW 206

(SPENT INORGANIC ACIDS WITH PRESENCE OF HEAVY METALS)

PARAMETER	MINIMUM VALUE (%w/w)	MAXIMUM VALUE (%w/w)
CHEMICAL:		
1. Base Transition Metals:		
a. Cobalt	20.0	-
b. Copper	5.0	95.0
c. Iron (Fe)	5.0	99.0
d. Lanthanum	50ppm	-
e. Manganese	7.0	-
f. Molybdenum	5.0	-
g. Niobium	50ppm	-
h. Nickel	5.0	99.0
i. Titanium	5.0	-
j. Vanadium	5.0	-
k. Zinc	5.0	99.0
l. Tungsten	5.0	-
2. Precious/Platinum Group Metals:		-
a. Gold	0.05	-
b. Silver	2.5	-
c. Palladium	1.0	-
d. Platinum	0.2	-
3. Other metals:		
a. Aluminum	4.8	95.0
b. Antimony	5.0	-
c. Indium	500ppm	-
d. Lead	-	70.0
e. Lithium	2.0	-
f. Tin	3.0	-
PHYSICAL:		
1. pH :	1.0	5.5
2. Moisture Content:	-	100.0
3. Phase:	Liquid phase	
4. Form:	Acid forms	
5. Packaging:	-IBC Tank -Bunghole plastic drum with covers -Plastic Carboy/Jerry Can (Very seldom)	

ASAS MASS BALANCE

Mass Balance: An application of conservation of mass to the analysis of physical systems by accounting for material entering and leaving a system



Basic equation: In = Out

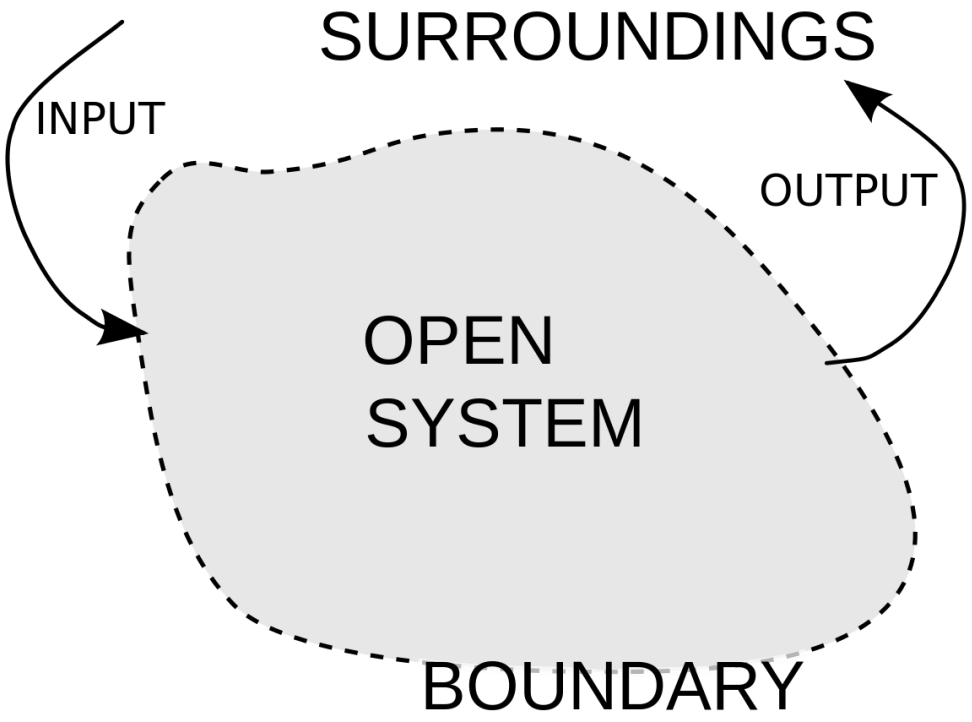
Material balance can refer to:

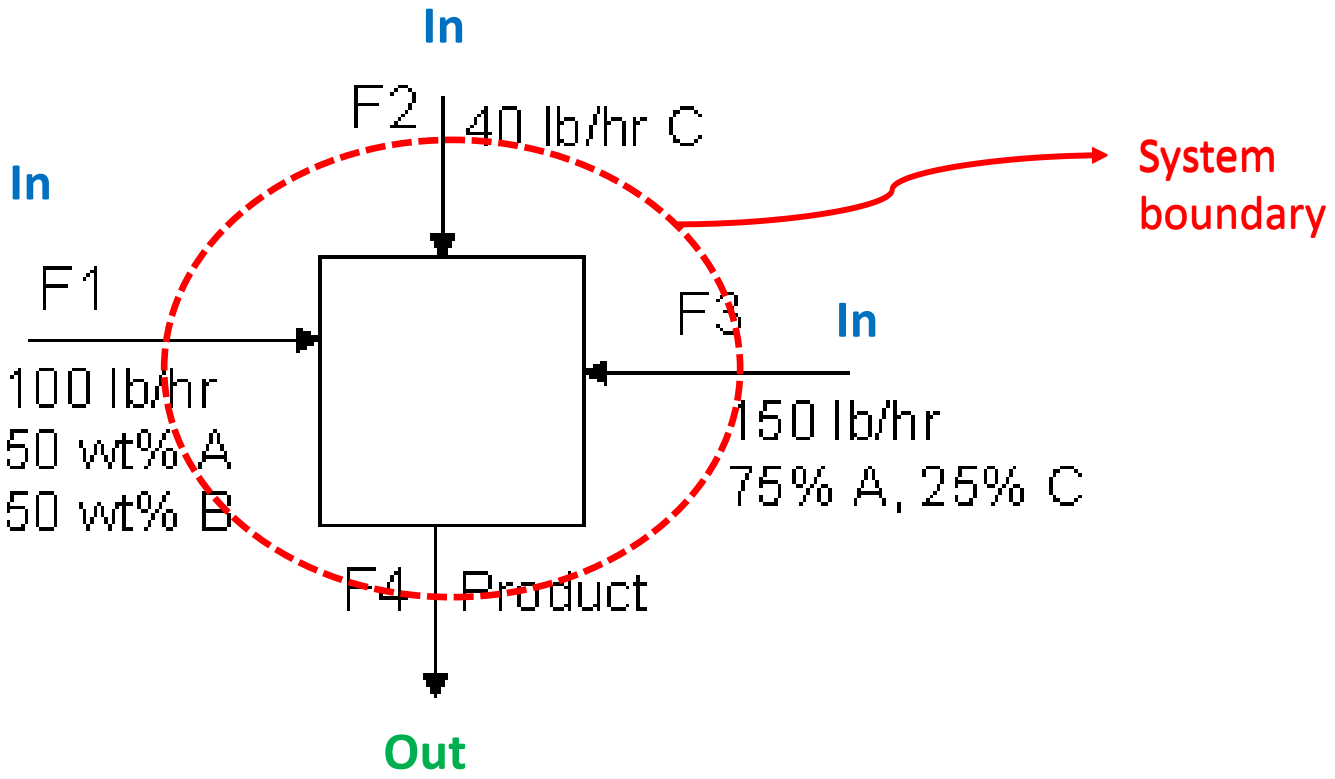
1. Total mass
2. Total moles
3. Mass of atomic species
4. Mass of chemical compound
5. Moles of chemical compound
6. Moles of an atomic species
7. Volume (possibly)

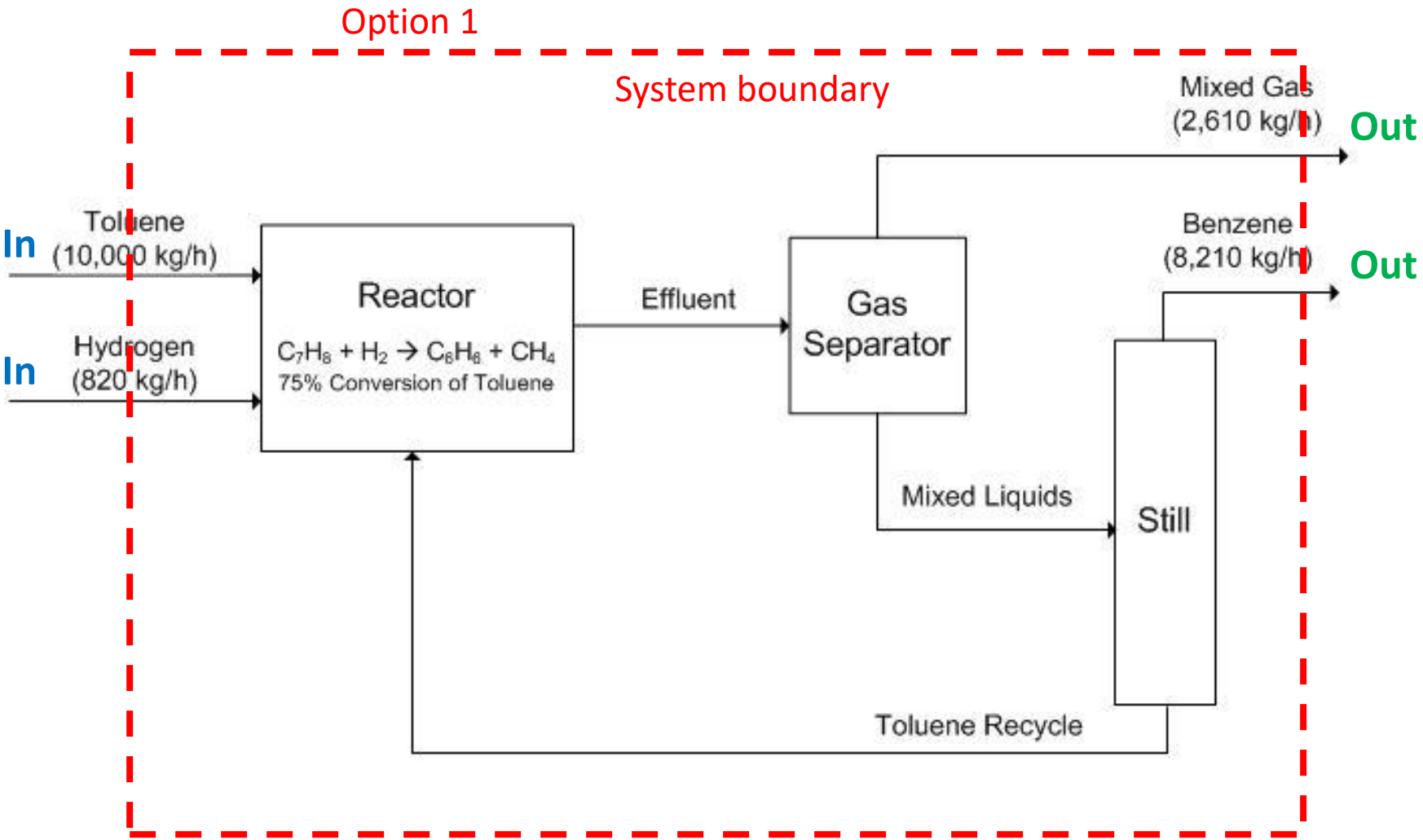
Important things to know:

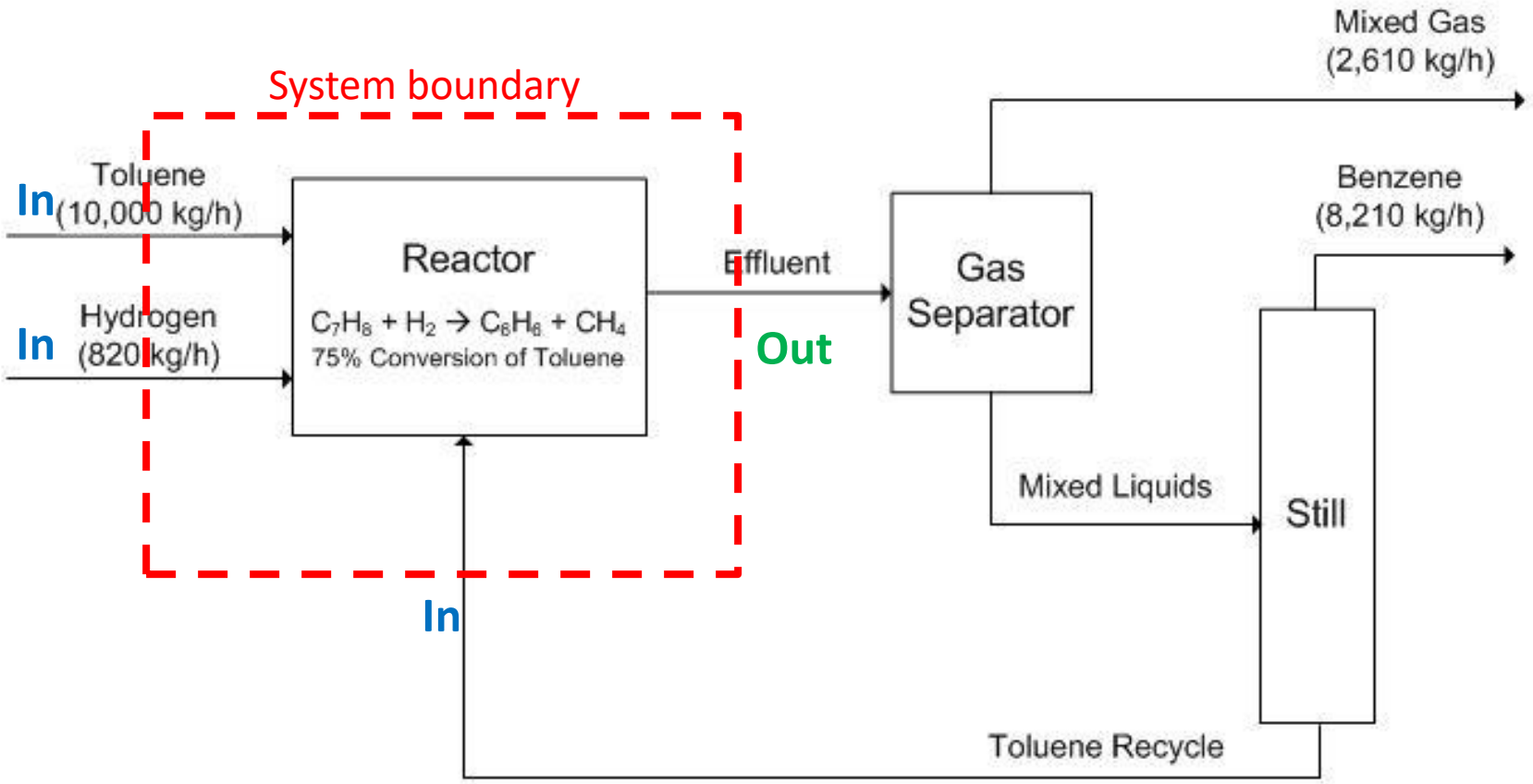
1. System boundary – arbitrary portion or whole of a process

   purposes: to determine what's in and what's out




In
F2
40 lb/hr C
In
System boundary
F1
100 lb/hr
50 wt% A
50 wt% B
F3
In
150 lb/hr
75% A, 25% C
F4
Product
Out


Option 1
System boundary
In
Toluene
(10,000 kg/h)
In
Hydrogen
(820 kg/h)
Reactor
$C_7H_8 + H_2 \rightarrow C_6H_6 + CH_4$
75% Conversion of Toluene
Effluent
Gas
Separator
Mixed Gas
(2,610 kg/h)
Out
Benzene
(8,210 kg/h)
Out
Mixed Liquids
Still
Toluene Recycle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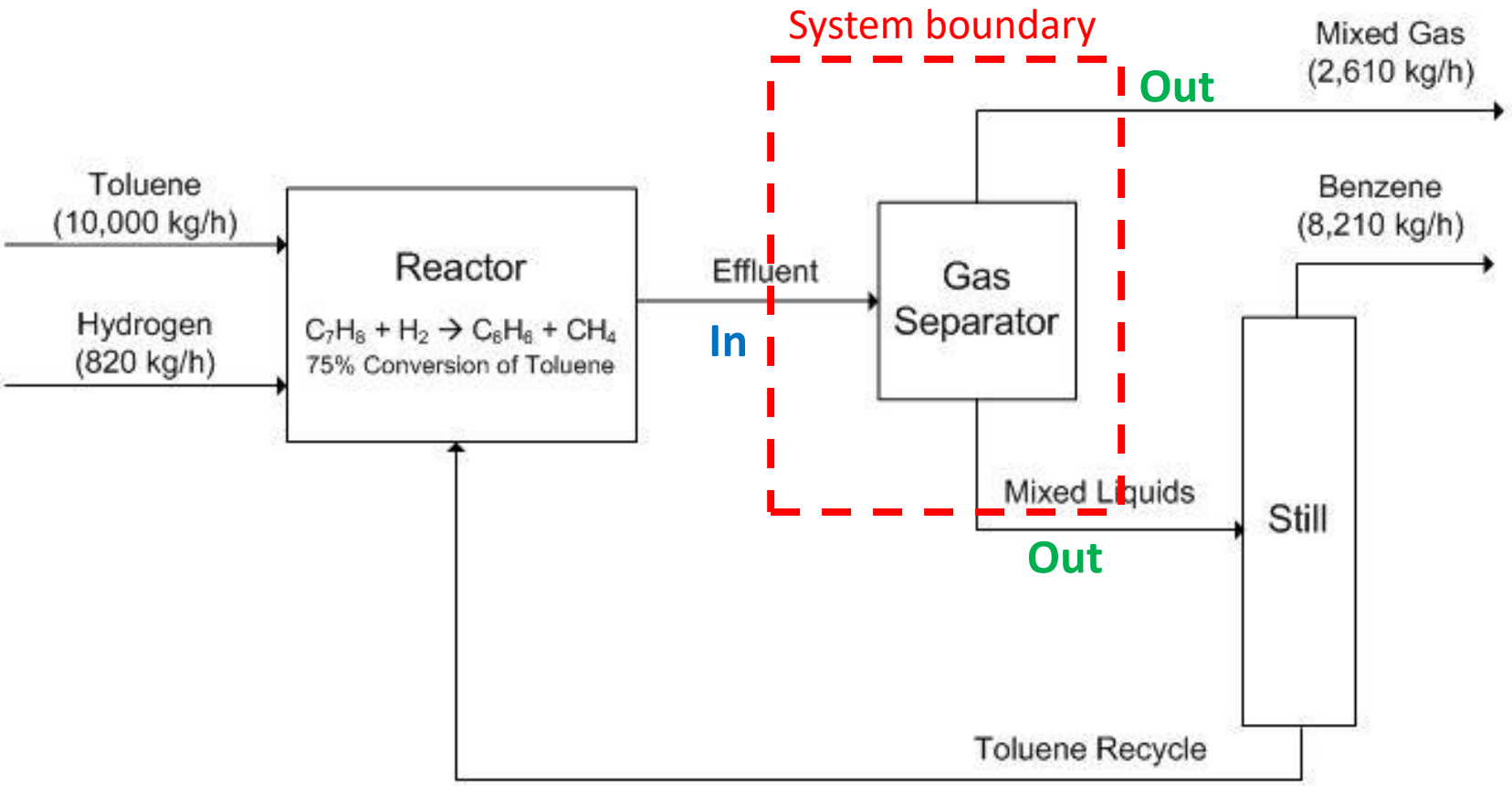
Toluene Recycle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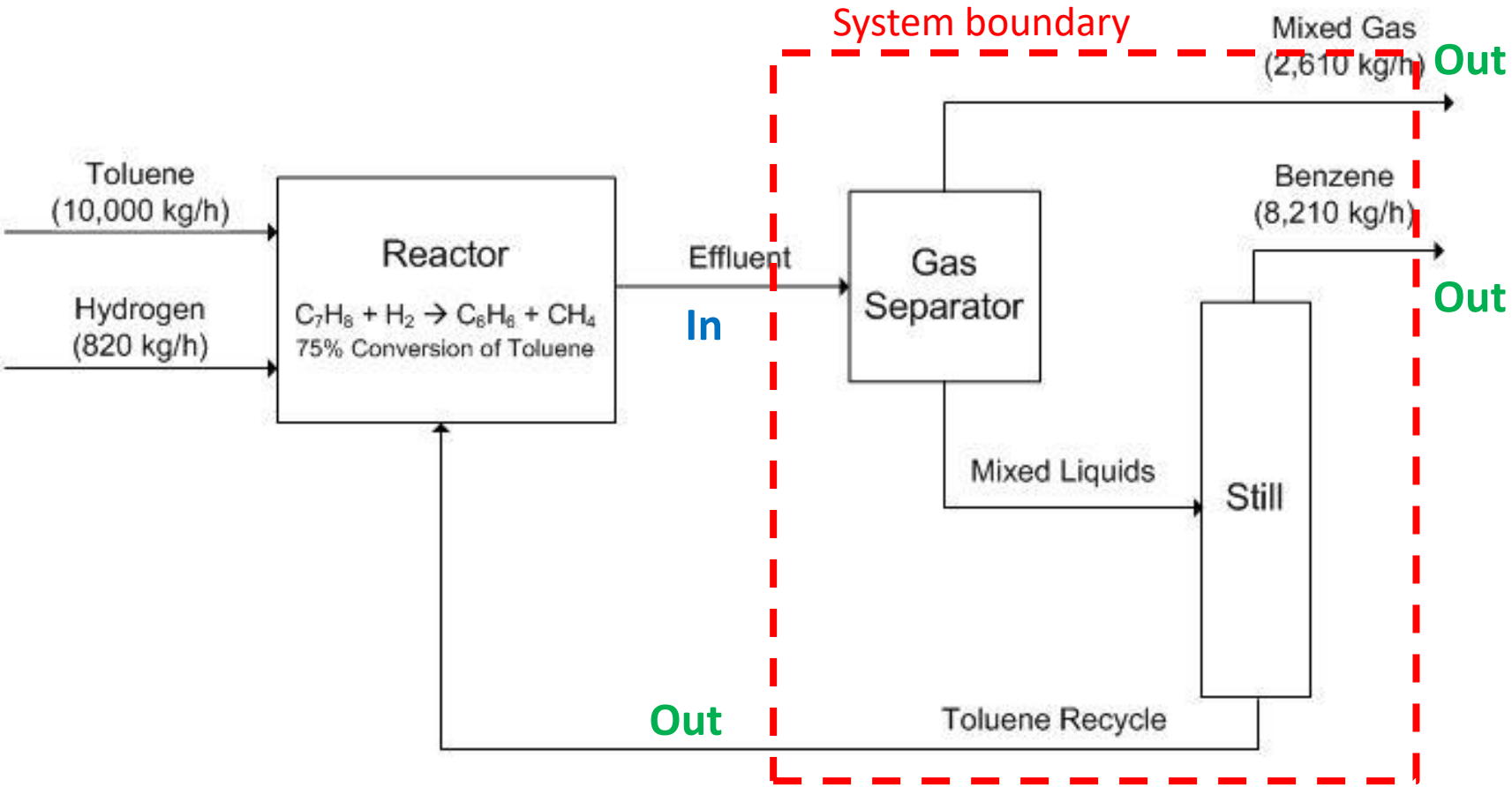
System boundary
Mixed Gas
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Out
Toluene
(10,000 kg/h)
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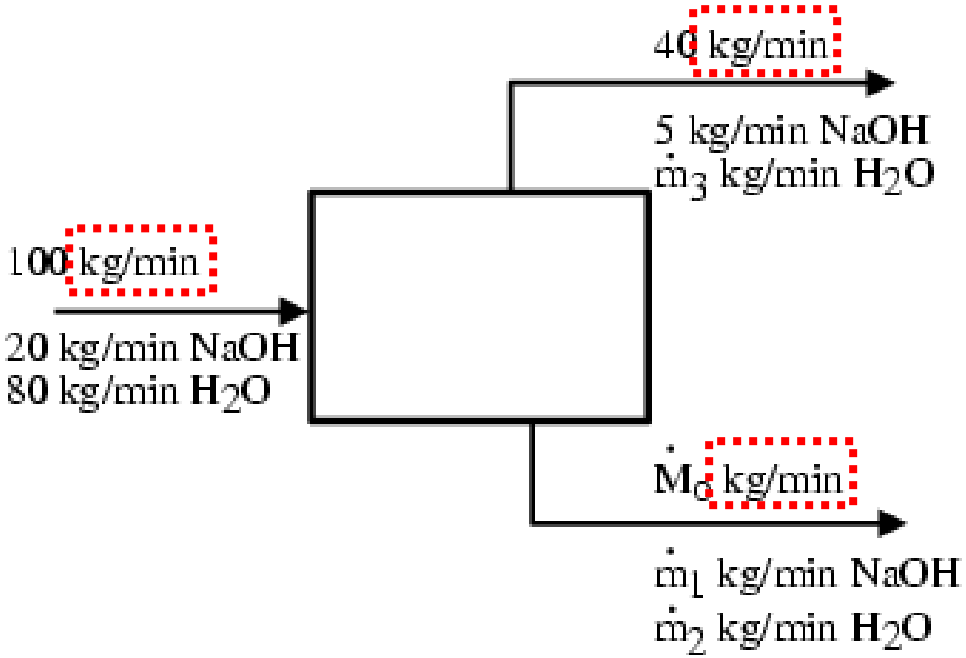
$C_7H_8 + H_2 \rightarrow C_6H_6 + CH_4$
75% Conversion of Toluene
Hydrogen
(820 kg/h)
Effluent
In
Gas
Separator
Benzene
(8,210 kg/h)
Out
Mixed Liquids
Still
Out
Toluene Recycle

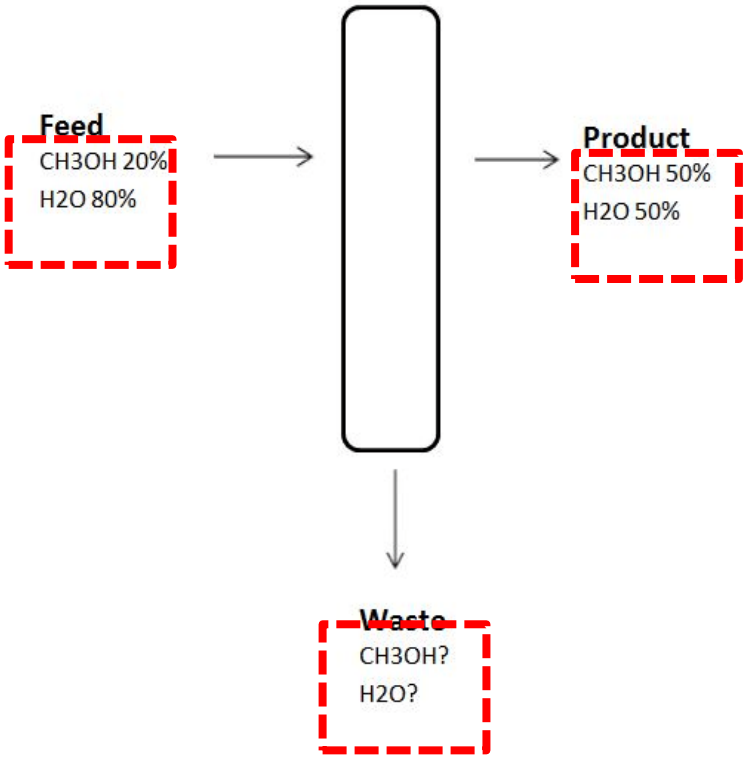
Important things to know:

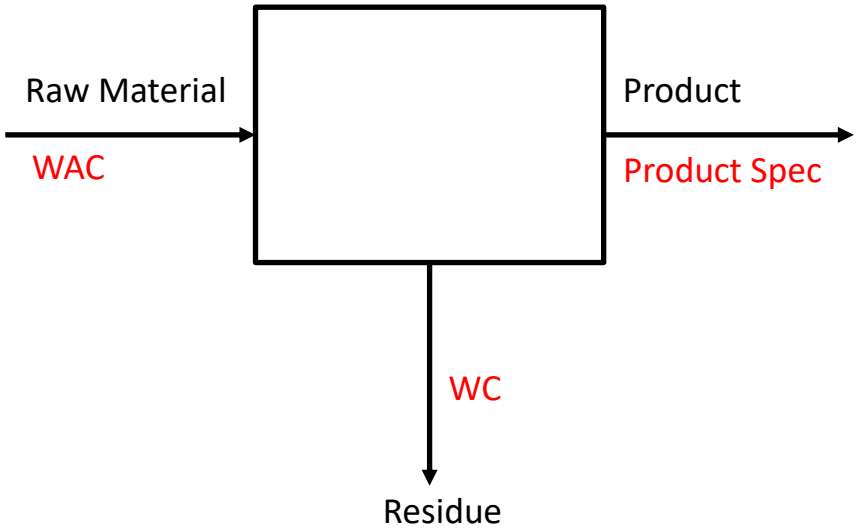
2. Units - material in and material out

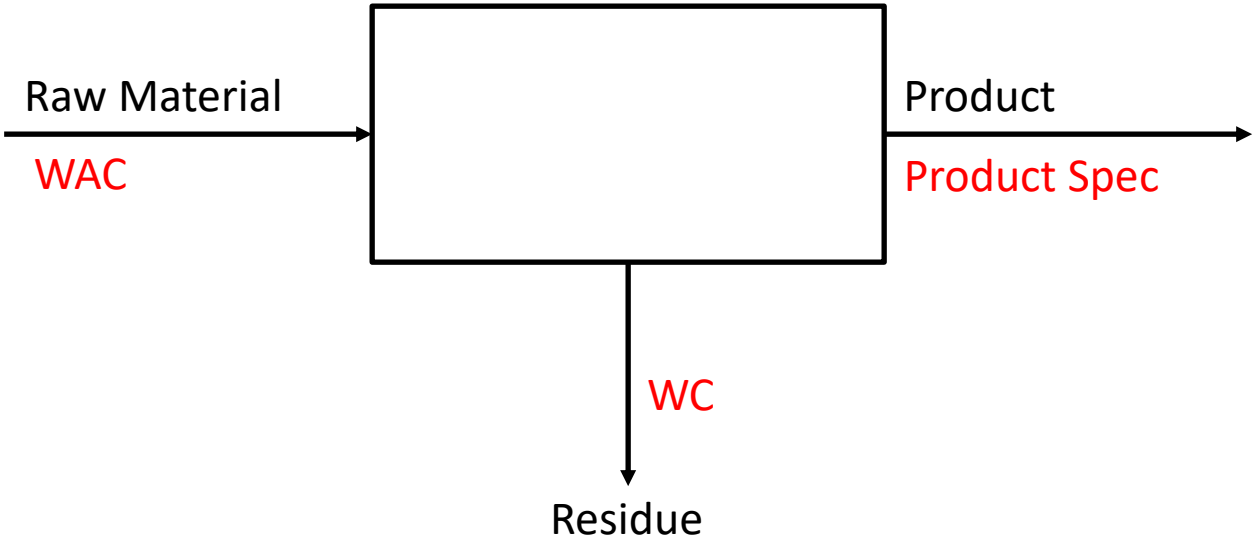


Important things to know:

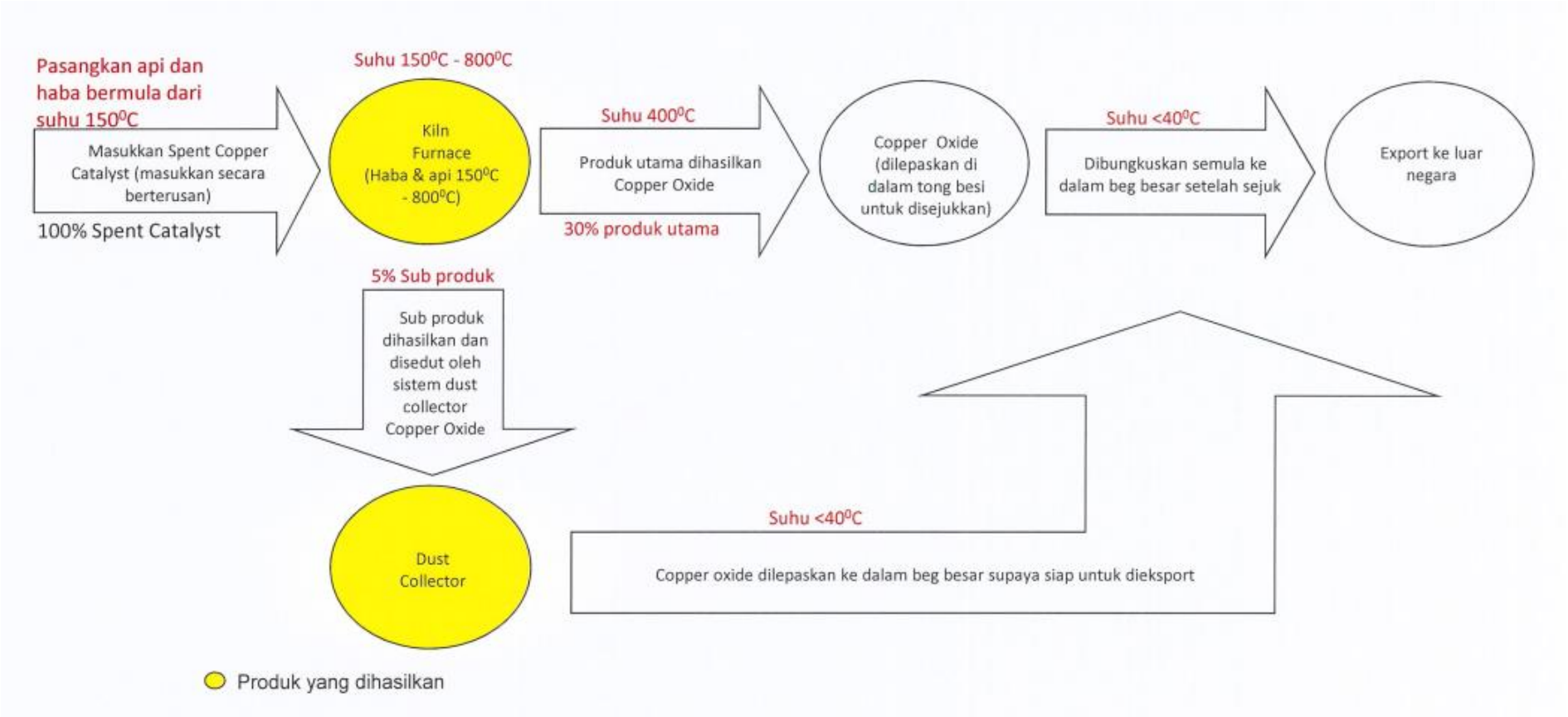
3. Basis calculation – clearly stated basis and assumption e.g – raw material criteria, product specification, proses condition, steady state etc.

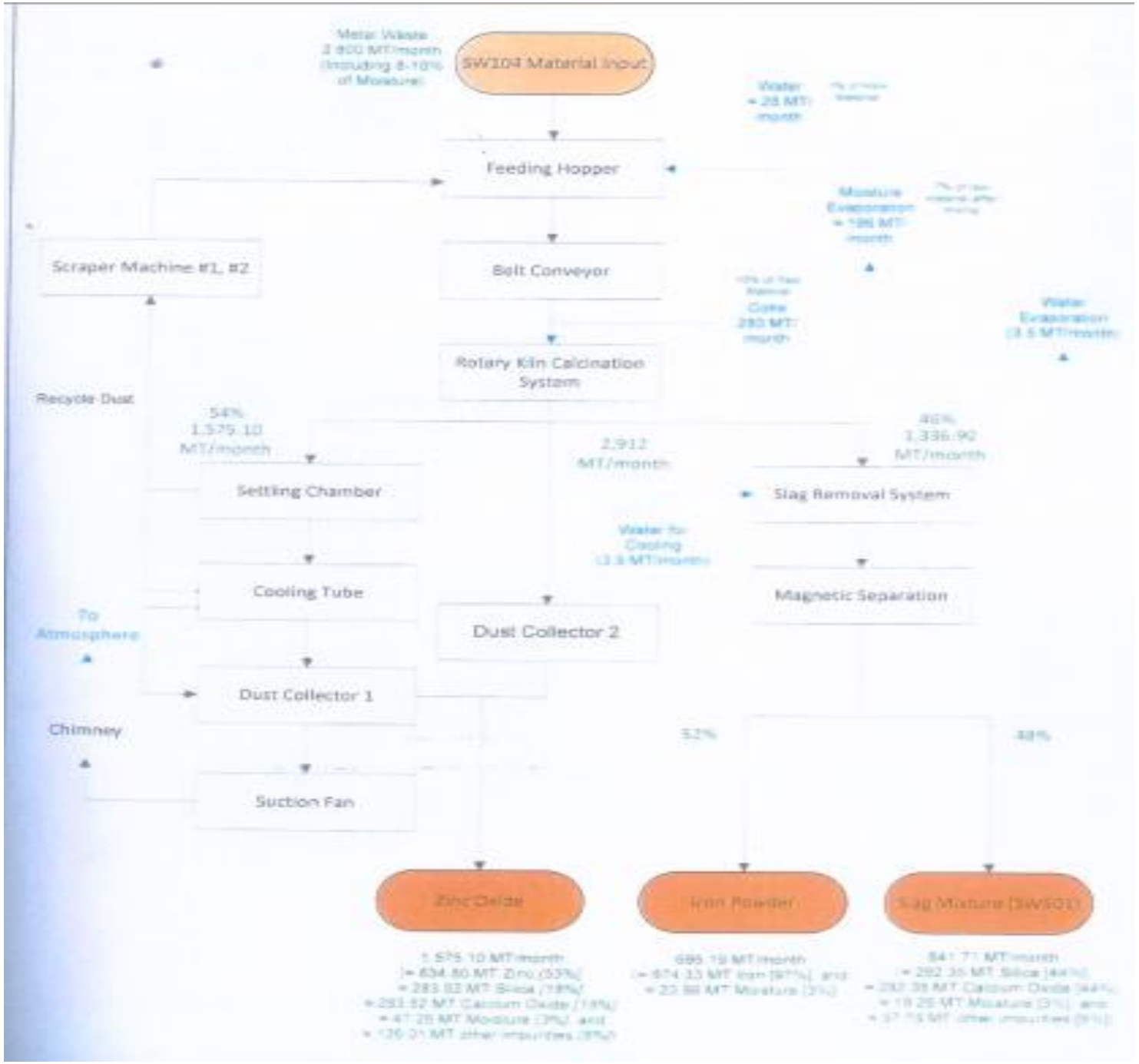





Raw Material
WAC
Product
Product Spec
WC
Residue

CONTOH


Pasangkan api dan haba bermula dari suhu 150⁰C
Masukkan Spent Copper Catalyst (masukkan secara berterusan)
100% Spent Catalyst
Suhu 150⁰C - 800⁰C
Kiln Furnace (Haba & api 150⁰C - 800⁰C)
Suhu 400⁰C
Produk utama dihasilkan Copper Oxide
30% produk utama
Copper Oxide (dilepaskan di dalam tong besi untuk disejukkan)
Suhu <40⁰C
Dibungkuskan semula ke dalam beg besar setelah sejuk
Export ke luar negara
5% Sub produk
Sub produk dihasilkan dan disedut oleh sistem dust collector Copper Oxide
Dust Collector
Suhu <40⁰C
Copper oxide dilepaskan ke dalam beg besar supaya siap untuk dieksport
Produk yang dihasilkan


SW104 Material Input
Feeding Hopper
Belt Conveyor
Rotary Kiln Calcination System
Scraper Machine #1, #2
Recycle Dust
54%
1,375.10
MT/month
2,912
MT/month
46%
1,336.90
MT/month
Settling Chamber
Cooling Tube
Dust Collector 2
Slag Removal System
Magnetic Separation
To Atmosphere
Dust Collector 1
Chimney
Suction Fan
52%
48%
Zinc Oxide
Iron Powder
Slag Mixture (SWS01)

Thank you.
Q & A