

**FLOW CHARTS
OF
INDUSTRIAL PROCESSES
(TOXIC AND HAZARDOUS WASTE GENERATION)**

BY



DEPARTMENT OF ENVIRONMENT

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FOREWORD

This document contains a compilation of Cleaner Production industrial processes flow diagrams with the purposed to highlight the type of waste being generated at each stage of the processes if it exists. One of the DOE's key functional area is proper Waste Management according to the Environmental Quality Act 1974.

This document is aimed to facilitate DOE officers in carrying enforcement. This information will help DOE officers identify potential sources and types of pollutants generated from industries. It also to help manage and control their waste according to the requirement under Environmental Quality Act 1974. It will also facilitate industries towards achieving Sustainable Development Goals (SDGs).

DATO' DR AHMAD KAMARULNAJUIB BIN CHE IBRAHIM

Director General

Department of Environment

Malaysia

LIST OF INDUSTRIAL PROCESSES

No.	TYPE	PRODUCT	REFERENCE
1.	AIR COND	CONDENSOR COIL	04
2.	AIR COND	EVAPORATOR COIL	05
3.	BATTERY (CAR)	CAR BATTERY	011
4.	BATIK	BATIK CLOTH	078
5.	CAR ASSEMBLY PLAT	MOTOR VEHICLE	052
6.	DETERGENT	POWDERED DETERGENT	017
7.	FERTILIZER	FERTILIZER	022
8.	FILM PROCESSING	PHOTO	023
9.	FLEXIBLE / POLYURETHANE FOAM	SPONGE / FOAM MATTRESS	024
10.	GLASS	DEMISTER GLASS	025
11.	INDUSTRIAL GAS PLANT	ACETYLENE GAS	028
12.		NITROUS OXIDE PLANT	029
13.	LEATHER TANNERY	COW HIDE LEATHER	030
14.	METAL FINISHING	COPPER PLATING	034
15.	METAL FINISHING	GALVANISING PLANT	035

LIST OF INDUSTRIAL PROCESSES

No.	TYPE	PRODUCT	REFERENCE
-:METAL WORKS:-			
16.	1) CLEANING AND PAINTING OF ALLOY CAR RIMS	CAR ALLOY RIM	039
17.	2) ALLUMINIUM WORKS	ALLUMINIUM KITCHEN	040
18.	3) BICYCLE PARTS	BICYCLE	041
19.	4) CABLE WIRE	CABLE WIRE	042
-:METAL WORKS :-		(NEW)	
20.	MAKING OF 45 GALLON DRUM	45 GALLON DRUM	043
21.	MAKING OF TIN CAN	TIN CAN	044
22.	MAKING OF CAR RADIATOR	CAR RADIATOR	045
23.	PEWTER	PEWTER	046
24.	GAS CYCLINDER RECYCLING	PAINTED GAS CYCLINDER	047
25.	SEWING MACHINE	SEWING MACHINE	048
26.	SHOCK ABSORBER	SHOCK ABSORBER	049
27.	PAPER CARTON BOXES	BOXES	053

LIST OF INDUSTRIAL PROCESSES

No.	TYPE	PRODUCT	REFERENCE
28.	PRINTING COMPANY	PRINTING	054
29.	PRINTING COMPANY	PLATE MAKING	055
	:- PAINT FACTORY :-		
30.	1) SOLVENT PAINT PROCESS	SOLVENT PAINT (CAT BESI)	052
31.	2) SOLVENT BASED PROCESS	-VARNISH & LACQUER -ROAD LINE MARKER -ALLUMINIUM PAINT	057
32.	3) WATER BASED PAINT	-CAT AIR	058
33.	PAPER MILL	TISSUE / PAPER	059
34.	PESTICIDE FORMULATION	MAKING OF ASMA	060
35.	1)	MAKING OF PARAQUAT	061
36.	2)	MAKING OF COPPER CHROME ARSENATE	062
37.	PLASTIC PRINTING	PRINTED PLASTIC	064
38.	RUBBER CONDOM	CONDOM	068
39.	RUBBER GLOVE	GLOVE	069

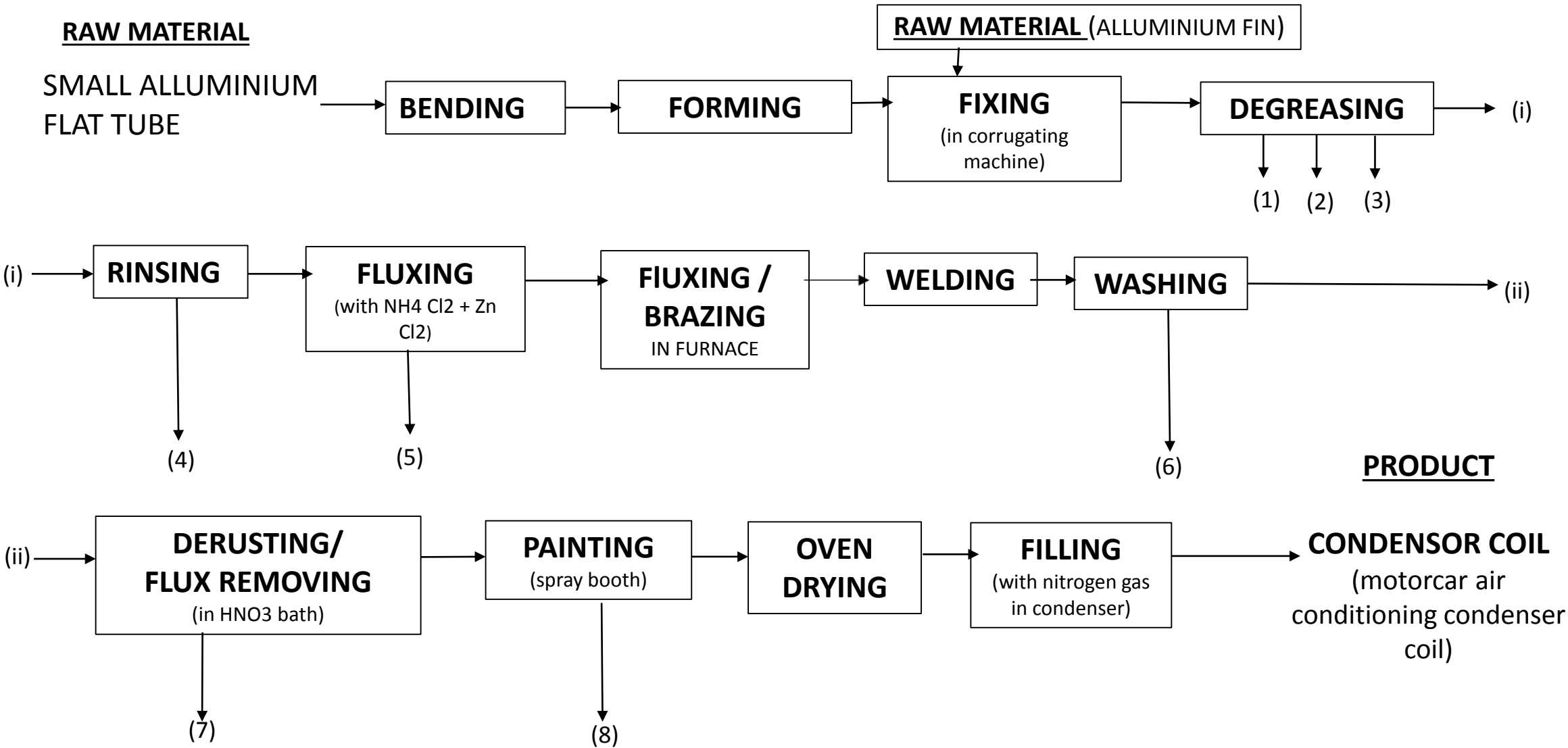
LIST OF INDUSTRIAL PROCESSES

No.	TYPE	PRODUCT	REFERENCE
40.	RECYCLING OF LUB OIL	3 RD GRADE LUB OIL	050
41.	REFINERY (OIL)	OIL REFINERY	052
42.	<u>SYNTHETIC RESIN FORMULATION</u>	MAKING OF FORMALIN	072
43.	1)	MAKING OF GLUE & ADHESIVE	073
44.	2)	ALKYD RESIN SOLUTION	074
45.	3)	PVC RESIN	075
46.	4)	PVA RESIN	076
47.	5)	PVA EMULSION / ACRYLIC EMULSION	077
48.	TEXTILE	FABRIC	079
49.	TEXTILE	FABRIC HAT	080
50.	RECYCLE PLASTIC	PLASTIC PALLET	081

AIR CONDITIONING EVAPORATOR COIL AND CONDENSOR COIL
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.004

CONDENSOR OIL



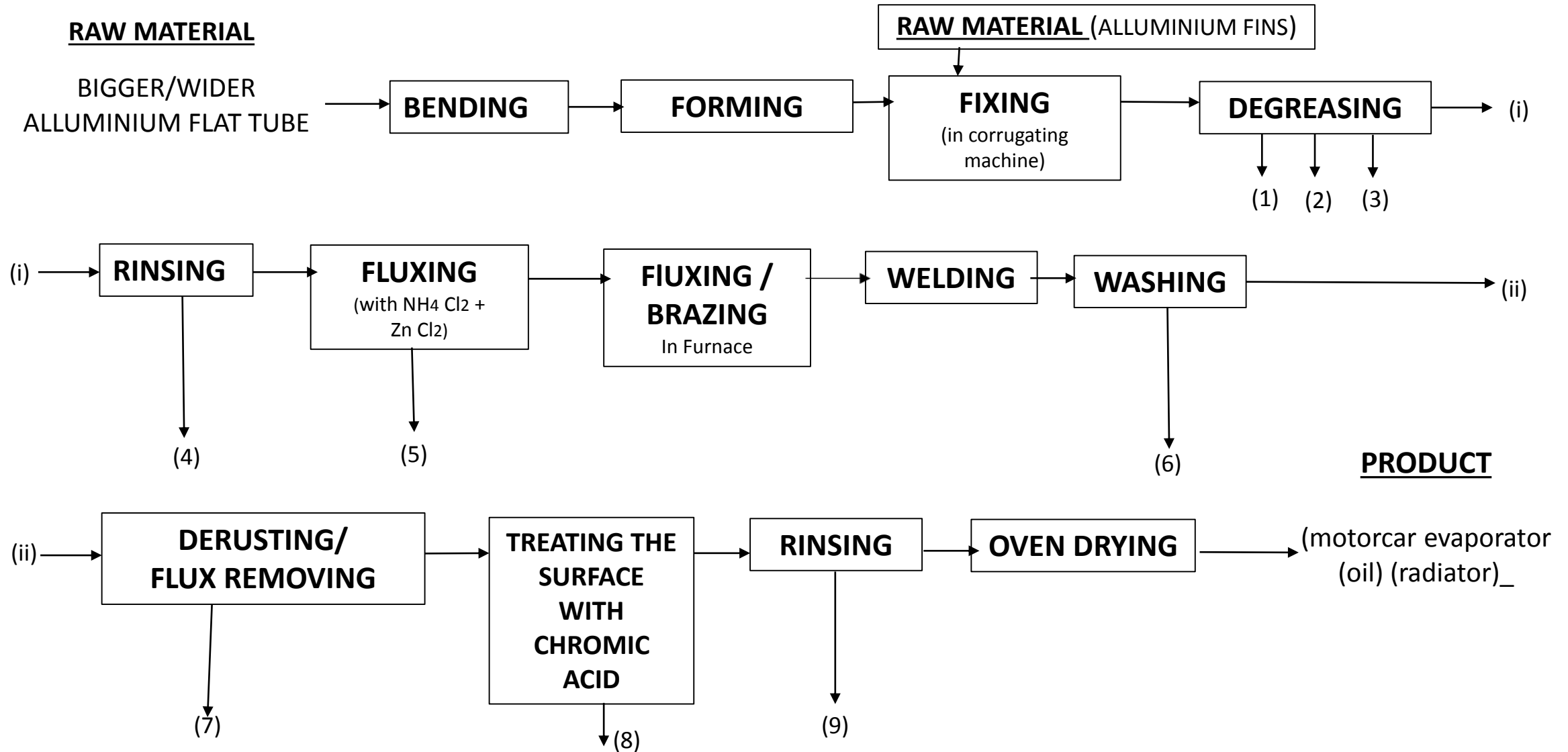
AIR CONDITIONING - CONDENSOR COIL
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Degreasing	1,1,1 TCE	Spent 1,1,1 TCE	Liquid
2.	Degreasing	1,1,1 TCE	1,1,1 TCE Sludge	semi - solid
3.	Degreasing	If using Na OH	Spent Na OH	Liquid
4.	Rinsing	If using Na OH	Aqueous Alkaline Waste (Na OH)	Liquid
5.	F Luxing (with NH ₄ Cl + Zn Cl ₂)	NH ₄ Cl + Zn Cl ₂	Spent Zinc Ammonium Chloride	Liquid
6.	Washing	H ₂ O	Aqueous Zinc Ammonium Chloride	Liquid
7.	Derusting / Flux Removing	HNO ₃	Spent or Aqueous HNO ₃	Liquid
8.	Painting	-	Paint Sludge (Water Based)	Semi-Solid

AIR CONDITIONING - EVAPORATOR COIL (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.005

EVAPORATOR COIL

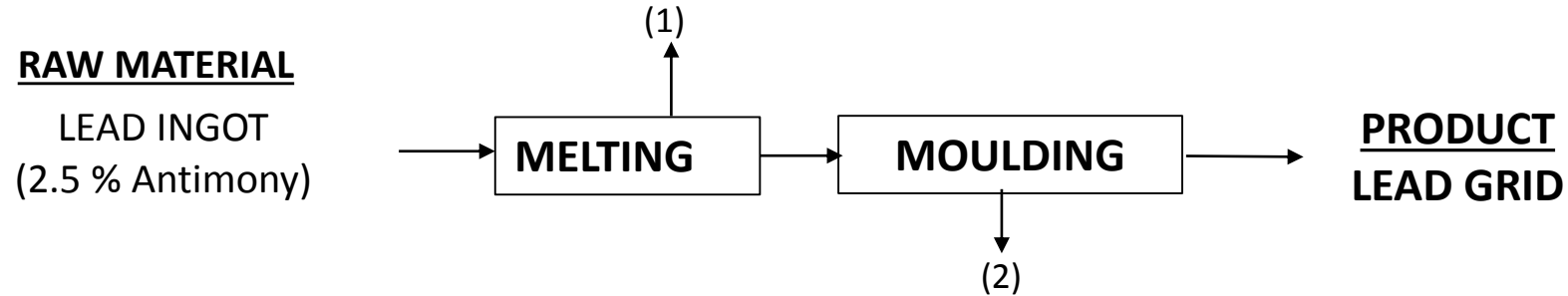


AIR CONDITIONING - EVAPORATOR COIL
(WASTE DESCRIPTION)

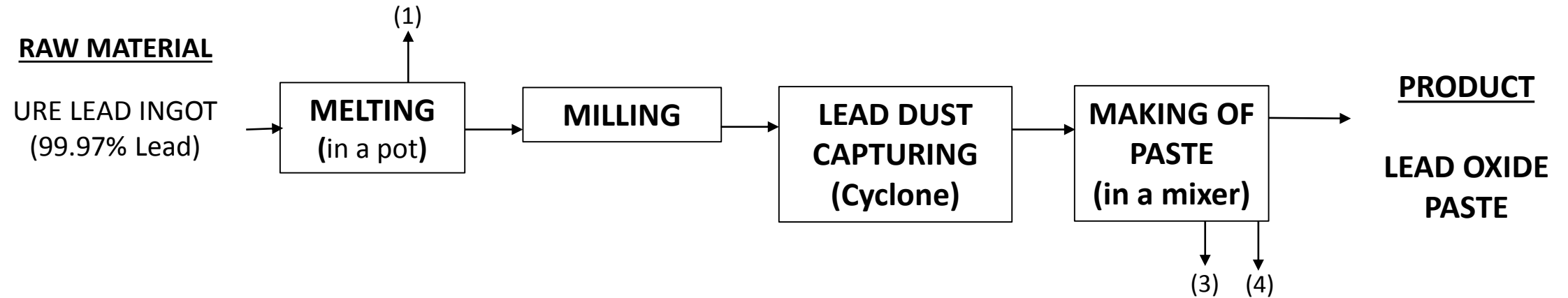
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Degreasing	1,1,1 TCE	Spent 1,1,1 TCE	Liquid
2.	Degreasing	1,1,1 TCE	1,1,1 TCE Sludge	semi - solid
3.	Degreasing	If using NaOH	Spent NaOH	Liquid
4.	Rinsing	-do-	Aqueous Alkaline Waste (NaOH)	Liquid
5.	Fluxing (with NH ₄ Cl + ZnCl ₂)	NH ₄ Cl + ZnCl ₂	Spent Zinc Ammonium Chloride	Liquid
6.	Washing	H ₂ O	Aqueous Zinc Ammonium Chloride	Liquid
7.	Derusting / Flux Removing	HNO ₃	Spent or Aqueous HNO ₃	Liquid
8.	Treating the Surface With Chromic Acid	Chromic Acid	Spent Chromic Acid	Liquid
9.	Rinsing	H ₂ O	Aqueous Chromic Acid	Liquid

BATTERY – MAKING OF LEAD GRID
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.011

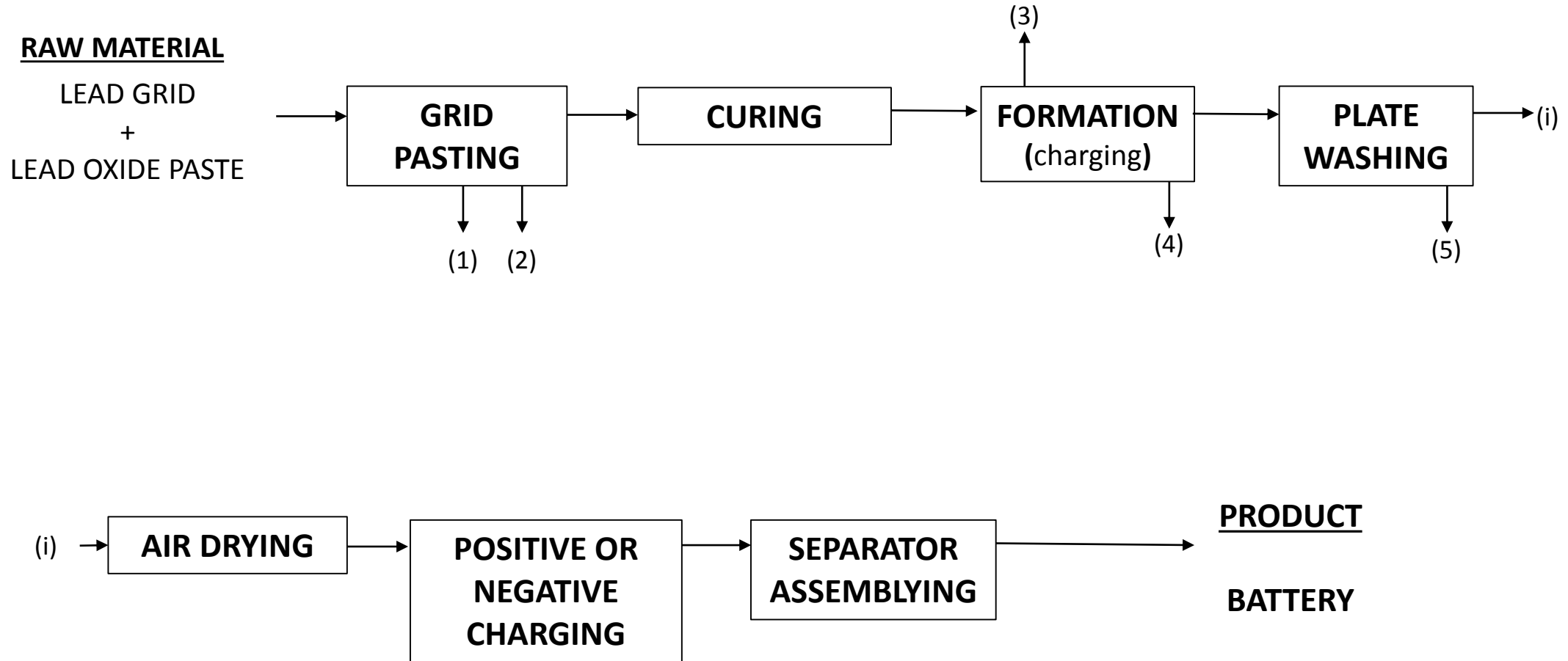


BATTERY – MAKING OF LEAD OXIDE PASTE
(PRODUCTION PROCESS DESCRIPTION)



BATTERY – ASSEMBLY OF GRID & PASTE TO FORM BATTERY (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.011



BATTERY – MAKING OF LEAD GRID
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Melting (used Acetylene gas)	-	Lead Dust	Dust
2.	Moulding	-	Off spec. grid	Solid (recycled)

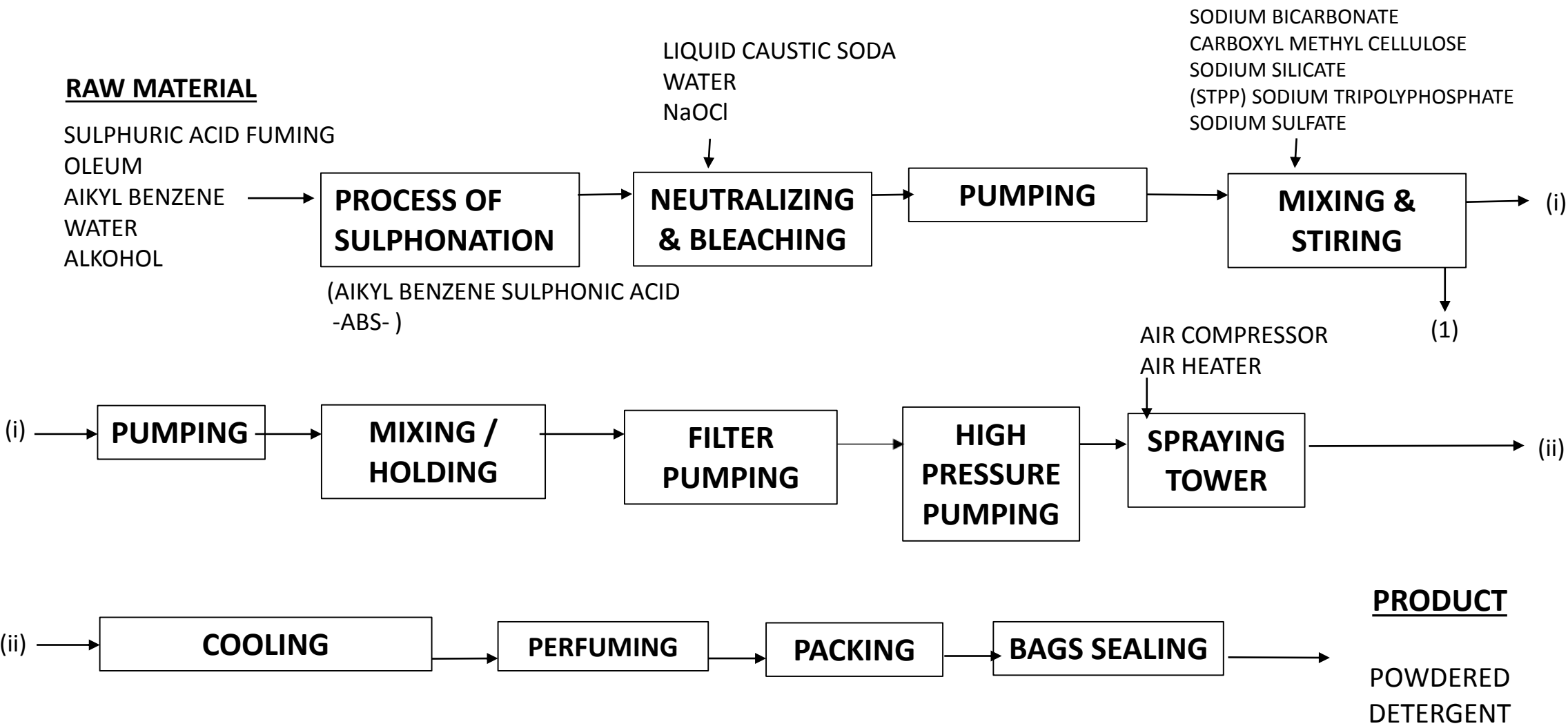
BATTERY – MAKING OF LEAD OXIDE PASTE
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Melting	-	Lead Oxide Dust	Dust
2.	Process of capturing Lead dust - cyclone	-	Lead Oxide Dust	Dust
3.	Making of Paste (in a mixer)	H ₂ SO ₄	Acidic effluent	Effluent
4.	Making of Paste (in a mixer)	H ₂ SO ₄	Acidic Lead Sludge or Slurry	Sludge/Slurry

BATTERY – ASSEMBLY OF GRID & PASTE TO FORM BATTERY
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Grid pasting	-	Acidic (H ₂ SO ₄) effluent	Effluent
2.	Grid pasting	-	Acidic Lead Slurry	Semi-Solid
3.	Formation	H ₂ SO ₄	Acid fumes (H ₂ SO ₄)	Gas
4.	Formation	H ₂ SO ₄	Aqueous Acid (H ₂ SO ₄)	Effluent
5.	Washing	Water H ₂ O	Aqueous Acid (H ₂ SO ₄)	Effluent

DETERGENT
(PRODUCTION PROCESS DESCRIPTION)



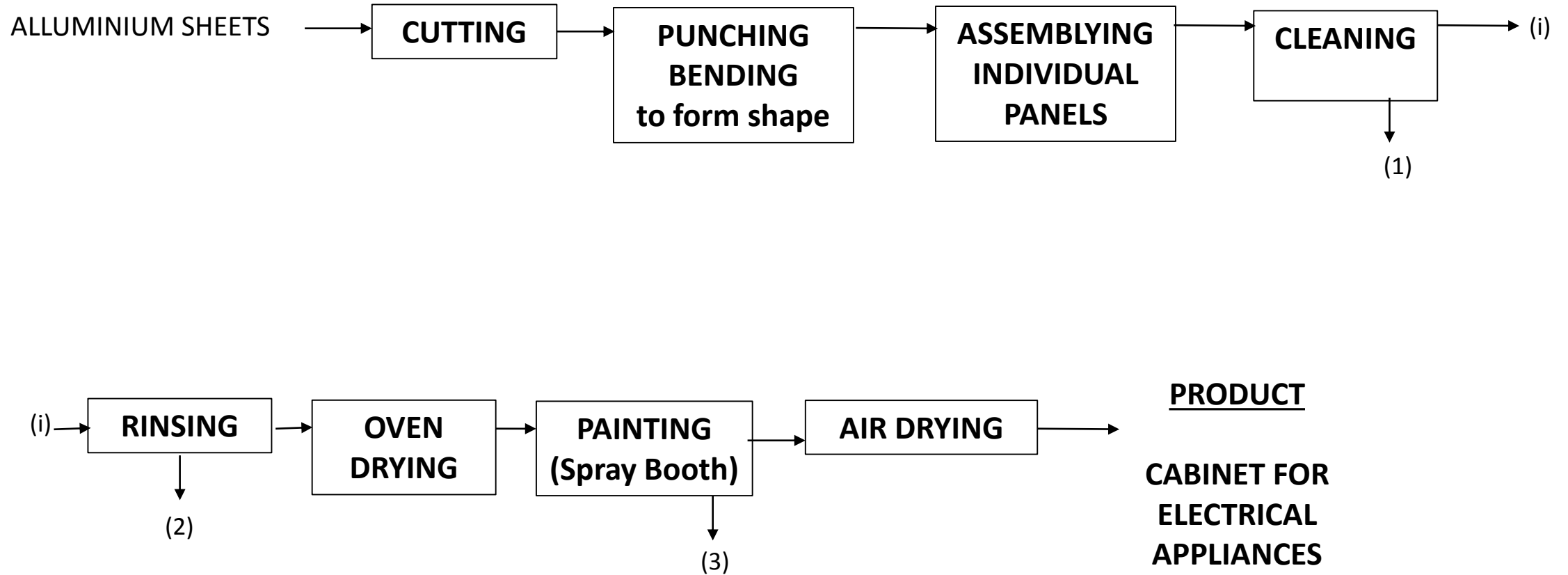
DETERGENT
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Mixing & Stirring (Washing of mixer)	as in the Production Process Description	Effluent Detergent (Alkaline)	Liquid

ELECTRICAL APPLIANCES – MAKING OF METAL CABINET (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.018

RAW MATERIAL



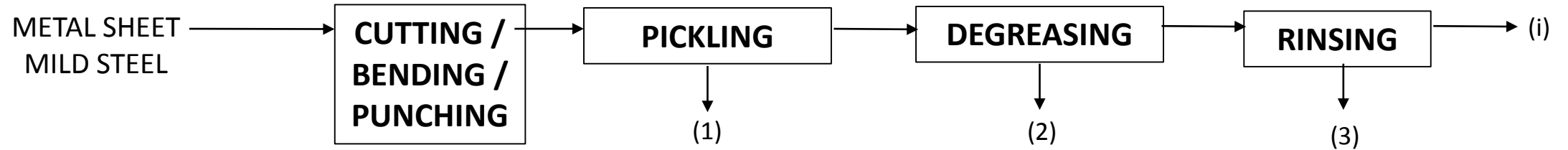
ELECTRICAL APPLIANCES – MAKING OF METAL CABINET
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Cleaning	Chromic Acid	Spent Chromic Acid	Liquid
2.	Rinsing	-	Aqueous Chromic Acid	Liquid
3.	Painting (Spray Booth)	-	Paint Sludge (Water Based)	Semi-Solid

ELECTRICAL APPLIANCES – SWITCH BOARD / SWITCHGEAR (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.019

RAW MATERIAL



PRODUCT

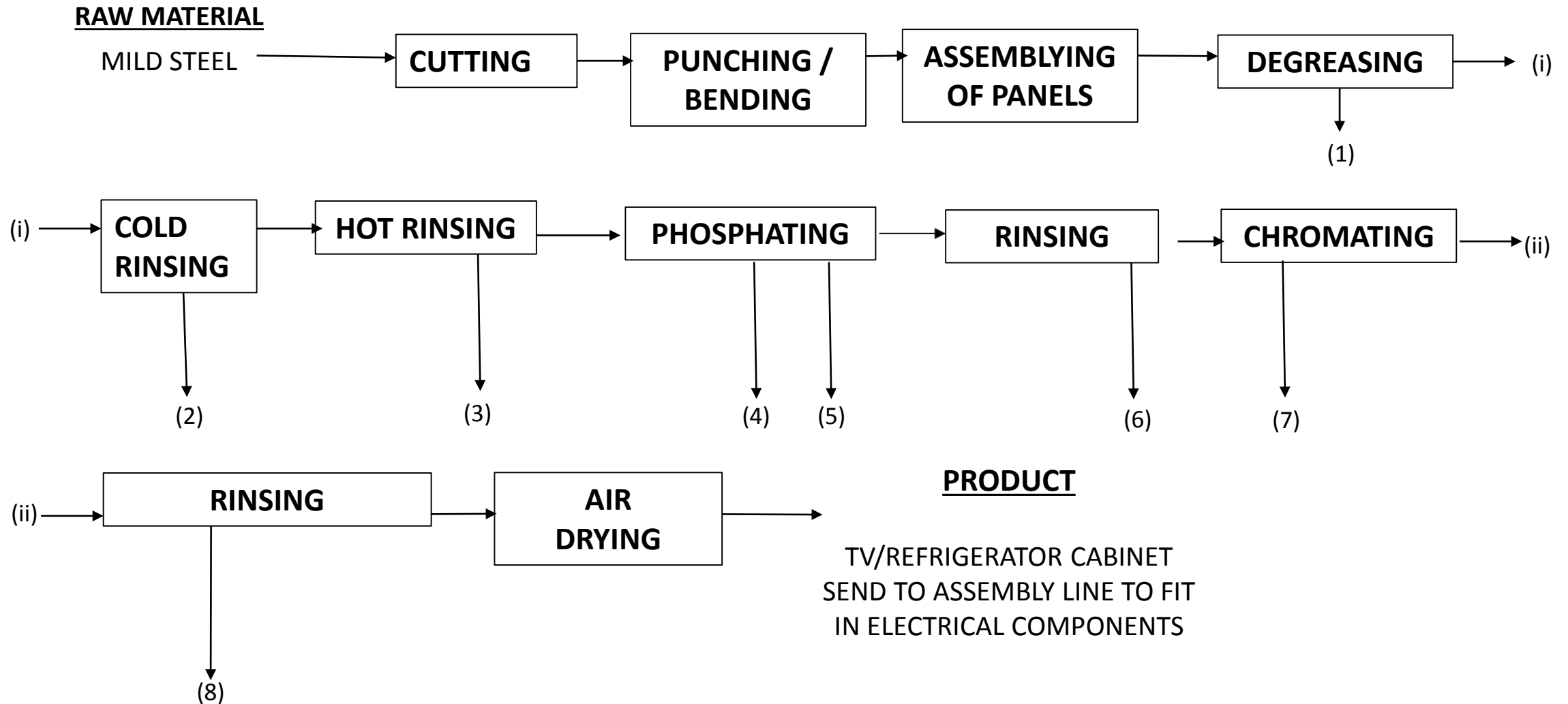


ELECTRICAL APPLIANCES – SWITCH BOARD / SWITCHGEAR
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Pickling	-	Acid Waste (HCl)	Liquid
2.	Degreasing	-	Alkaline Waste	Liquid
3.	Rinsing	-	Aqueous Alkaline Waste	Liquid
4.	Painting (in a spray booth)	-	Paint Sludge (waste based)	Liquid

ELECTRICAL APPLIANCES – TV / REFRIGERATOR CABINET (PRODUCTION PROCESS DESCRIPTION)

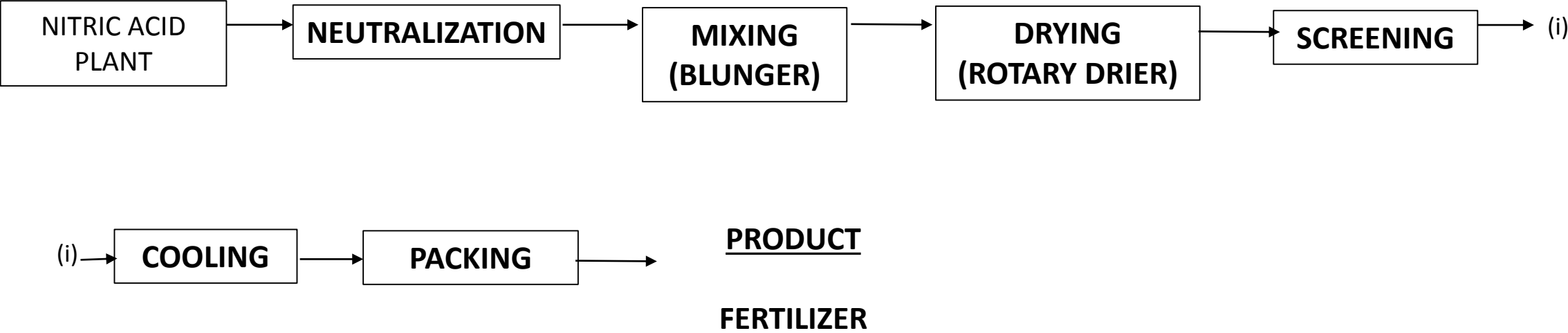
JAS/PNG/88/R.020



ELECTRICAL APPLIANCES – TV / REFRIGERATOR CABINET
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Degreasing	Alkaline	Alkaline Waste	Liquid
2.	Cold Rinsing	Water	Aqueous Alkaline Waste	Liquid
3.	Hot Rinsing	Water	Aqueous Alkaline Waste	Liquid
4.	Phosphating	Zinc Ammonium Phosphate	Spent / Aqueous Zinc Ammonium Phosphate	Liquid
5.	Phosphating	-do-	Zinc Ammonium Phosphate	Liquid
6.	Rinsing	Water	Aqueous Zinc Ammonium Phosphate	Liquid
7.	Chromating	Chromatic Acid	Spent Chromic Acid	Liquid
8.	Rinsing	Water	Aqueous Chromic Acid	Liquid

FERTILIZER MANUFACTURING
GRANULATION PROCESS
(PRODUCTION PROCESS DESCRIPTION)

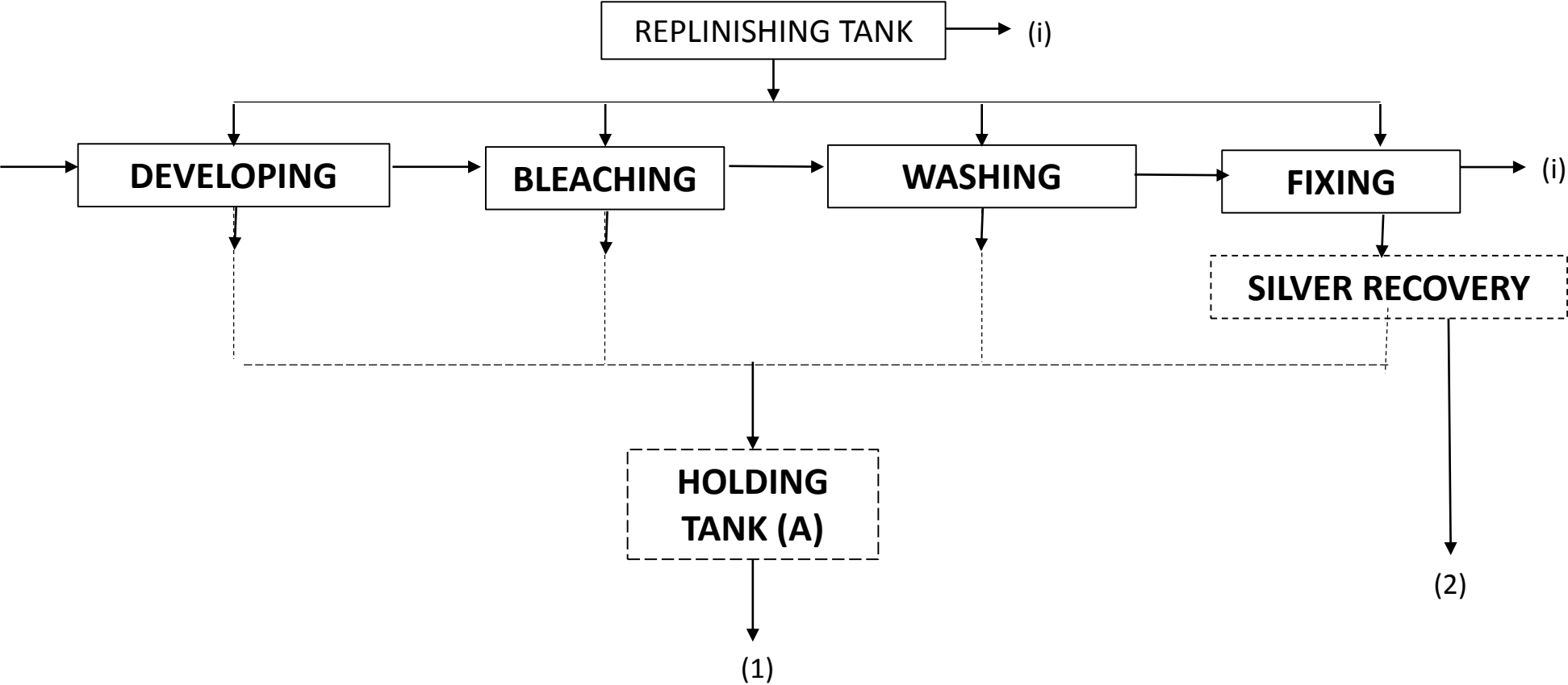


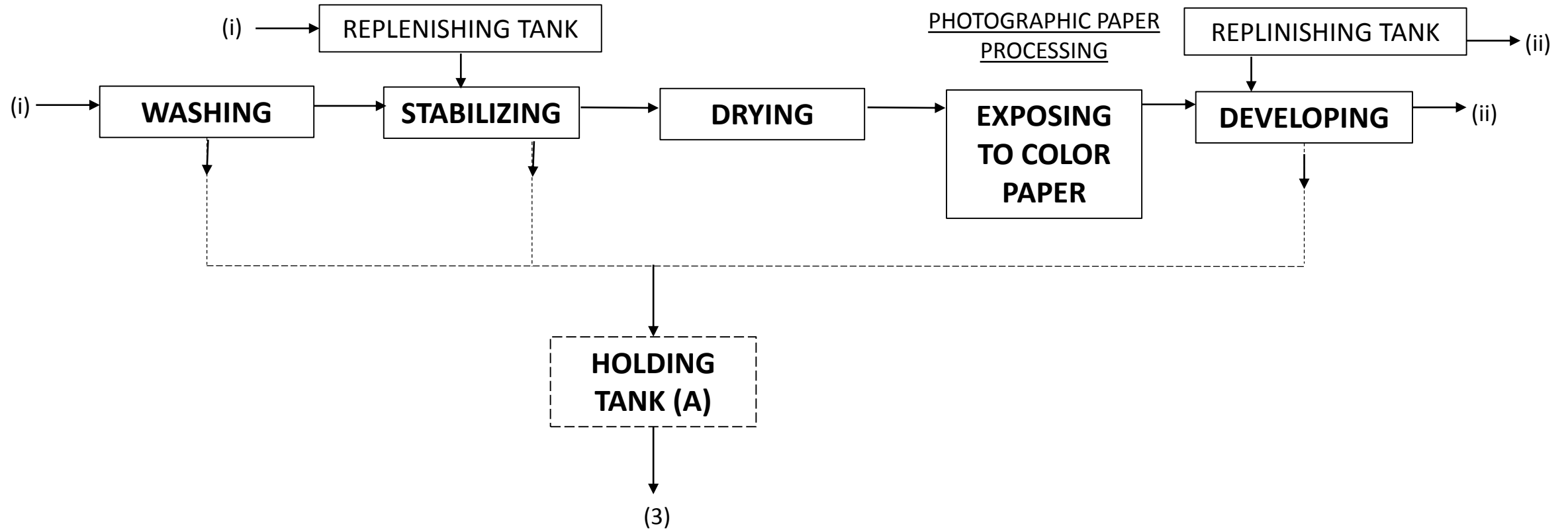
FILM PROCESSING - KODAK
(PRODUCTION PROCESS DESCRIPTION)

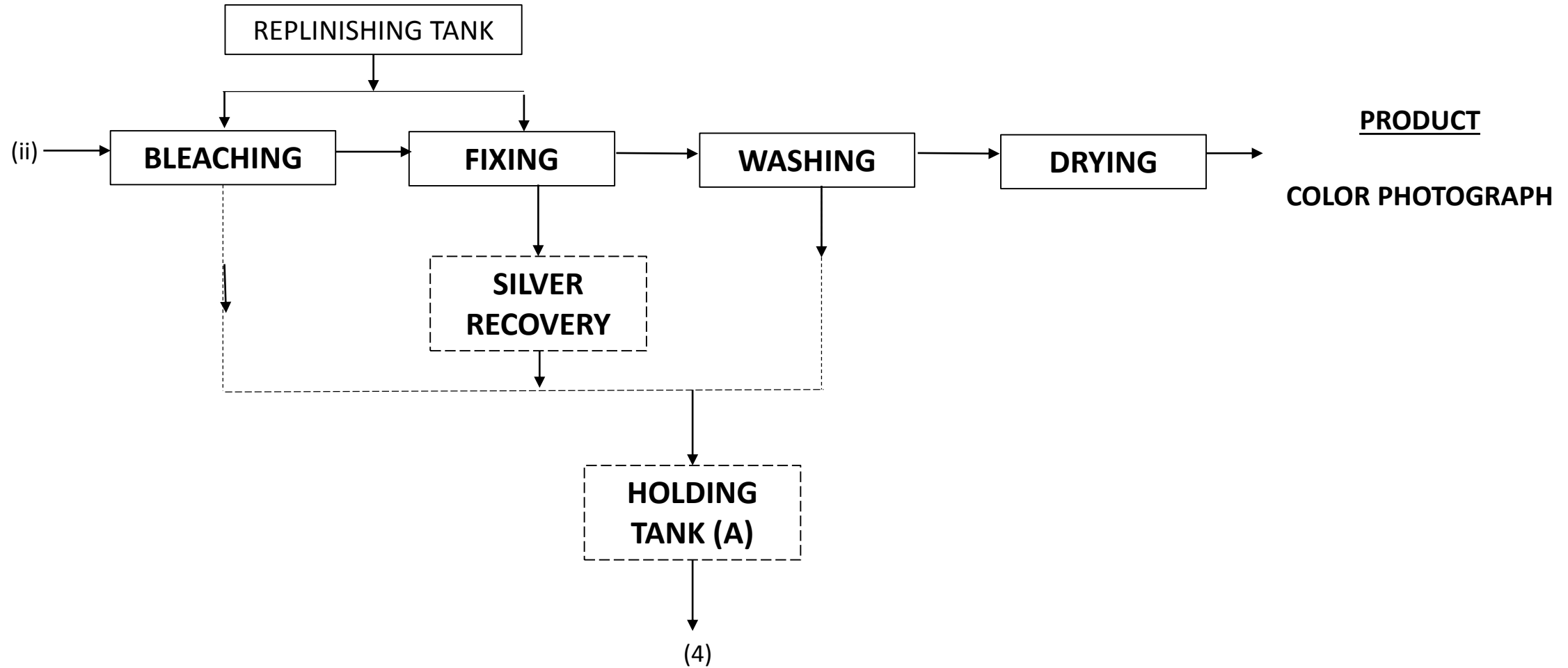
NEGATIVE FILM PROCESSING

RAW MATERIAL

ROLLS OF
NEGATIVE FILM







FILM PROCESSING – KODAK (WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	<u>Holding Tank (A)</u>			
	<u>Negative Film Processing:-</u>	<u>Chemical constituent</u>		
	- Developing			
	(to give out dye/color image to film, exposed Silver halide in film to form metallic halide)	Bromide, Iodide, Sodium hydrosulfite or hydro-quinon	Aqueous Spent Developer	Liquid
	-Bleaching			
	(Converting metallic Silver to Silver Bromide)	EDTA, Acetic Acid, Bromide, Iron Element	Aqueous/Spent Bleaching Chemicals	Liquid
	-Washing	Water	Aqueous Bleaching Chemicals	Liquid
	-Fixing / Silver Recovery			
	(To converting Silver Halide / Bromide to soluble Silver) leaving dye image in film Method:-Metallic Exchange or Electrolytic method	Ammonium thiosulfate Sodium hydrosulfite	Aqueous Spent Fixer	Liquid
	-Washing	Water	Aqueous Fixer Chemicals	Liquid
	-Stabilizing (To improve Dye/Color stability and uniform dryness)	Formalin, Wetting Agent	Aqueous Stabilizer	Liquid

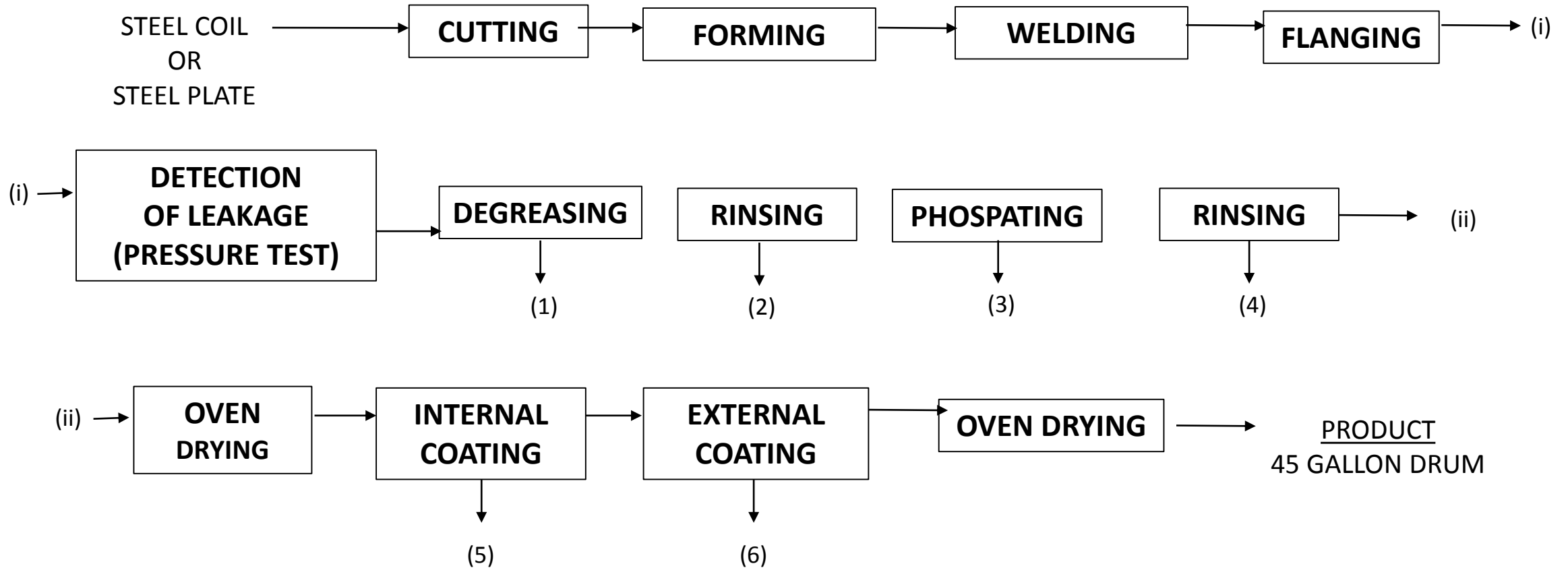
FILM PROCESSING – KODAK (WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
2.	Silver Recovery			
	(From Negative film processing)	-	Silver metal	Solid
3.	Holding tank (A) from photo-graphic paper processing	Similar as above	Similar as above	Similar as above
4.	Silver Recovery	-	Silver metal	Solid
	(From photo-graphic paper processing)			
5.	Holding Tank (A)	Similar as above	Similar as above	Similar as above
	(from photographic paper processing)			

METAL WORKS – MAKING OF 45 GALLON DRUM (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.043

RAW MATERIALS

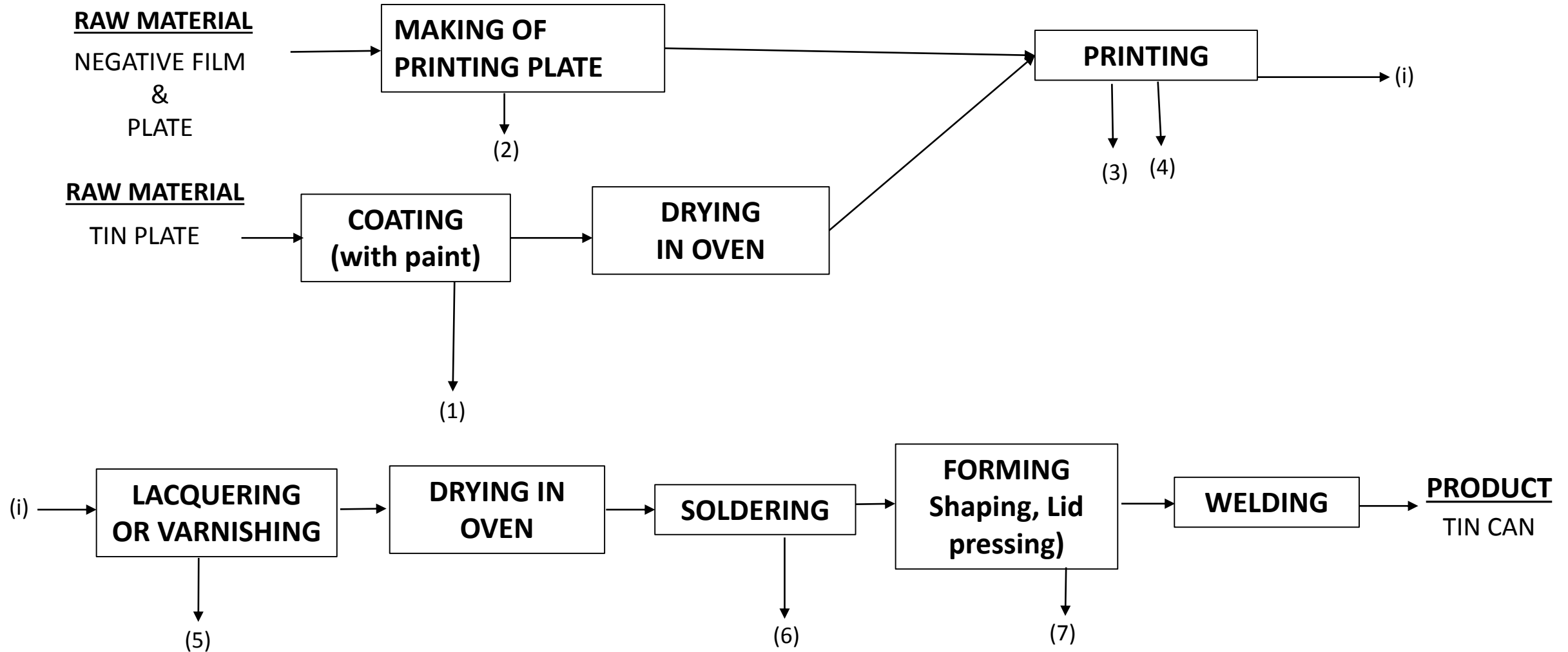


METAL WORKS – MAKING OF 45 GALLON DRUM (WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Degreasing	-	Solvent -1,1,1 TCE or Organic Precleaner – (Alkaline Degreaser)	Spent Solvent or Spent Alkaline Degreaser
2.	Rinsing	-	Aqueous Alkaline (if not using 1,1,1 TCE)	Liquid
3.	Phosphating		Aqueous Zinc Phosphate	
4.	Rinsing	-	Aqueous Zinc Phosphate	Liquid
5.	Internal Coating (Washing of Drum)	-	Lacquer & Thinner	Liquid
6.	External Coating/Painting (from Paint Spray Booth)		Paint Sludge (Water Based)	Semi-Solid

METAL WORKS - MANUFACTURING OF TIN CAN (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.044



METAL WORKS – MANUFACTURE OF TIN CAN
(WASTE DESCRIPTION)

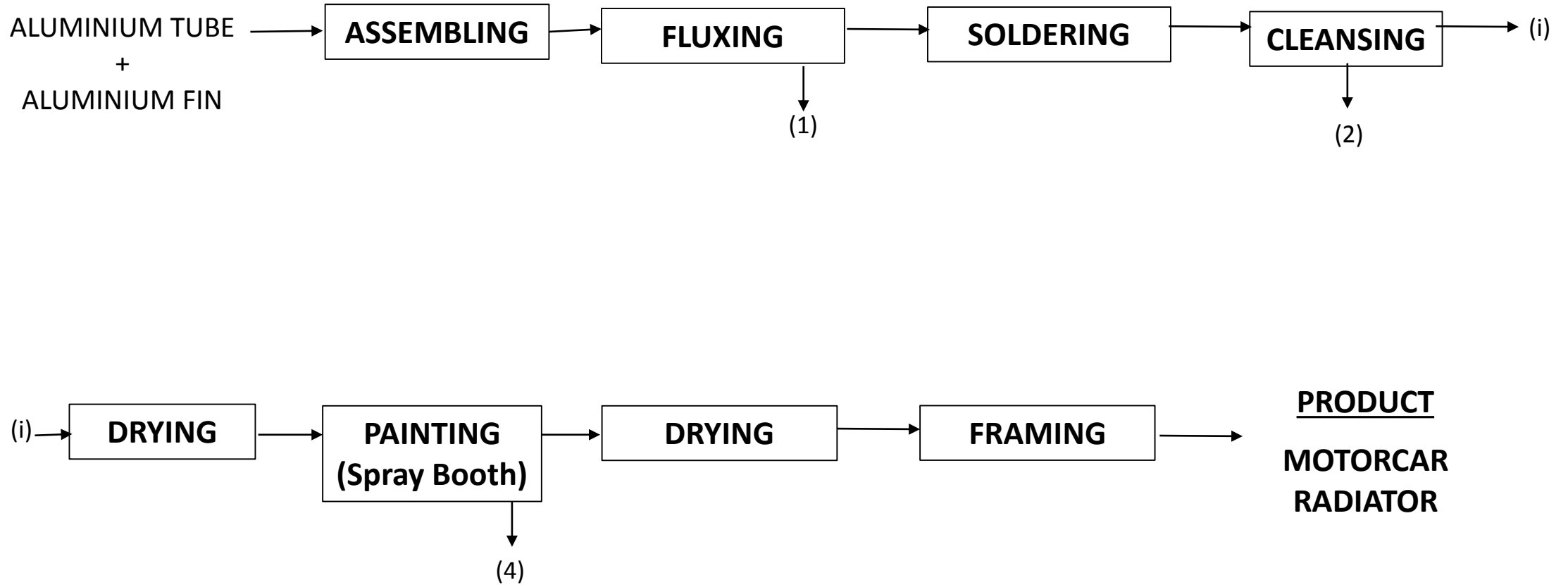
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Coating (cleaning of the coating machine)	-	Mixture of solvent (thinner) with white coating paint	Liquid
2.	Making of printing plate	-	Mixture of Aqueous photographic developer and ink	Liquid
3.	Printing (cleaning of machine)	-	Mixture of paint and solvent (thinner or white spirit)	Liquid
4.	Printing (cleaning of machine)	-	Cotton rags contaminated with solvent and paint	Solid
5.	Lacquering or varnishing	-	Mixture of spent or discarded varnishes or gold lacquer with white coat paint	Liquid

METAL WORKS
MOTORCAR RADIATOR
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.045

RAW MATERIALS

ALUMINIUM TUBE
+
ALUMINIUM FIN



METAL WORKS – MOTORCAR RADIATOR TIN CAN
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Fluxing	Zinc ammonium chloride	Zinc ammonium chloride	Liquid
2.	Cleansing (with HNO ₃ in a bath)	HNO ₃	Spent/aqueous HNO ₃	Liquid
3.	Painting (spray booth)	-	Paint sludge	Semi-solid

METAL WORKS – MAKING OF PEWTER (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.046

RAW MATERIALS

TIN INGOT +
ANTINOMY +
COPPER INGOT

**MELTING/CAS
TING**

**COOLING
(in a water
bath)**

**FILLING,
POLISHING
BUFFING**

(i)

(i)

DEGREASING

STAINING

**PROCESS OF
SLOW BUFFING**

SOLDERING

PRODUCT
PEWTER

(1)

(2)

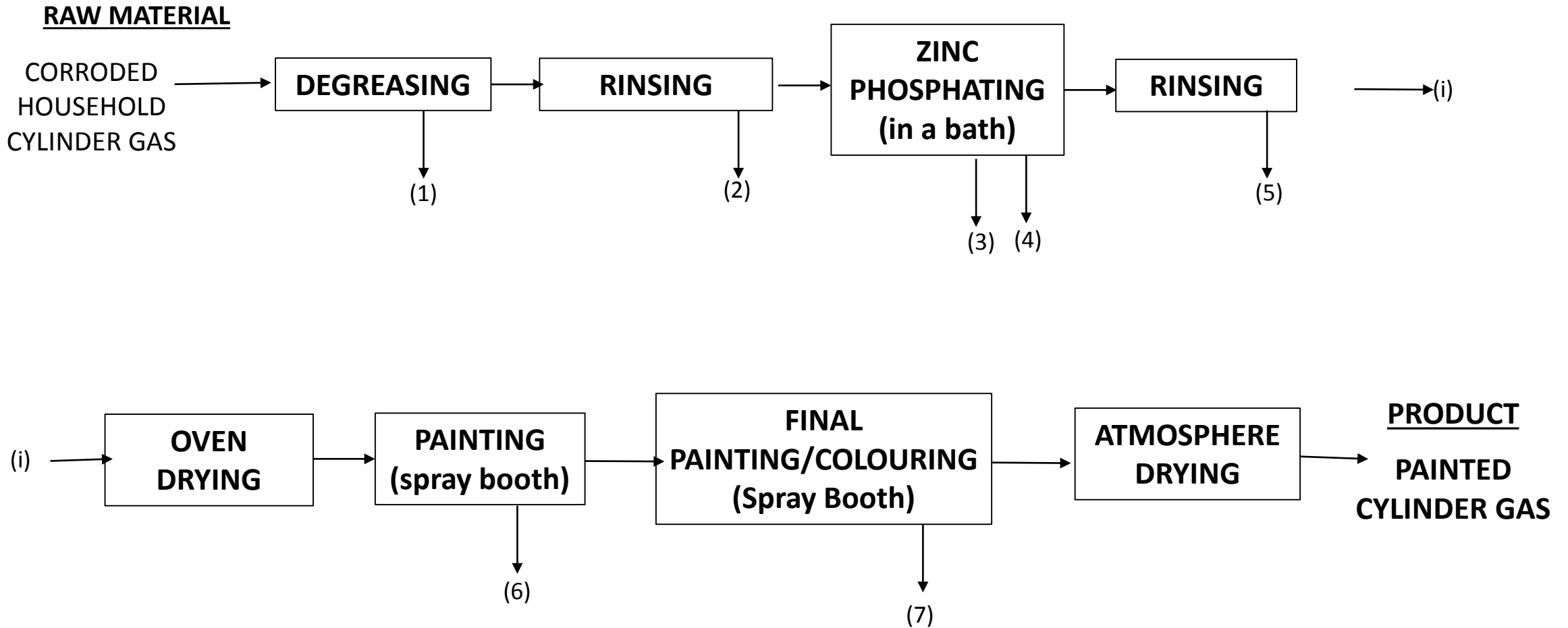
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METAL WORKS – MAKING OF PEWTER
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Degreasing	-	Sodium Hydroxide	Liquid
2.	Staining (to blacken the pewter)	-	Mixture of Nitric Acid & Copper Sulphate	Liquid
3.	Soldering	-	Mixture of Hydrochloro Acid & Glycerine	Semi-solid

METAL WORKS – RECYCLING OF GAS CYLINDER (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.047



METAL WORKS – RECYCLING OF GAS CYLINDER
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Degreasing	Alkaline degreaser	Alkaline waste	Liquid
2.	Rinsing	H ₂ O	Aqueous Alkaline waste	Liquid
3.	Zinc Phosphating	Zinc Phosphate	Spent zinc phosphate (occasionally)	Liquid
4.	Zinc Phosphating	-	Zinc Phosphate sludge	Semi-Solid
5.	Rinsing	H ₂ O	Aqueous zinc phosphate	Liquid
6.	Painting (spray booth)	-	Paint sludge	Semi-solid
7.	Painting (spray booth)	-	Paint sludge	Semi-solid

METAL WORKS – MAKING OF SEWING MACHINE (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.048

RAW MATERIALS

PIG IRON

**CASTING/
MOULDING**

**GRINDING/
DRILLING**

**PROCESS OF
ALIGNMENT**

**PROCESS OF
ALIGNMENT**

(i)

(i)

**PAINTING
(primer spray)**

**OVEN
BAKING**

**FILLING
WITH PUTTY**

SANDING

**PAINTING
(spray gun)**

(ii)

(1)

(2)

(3)

(ii)

**OVEN
BAKING**

SANDING

**APPLYING
VARNISH/GLUE**

CLEANSING

**PAINTING
(spray gun)**

**PRODUCT
SEWING
MACHINE**

(4)

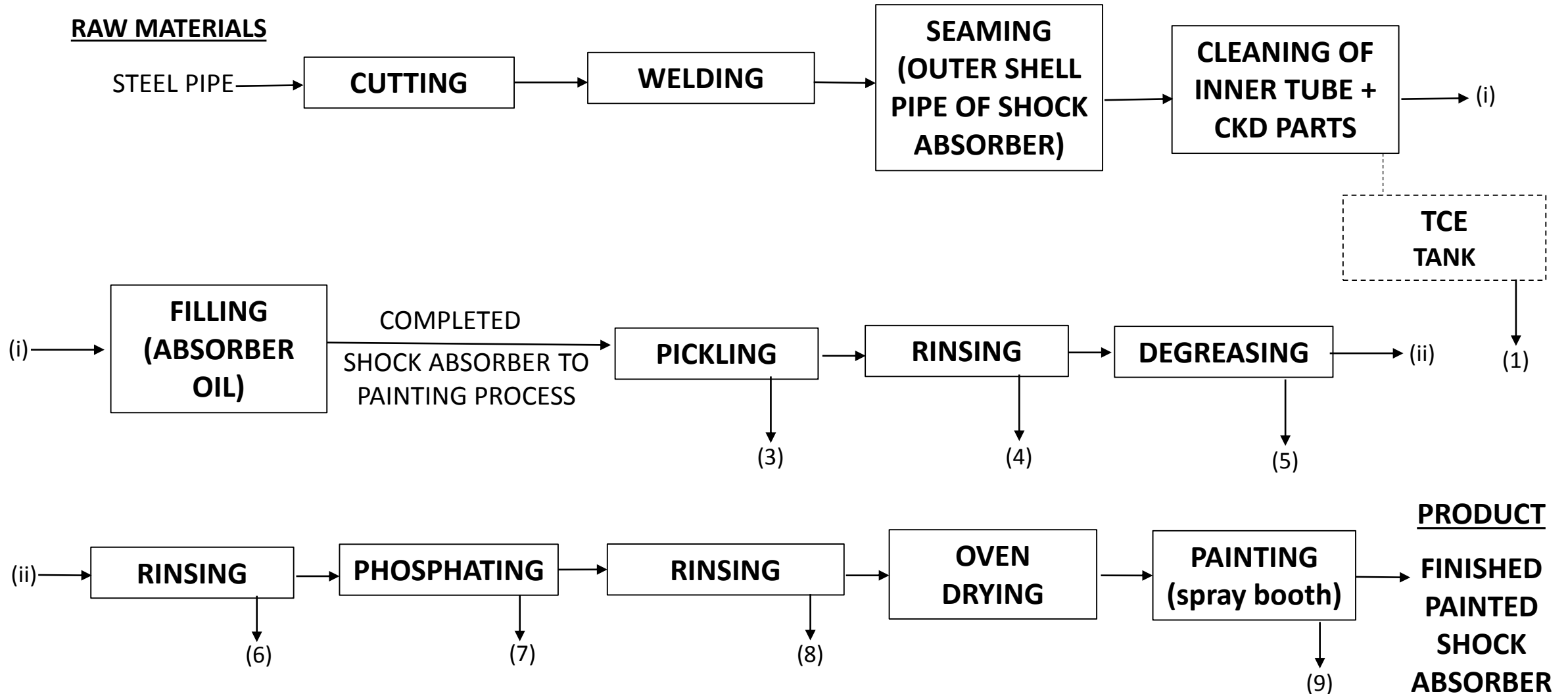
(5)

METAL WORKS – MAKING OF SEWING MACHINE
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Painting (Primer Paint)	-	Hardened Paint	Liquid
2.	Filling with putty	-	Nitrocellulose	Semi-solid
3.	Painting (Spray gun)	-	Hardened Paint	Solid
4.	Cleansing	-	Thinner mixed with water	Liquid
5.	Painting (Spray gun)	-	Hardened Paint	Solid

METAL WORKS – SHOCK ABSORBER
(PRODUCTION PROCESS DESCRIPTION)

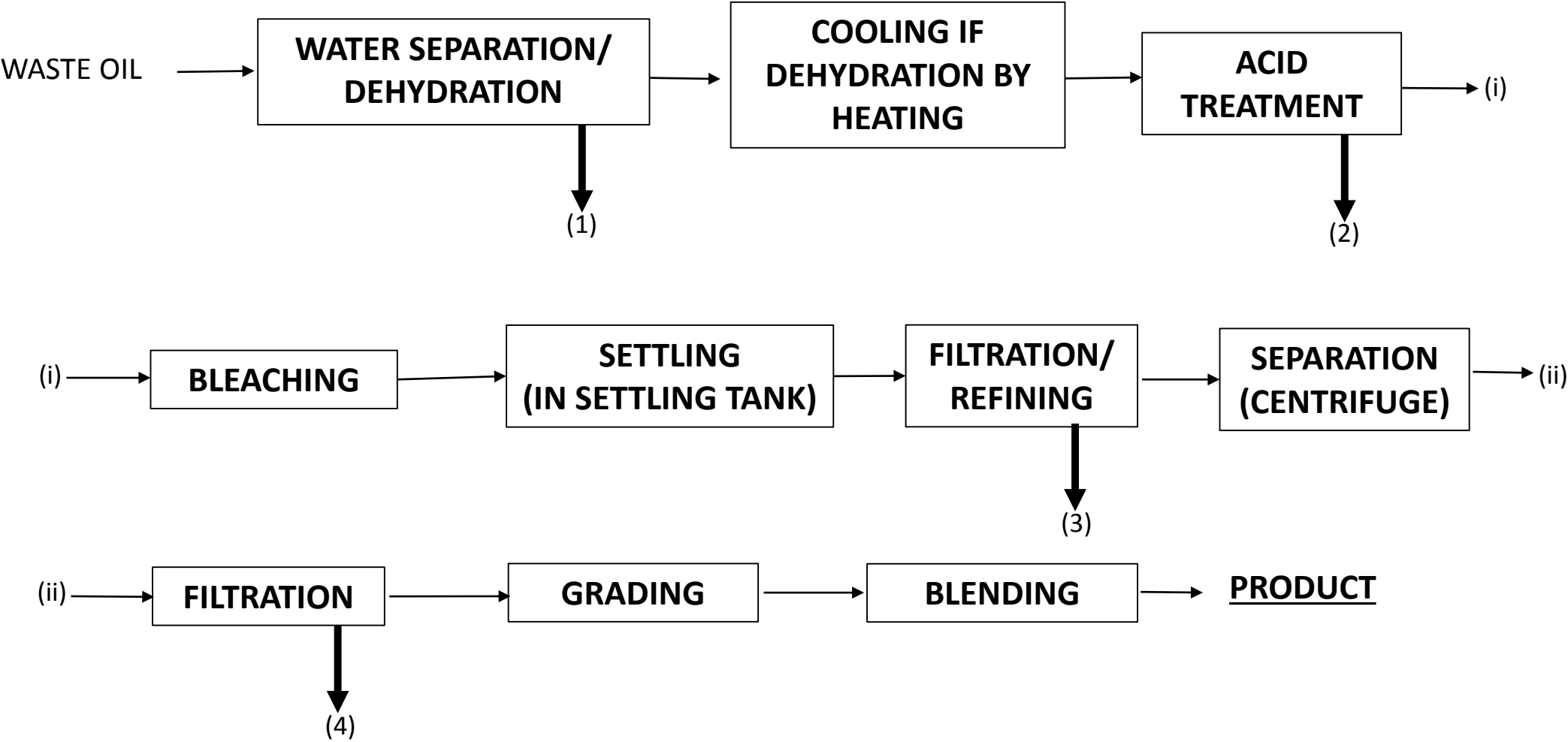
JAS/PNG/88/R.049



METAL WORKS – SHOCK ABSORBER
(WASTE DESCRIPTION)

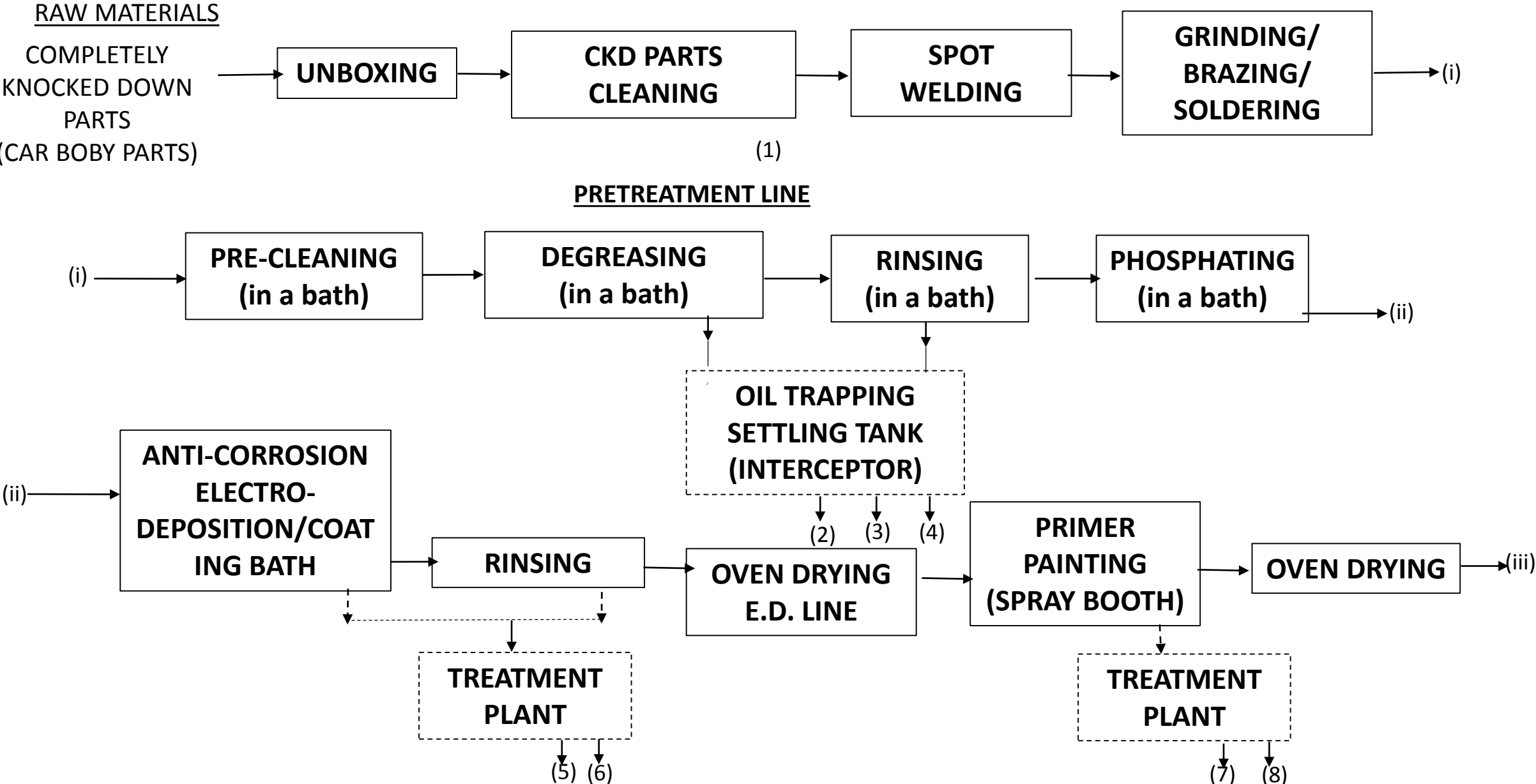
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Cleaning or Degreasing of Inner Tube + Completely knock down parts – TCE Tank	Solvent = Trichloro-ethylene (TCE)	TCE	Solvent- (Liquid) -Recycled-
2.	Cleaning or Degreasing of Inner Tube + Completely knock down parts – TCE Tank	Solvent = Trichloro-ethylene (TCE)	TCE Sludge	Sludge
3.	Pickling	Inorganic Acid such as HCL/H ₂ SO ₄	Acid	Liquid
4.	Rinsing	-	Aqueous Inorganic Acid	Liquid
5.	Degreasing	Alkaline Degreaser	Spent Alkaline Degreaser such Detergent	Liquid
6.	Rinsing	-	Aqueous Alkaline Degreaser	Liquid
7.	Phosphating	Zinc phosphate	Spent Zinc Phosphate	Liquid
8.	Paint Spray Booth	-	Paint Sludge	Sludge

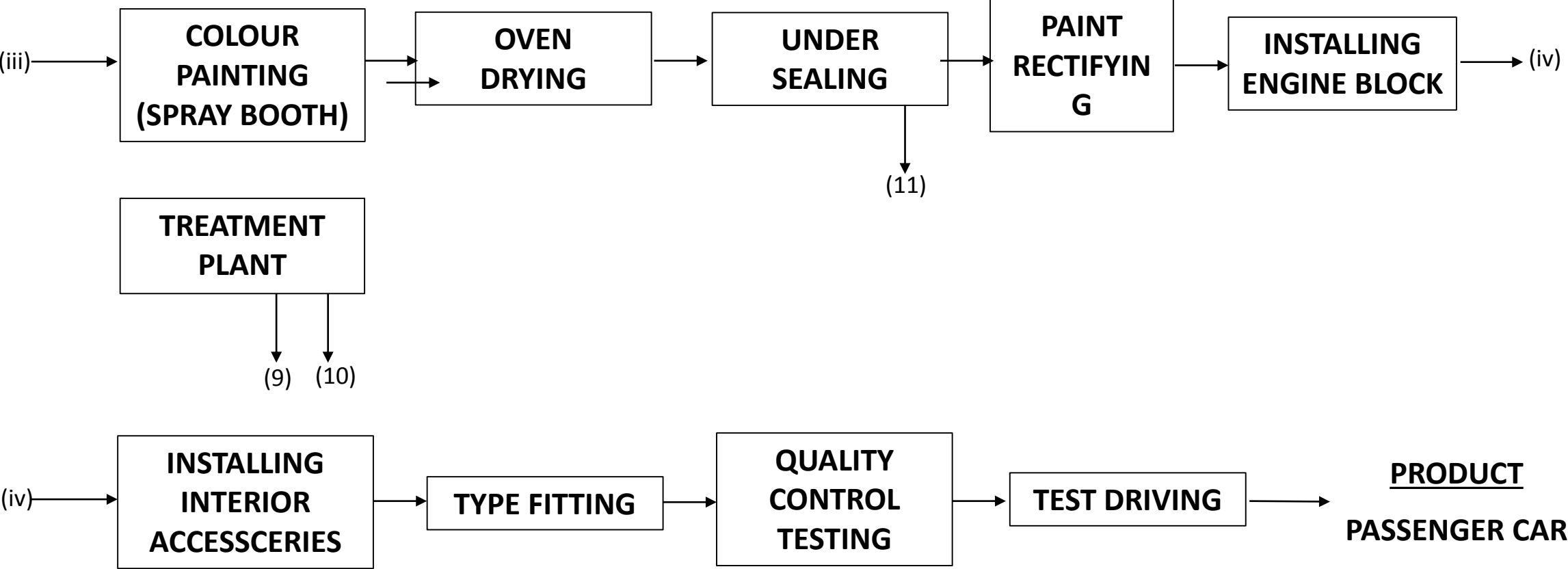
RECYCLING OF LUBRICATION OIL (WASTE OIL)
(PRODUCTION PROCESS DESCRIPTION)



PASSENGER CAR ASSEMBLY PLANT
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.051





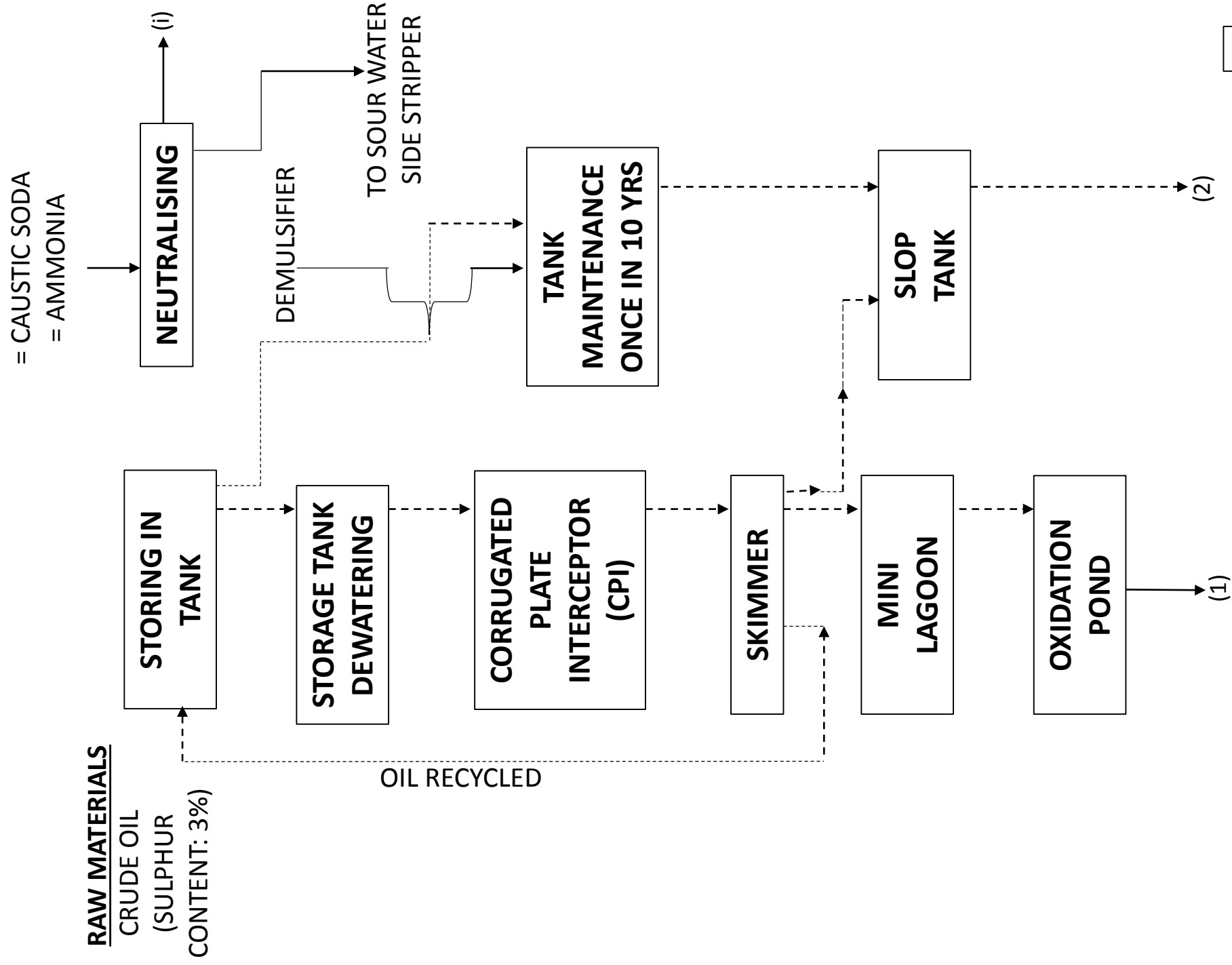
PASSENGER CAR ASSEMBLY PLANT
(WASTE DESCRIPTION)

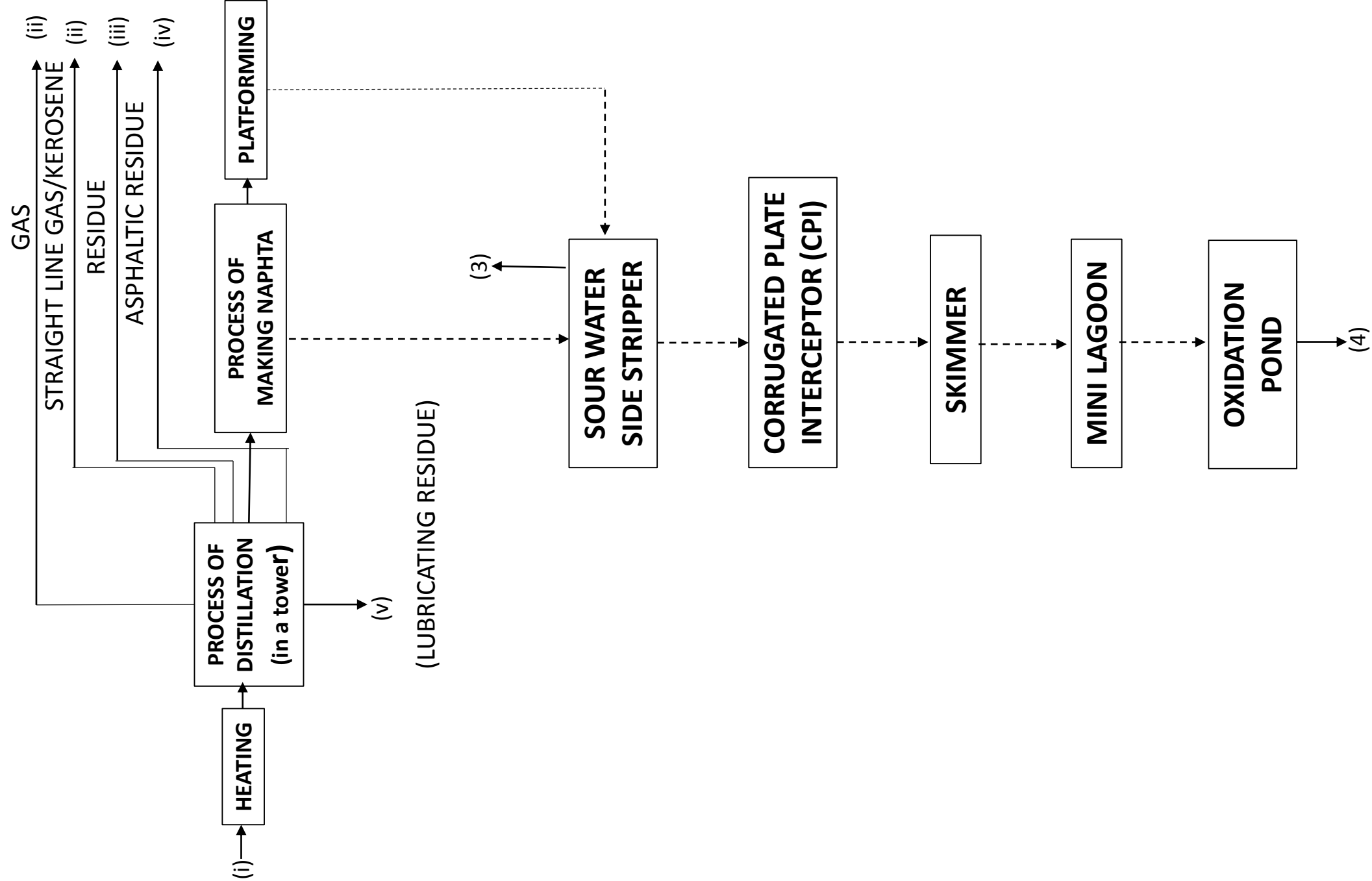
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	CKD cleaning	Kerosene or other solvent	Cotton Rags contaminated with kerosene or other solvent	Solid
2.	Oil trapping (interceptor)/ Settling tank – from process :- i) Pre cleaning ii) Degreasing iii) Rinsing	-	Oily waste	Liquid
3.	Oil trapping (inter captor)/settling tank from process :- i) Pre cleaning ii) Degreasing iii) Rinsing	Alkaline Degreaser	Alkaline waste (Aqueous)	Liquid
4.	Oil trapping (inter captor)/ Settling tank from process :- i) Phosphating	Zinc phosphate	Zinc phosphate sludge	Semi-solid
5.	TREATMENT PLANT for :-	Poly Aluminium	PAINT	Semi-solid

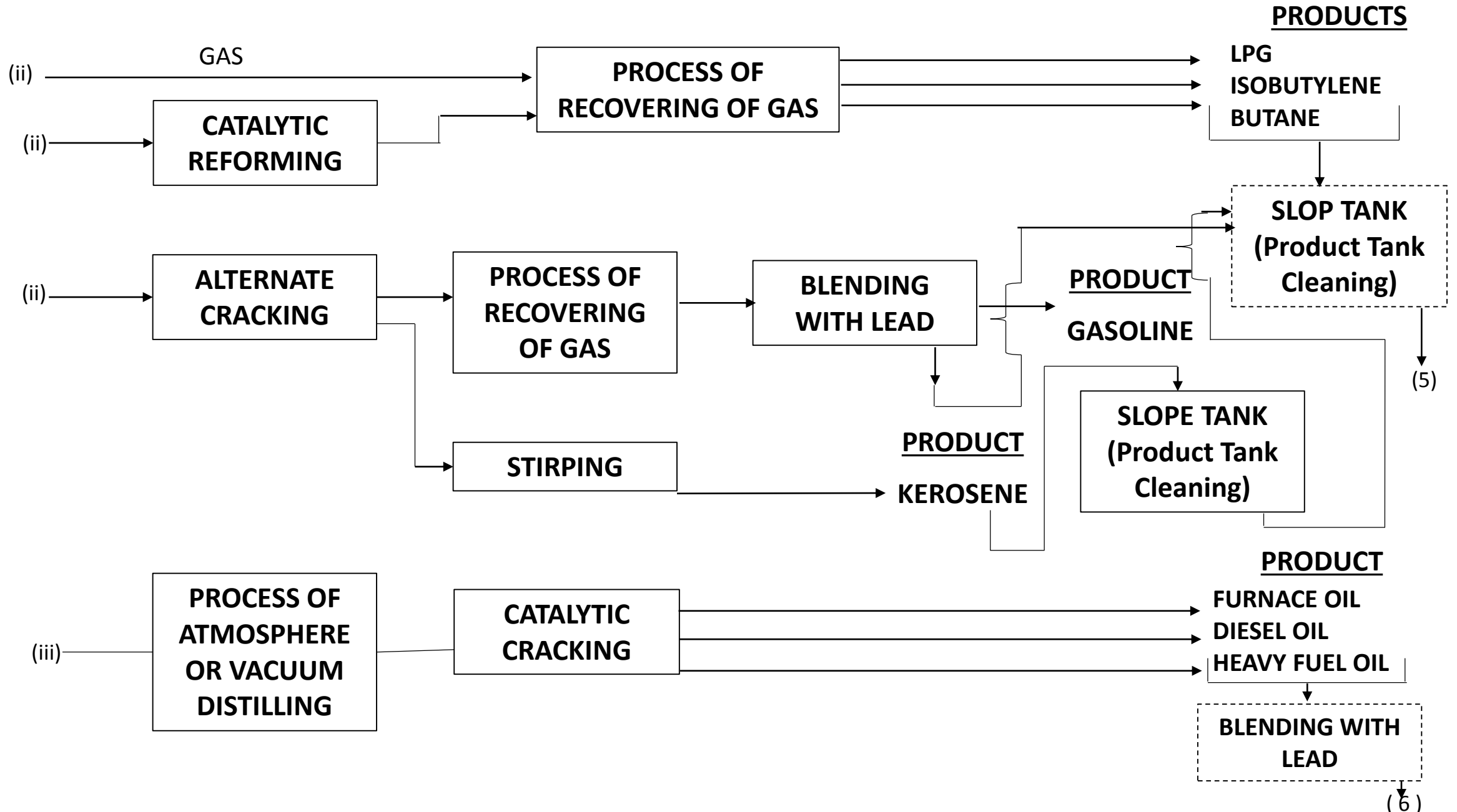
PASSENGER CAR ASSEMBLY PLANT
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
6.	- do -	-	E.D. Waste Water (Mixed with paint)	Liquid
7.	Treatment Plant for :- i) Primer Painting ii) Colour Painting	Poly Aluminium Sulphate	Paint Sludge (Water based sludge)	Semi-Solid
8.	- do -	-	Waste Water Effluent	Liquid
9.	Treatment Plant Colour Painting	-	Paint Sludge	Semi-Solid
10.	Treatment Plant (Colour painting)	-	Waste Water	Liquid
11.	Underseal	-	Tar, (bituminous) Anti-corrosion substances (negligible)	Semi-Solid

OIL REFINERY
(PRODUCTION PROCESS DESCRIPTION)

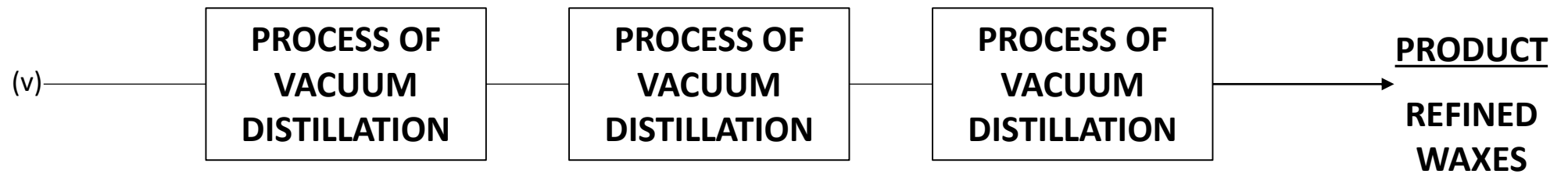
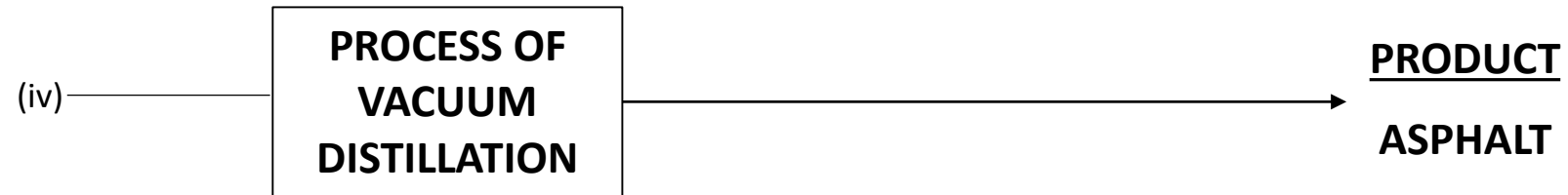






PAPER CARTON/BOXES
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.052



OIL REFINERY
(WASTE DESCRIPTION)

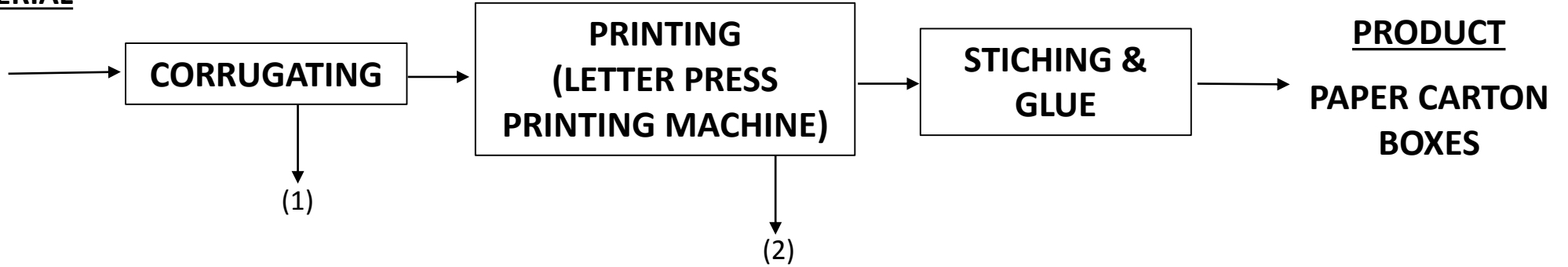
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Oxidation Pond	-	Oil Sludge	Semi-Solid
2.	Slop Tank i) Tank Maintenance Once In 10yrs ii) From Skimmer	-	Oily Sludge	Semi-Solid
3.	Sour Water Side Stripper (Waste From Neutralising Oil with Caustic Soda Or Ammonia)	-	Hydrogen Sulphite	Gas
4.	Oxidation Pond (Same Pond As Waste Ref: No. 1)	-	Oily Sludge	Semi-Solid
5.	Slop Tank (Product Tank Cleaning) or Tank Maintenance	-	Oily Sludge	Semi-Solid
6.	do (Same Tank)	-	Oily Sludge	Semi-Solid

PAPER CARTON/BOXES
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.053

RAW MATERIAL

PAPER
CARTON

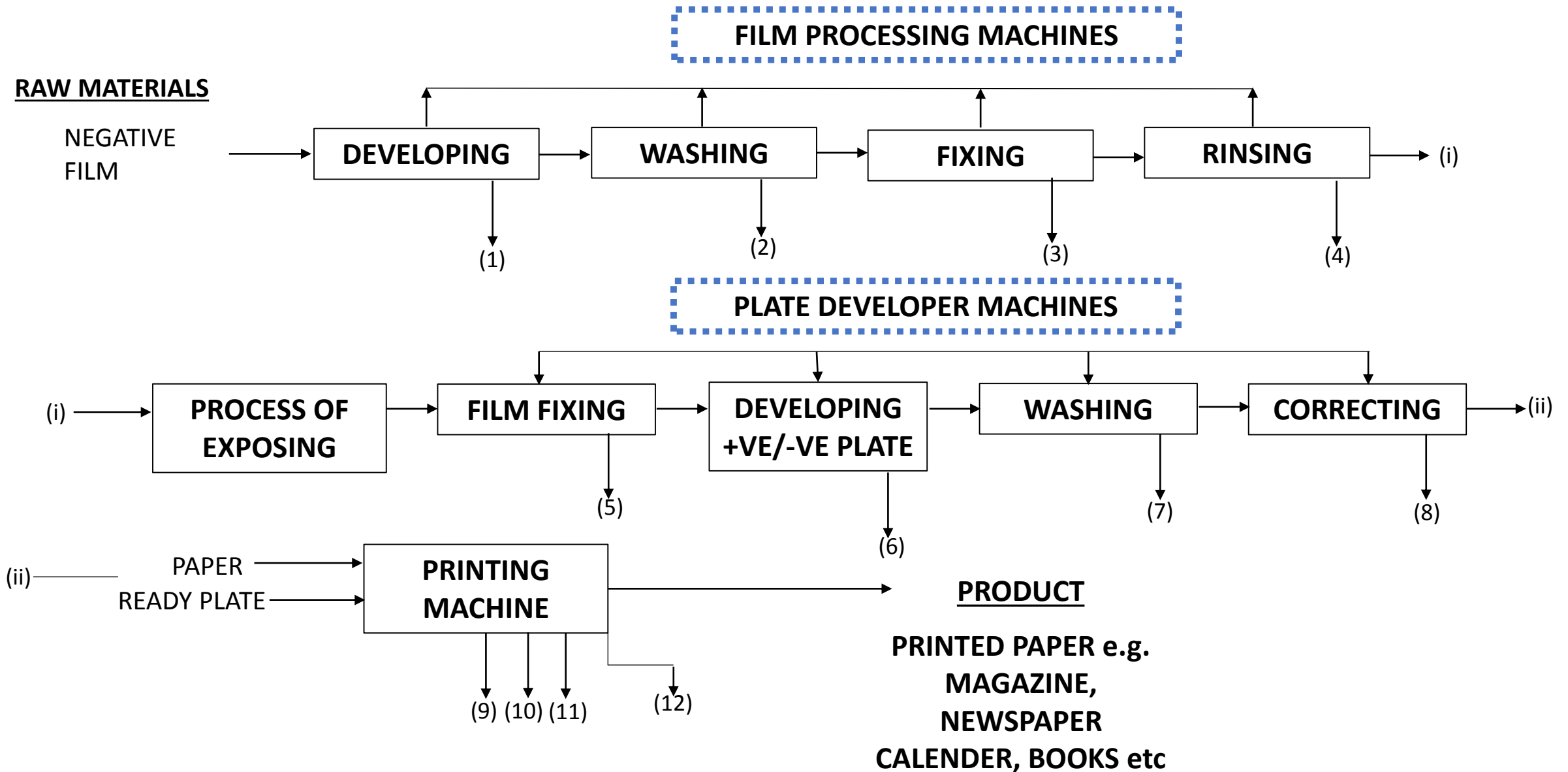


PAPER CARTON/BOXES
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Corrugating	-	Lubrication oil & grease	Liquid
2.	Printing (Cleaning of letter press printing machine)	-	Mixture of ink and water	Liquid

PAPER PRINTING WORKS
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.054



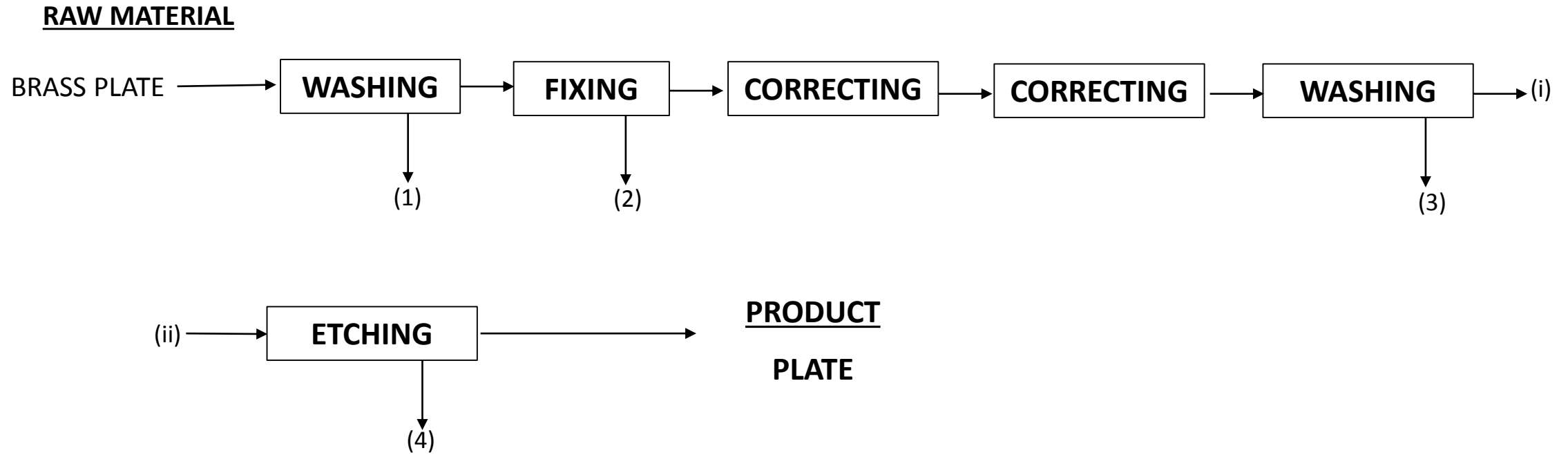
PAPER PRINTING WORKS
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Developing	Developer	Spent Developer	Liquid
2.	Washing	Water	Aqueous Developer	Liquid
3.	Fixing	Fixer	Spent Fixer	Liquid
4.	Rinsing	Water	Aqueous Fixer	Liquid
5.	Film Fixing	Fixer	Spent Fixer	Liquid
6.	Developing +ve/-ve Plate (Plate Washing)	Developer	Aqueous Developer	Liquid
7.	Washing (Plate Washing)	Water	Spent Zinc Phosphate	Liquid
8.	Correcting (Plate Washing With Correction Fluid)	Correction Fluid	Aqueous Correction Fluid	Liquid

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
9.	Printing Machine From Process :- <ul style="list-style-type: none"> - Dampening - Washing of Cotton Roller Printing Machine - Cleaning of Off-Set Type Printing Machine 	Fountain Solution Water White Spirit	Aqueous Fountain Solution Ink Mied Water Ink Mixed With Solvent	Liquid Liquid Liquid

PAPER PRINTING WORKS, PLATE MAKING
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.055

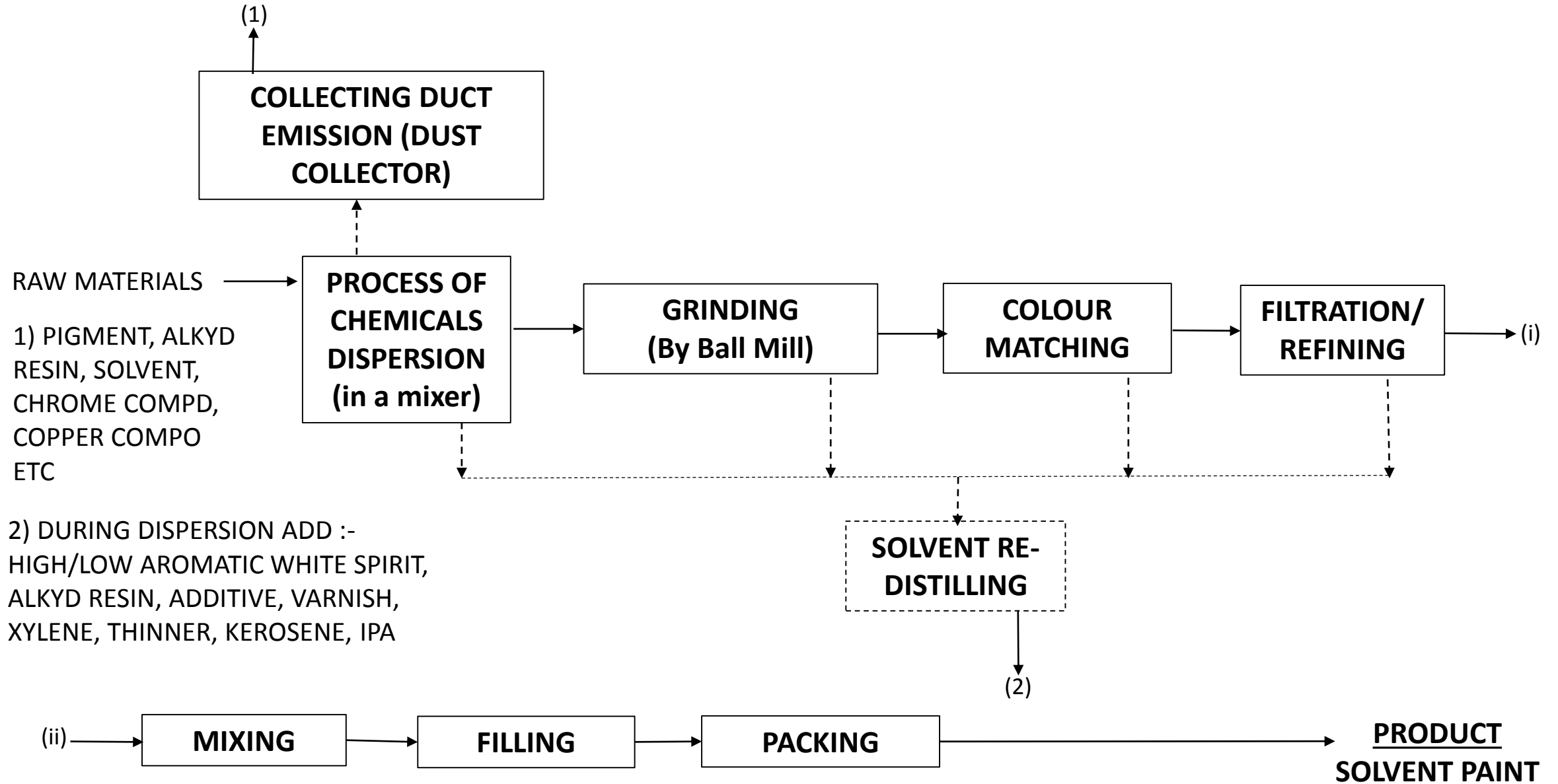


PAPER PRINTING – PLATE MAKING WORK
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Washing	-	Water Plus Brass Particulate	Liquid/Solid
2.	Fixing	-	Spent Fixer	Liquid
3.	Washing	-	Aqueous Fixing Chemicals	Liquid
4.	Etching	Ferric Chloride	Spent Ferric Chloride	Liquid

PAINT FACTORY – SOLVENT PAINT
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.056



PAINT FACTORY – SOLVENT PAINT
(WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Collecting Dust Emission (Dust Collector)	-	Pigment Dust	Dust
2.	Solvent Distilling (from process):- - Process of Chemical Dispersion (Cleaning of mixer) - Grinding (Cleaning the drum) - Colour matching (Cleaning the drum)	- Solvent (eg. Spirit) Solvent (eg. Spirit)	i) Solvent mixed with paint ii) Solvent paint sludge	Liquid Semi-solid

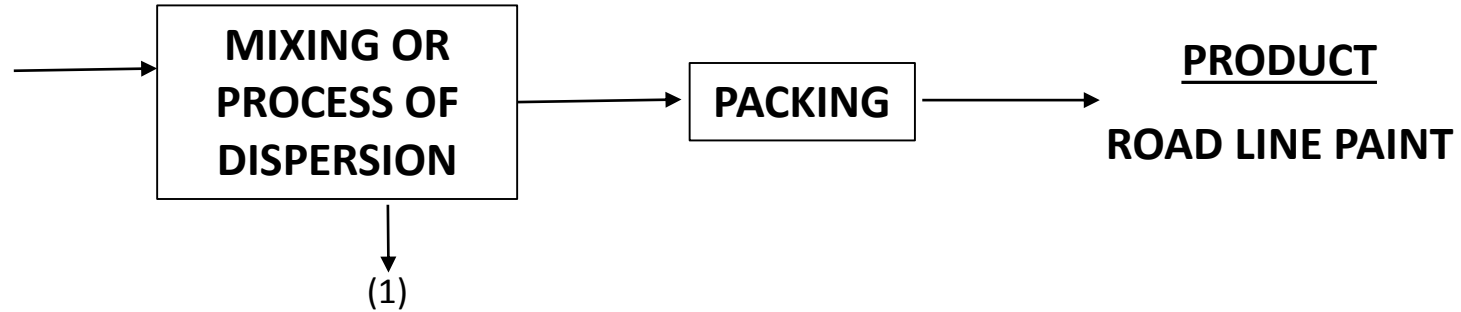
PAINT FACTORY – SOLVENT PAINT
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.057

(A) MAKING OF VARNISH

RAW MATERIALS

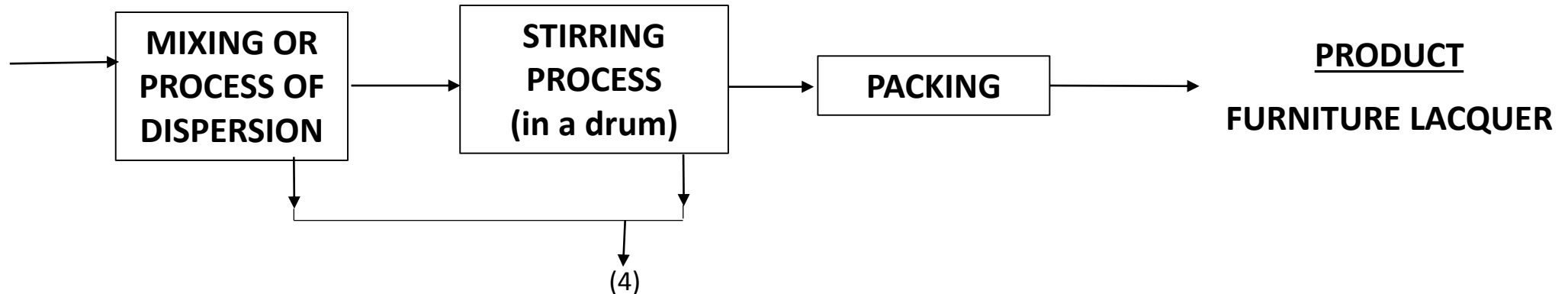
RESIN
VARNISH
DRYER
XYLENE
THINNER



(B) MAKING OF FURNITURE LACQUER

RAW MATERIALS

ALKYD RESIN
NITROCELLULOS
E THINNER

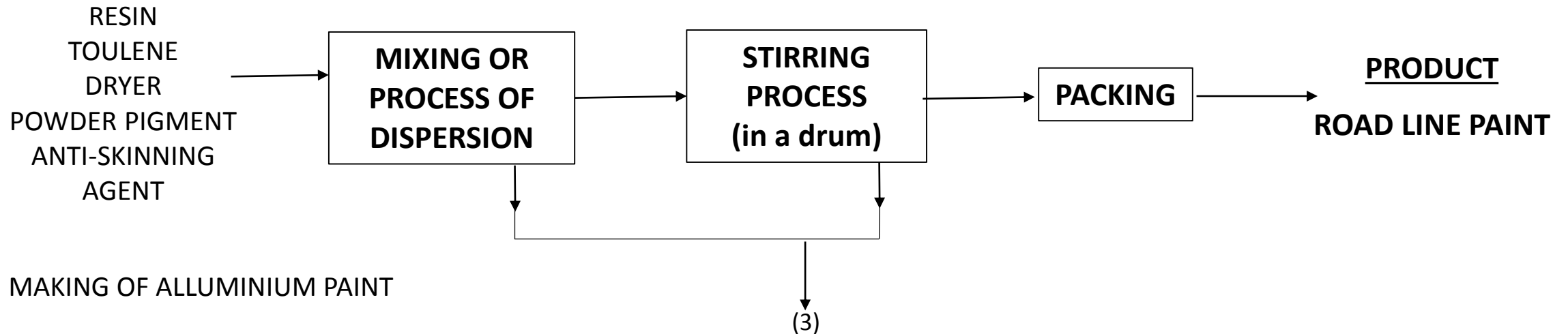


PAINT FACTORY – SOLVENT PAINT
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.057

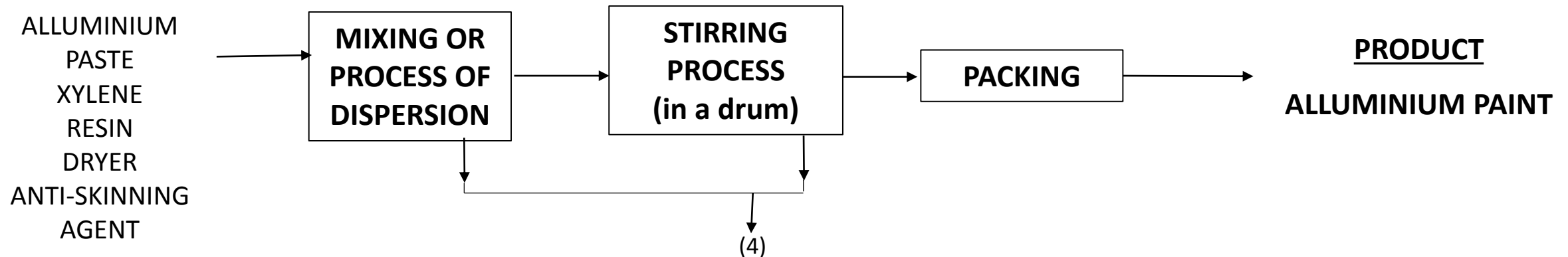
(C) MAKING OF ROAD LINE PAINT

RAW MATERIALS



(D) MAKING OF ALLUMINIUM PAINT

RAW MATERIALS



PAINT FACTORY – SOLVENT PAINT

MAKING OF: (A) VARNISH

(B) FURNITURE LACQUER

(C) ROAD LINE PAINT

(D) ALLUMINIUM PAINT

(WASTE DESCRIPTION)

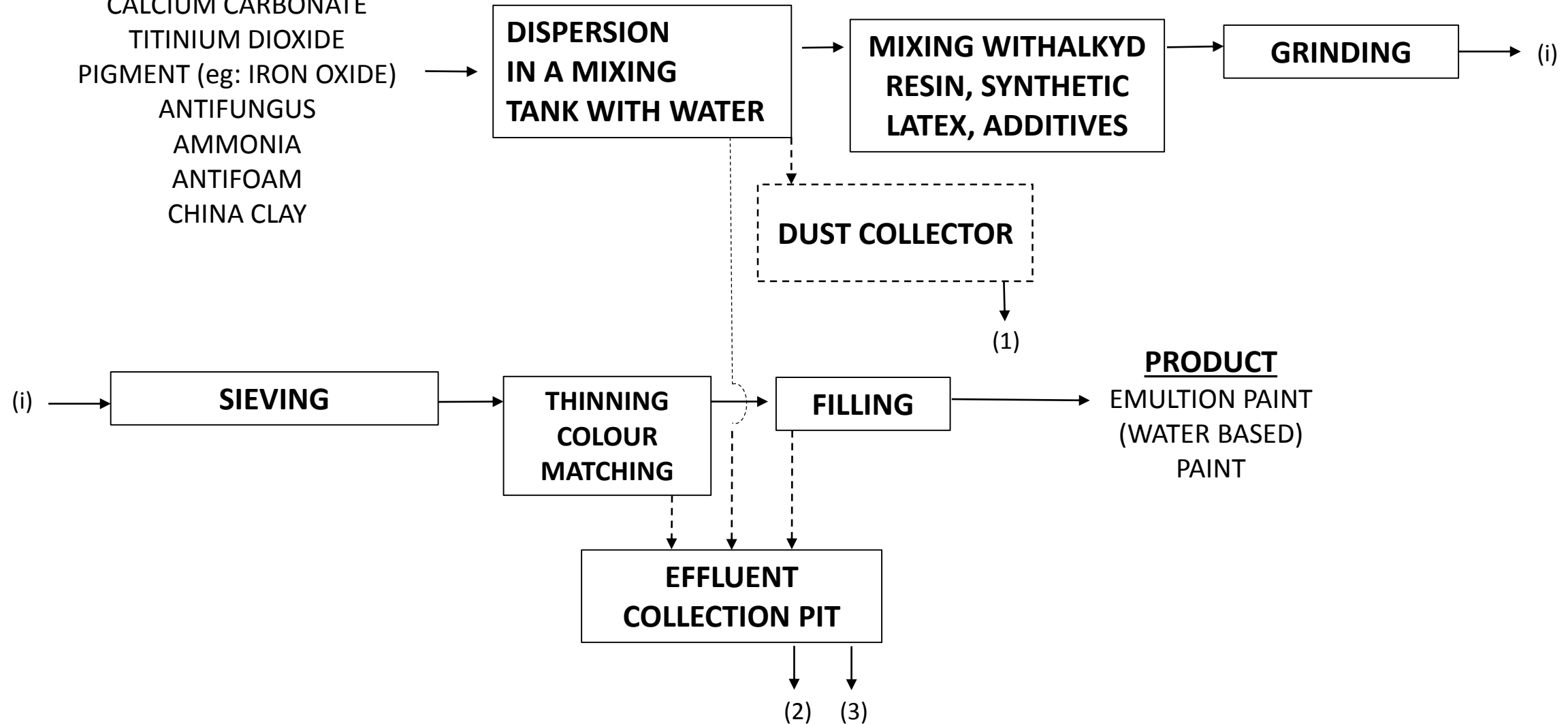
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Mixing or process of dispersion	-	Mixture of solvent (eg. Kerosene) and paint	Liquid
2.	Mixing or process of dispersion/ Stirring process (in a drum)	-	Mixture of solvent (eg. Kerosene) and paint	Liquid
3.	Mixing or process of dispersion/ Stirring process (in a drum)	-	Mixture of solvent (eg. Kerosene) and paint	Liquid
4.	Mixing or process of dispersion/ Stirring process (in a drum)	-	Mixture of solvent (eg. Kerosene) and paint	Liquid

PAINT FACTORY – EMULSION PAINT (WATER BASED PLANT)
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.058

RAW MATERIALS

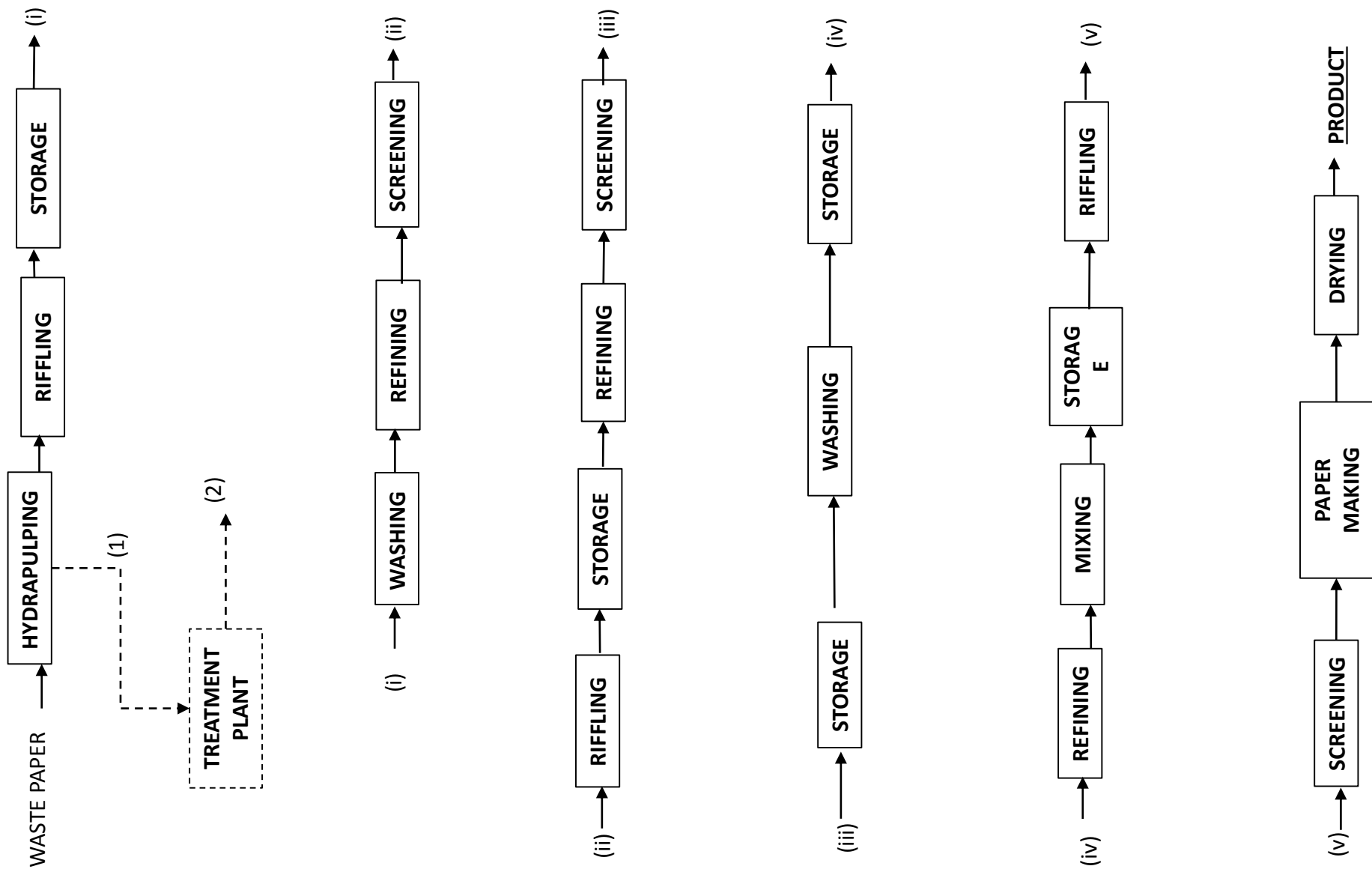
Talc Powder
CALCIUM CARBONATE
TITINIUM DIOXIDE
PIGMENT (eg: IRON OXIDE)
ANTIFUNGUS
AMMONIA
ANTIFOAM
CHINA CLAY



PAINT FACTORY – EMULSION PAINT (WATER BASED PLANT)
(PRODUCTION PROCESS DESCRIPTION)

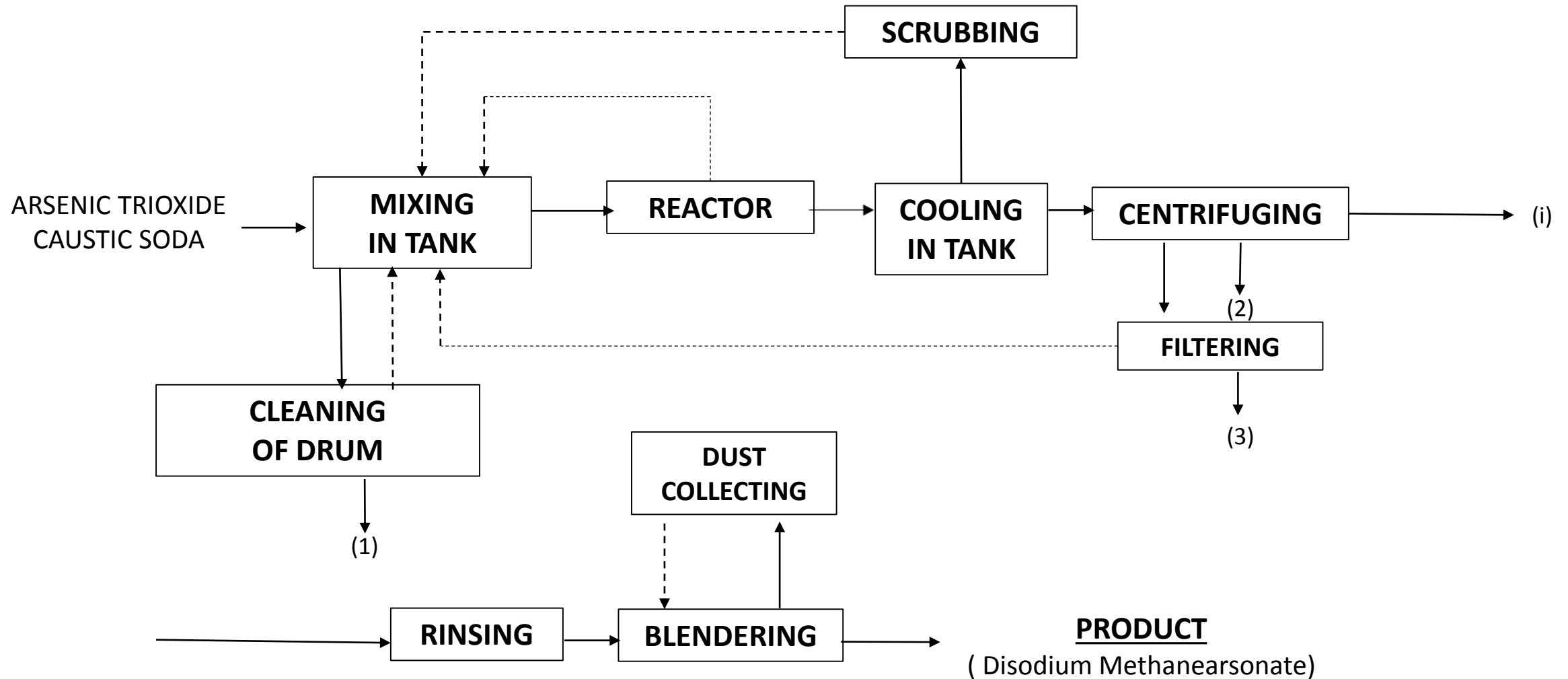
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Dust Collector at Dispersion/ Mixing Tank	-	Pigment Dust	Dust
2.	Effluent Collection Pit/ Effluent From Mixing Tank Cleaning, Spillage, Filling Tank Spillage	-	Water Based Paint Effluent	Liquid
3.	Effluent Collection Pit	-	Water Based Paint Effluent	Semi - Solid

PAPER MILL
(PRODUCTION PROCESS DESCRIPTION)



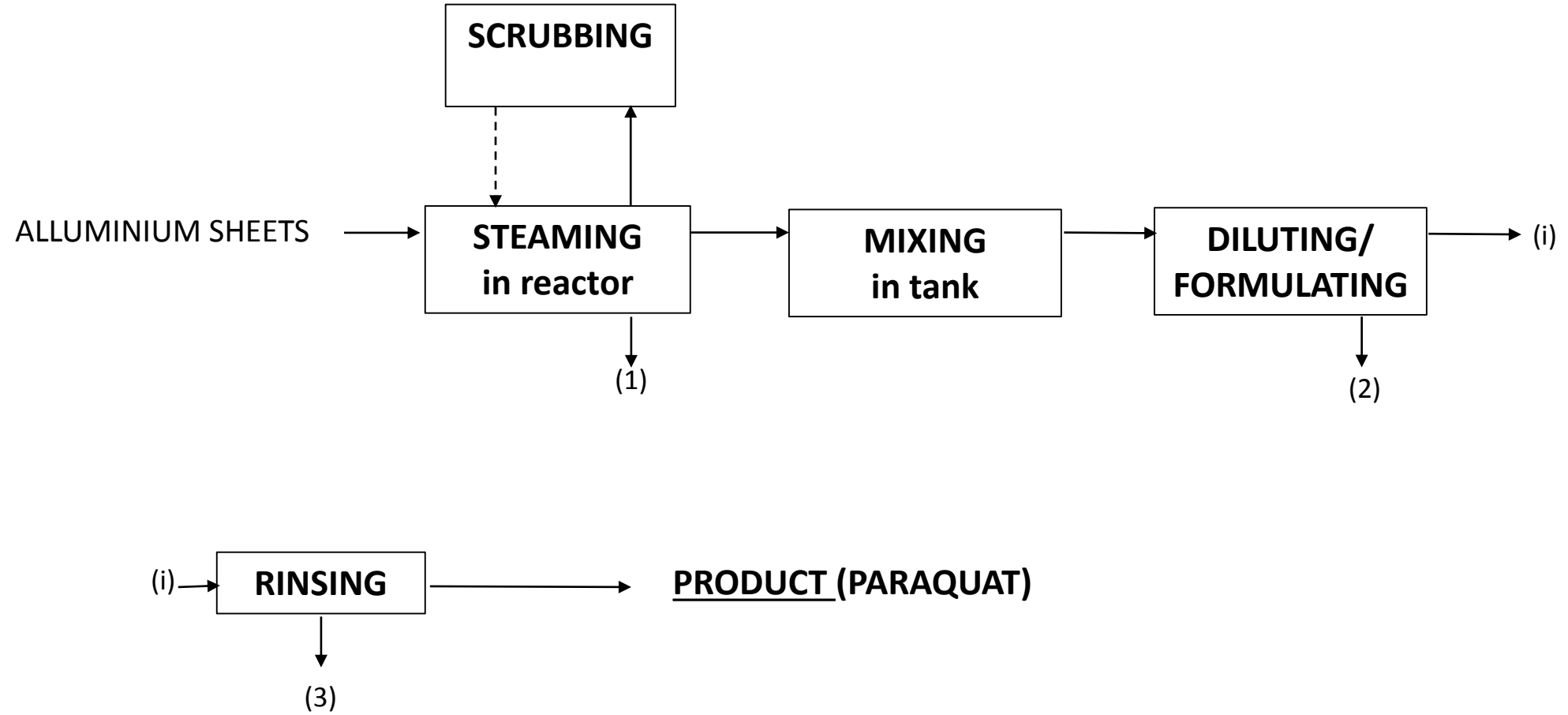
PESTICIDE FORMULATION - DSMA
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.060

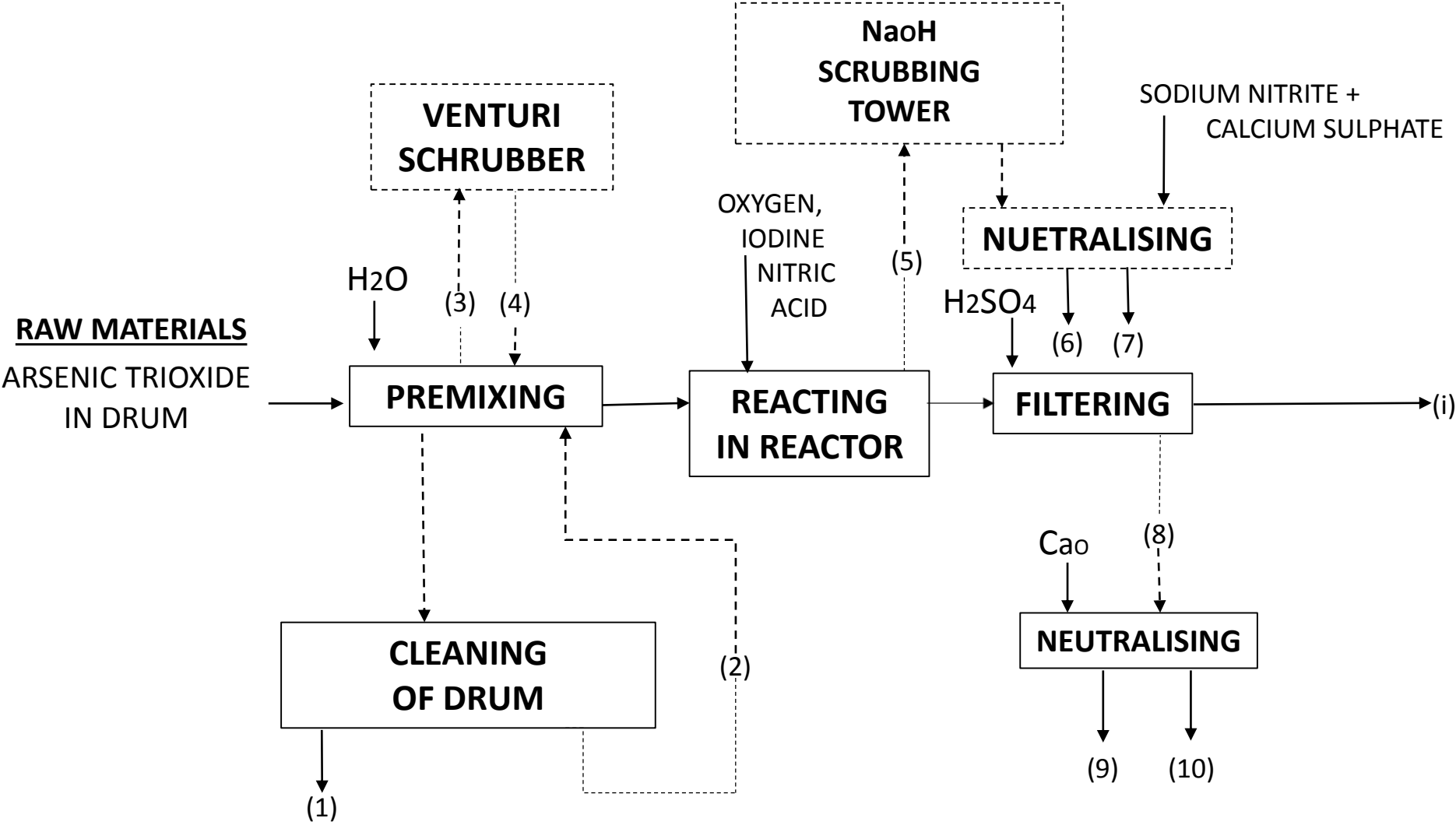


PESTICIDE FORMULATION - PARAQUAT (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.061



PESTICIDE – WOOD PRESERVATIVE (COPPER CHROME ARSENATE)
(PRODUCTION PROCESS DESCRIPTION)



COPPER SULPHATE/ SODIUM BICHROMATE

(i)→

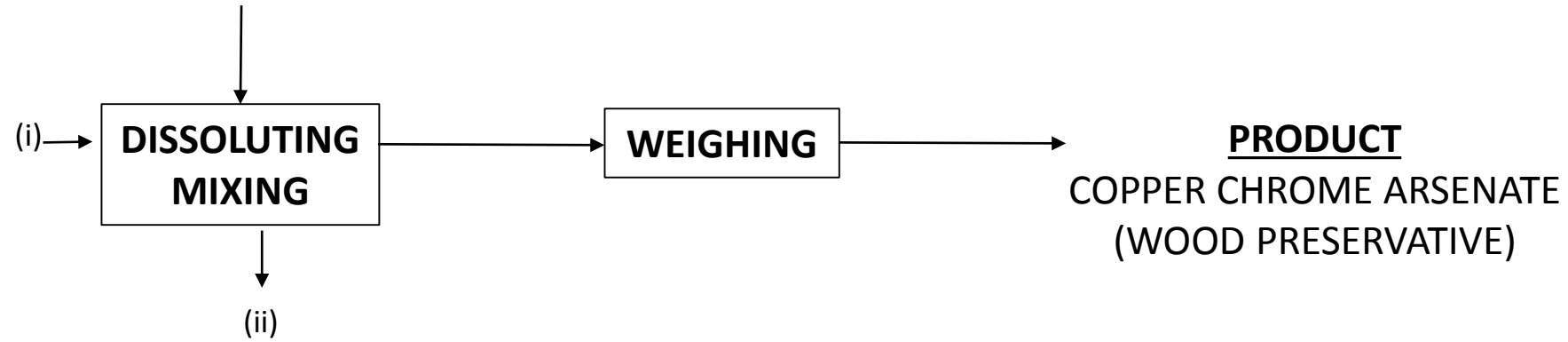
**DISSOLUTING
MIXING**

(ii)

WEIGHING

PRODUCT

COPPER CHROME ARSENATE
(WOOD PRESERVATIVE)

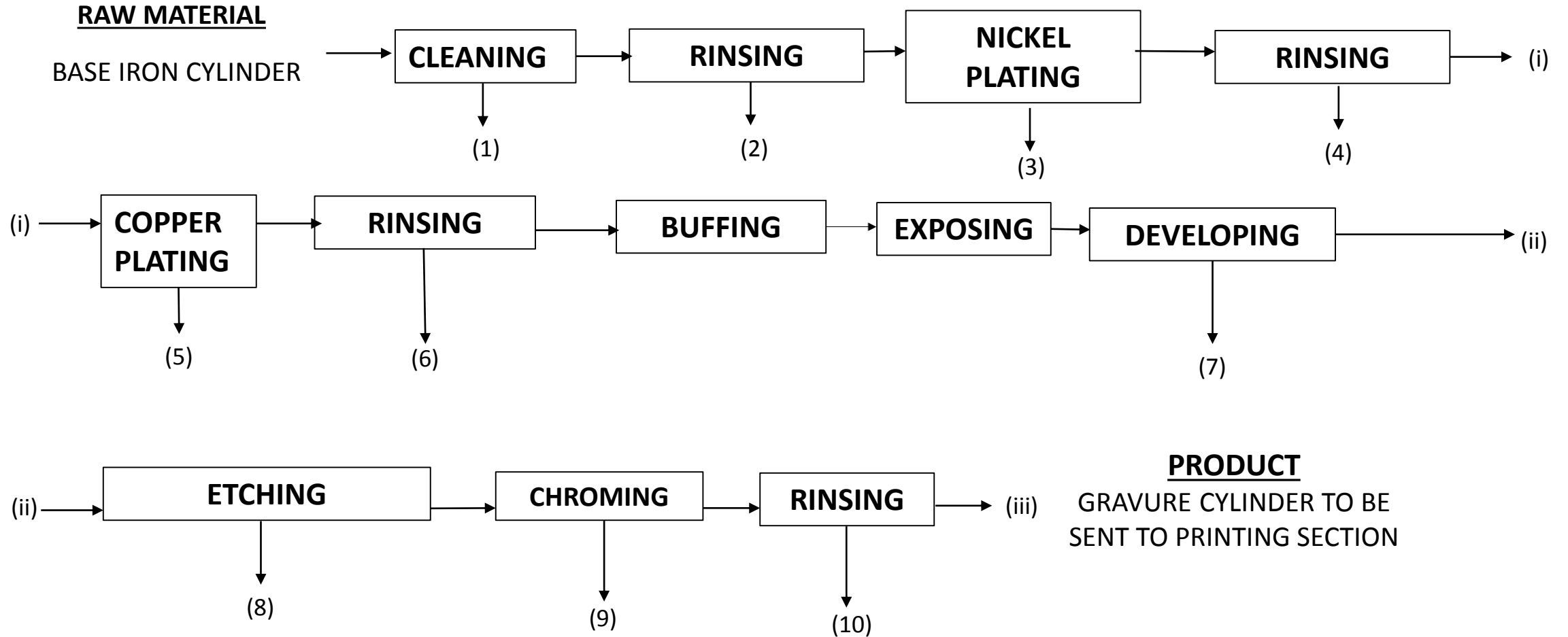


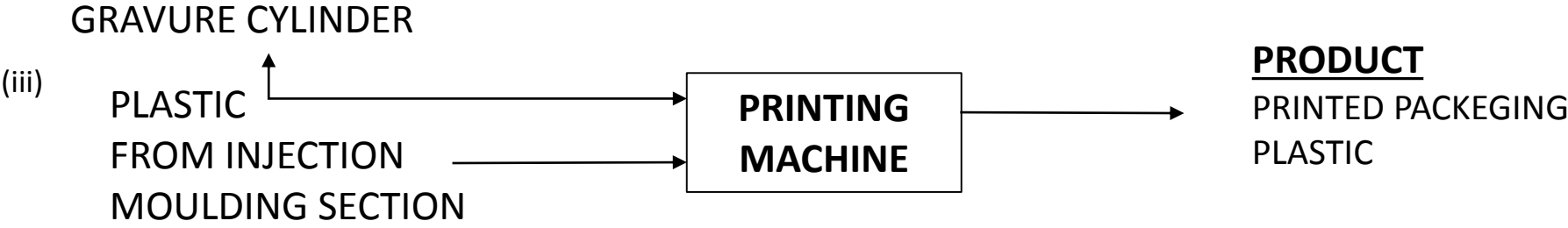
PESTICIDE – WOOD PRESERVATIVE (COOPER CHROME ARSENATE) (WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Cleaning of Drum	H ₂ O	Crushed drum (buried)	Solid
2.	Cleaning of Drum	H ₂ O	Waste Water (recycled)	Liquid
3.	Venturi Schrubber	NaOH	Arsenic trioxide dust	Dust
4.	Venturi Schrubber	NaOH	Arsenic Sludge/ Effluent	Semi-Solid Liquid
5.	Reacting in a Reactor (NaOH Scrubbing Tower)	-	Nox + air	Air
6.	Neutralizing	Acid	Calcium Arsenate Nitrite Sludge	Semi-Solid
7.	Neutralizing	Acid	Effluent (Neutralised)	Liquid
8.	Filtering	-	Effluent/ Sludge	Liquid/ Semi-Solid
9.	Neutralizing	CaO	Calcium Arsenic	Semi-Solid
10.	Neutralizing	CaO	Neutralised Effluent	Liquid
11.	Dissolving/ Mixing	-	Effluent	Liquid

PLASTIC & PRINTING WORKS – GRAVURE MAKING
(PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.063





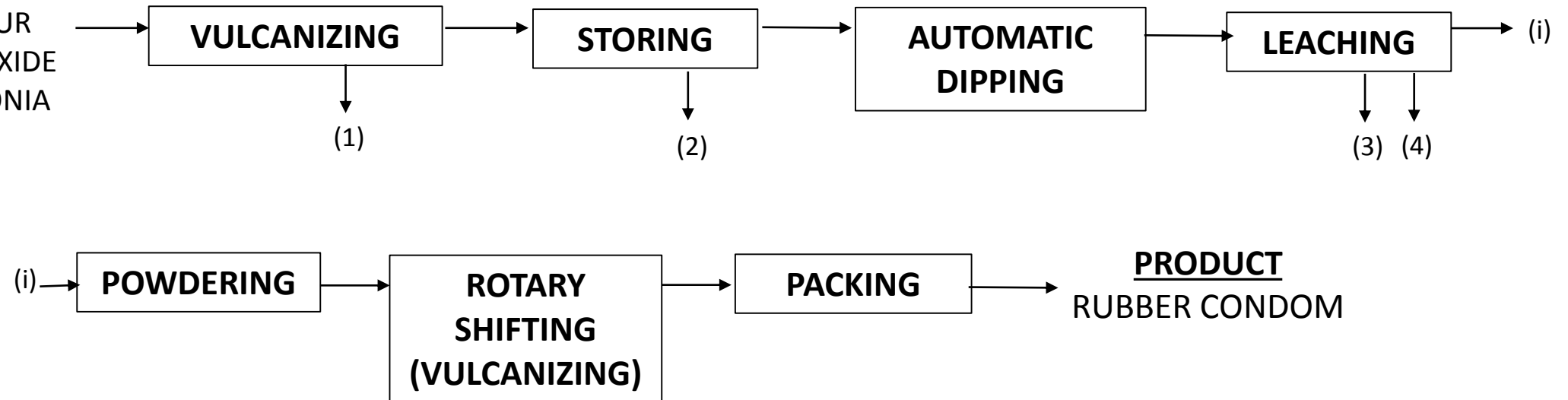
PLASTIC & PRINTING WORKS – GRAVURE MAKING (WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Cleaning	Sulphuric Acid	4% Sulphuric Acid	Liquid
2.	Rinsing	Water	Aqueous Sulphuric Acid	Liquid
3.	Nickel Plating	Boric Acid, Nickel Sulphate, Nickel Chloride	Spent Plating Waste	Liquid
4.	Rinsing	Water	Aqueous Nickel Plating Waste	Liquid
5.	Copper Plating	Sodium Cyanide	Spent copper plating (Alkaline Waste)	Liquid
6.	Rinsing	Water	Spent copper plating (Alkaline Waste)	Liquid
7.	Developing	-	Alkaline Waste Containing Developer	Liquid
8.	Etching	Ferric Chloride	Alkaline Waste Containing Ferric Chloride	Liquid
9.	Chroming	Chromic Acid	Spent Chromic Acid	Liquid
10.	Rinsing	Water	Aqueous Chromic Acid	Liquid

RUBBER PRODUCT
RUBBER CONDOM
(PRODUCTION PROCESS DESCRIPTION)

RAW MATERIAL

- LATEX
- SULPHUR
- ZINC OXIDE
- AMMONIA

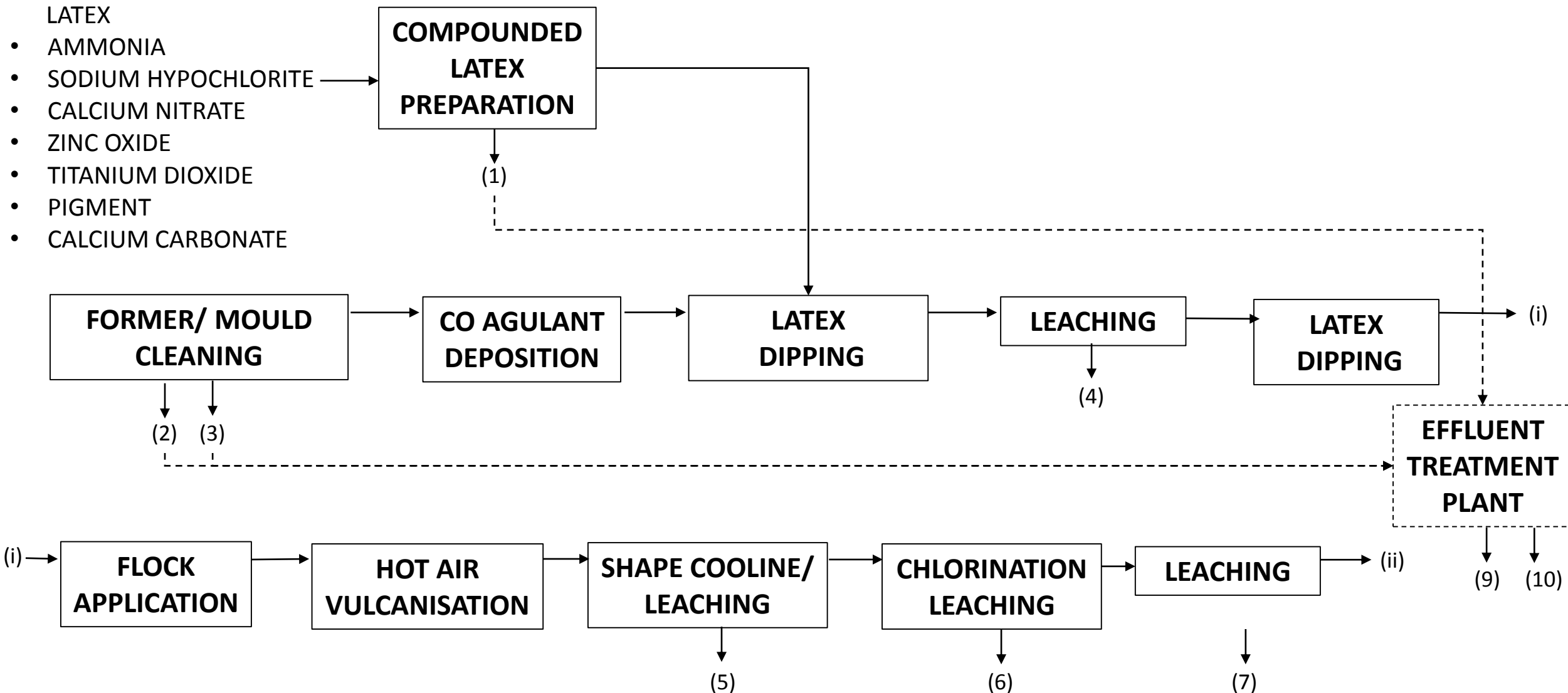


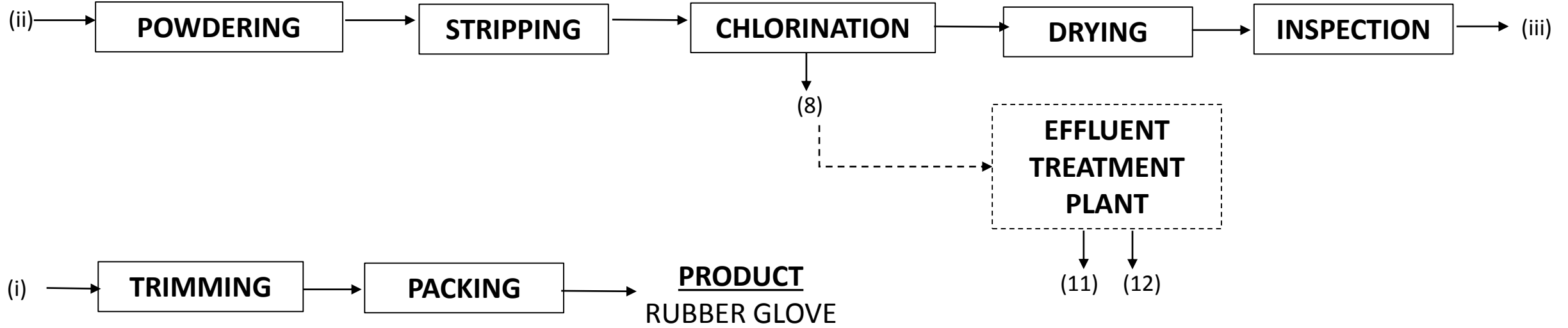
RUBBER PRODUCT
RUBBER GLOVE

(PRODUCTION PROCESS DESCRIPTION)

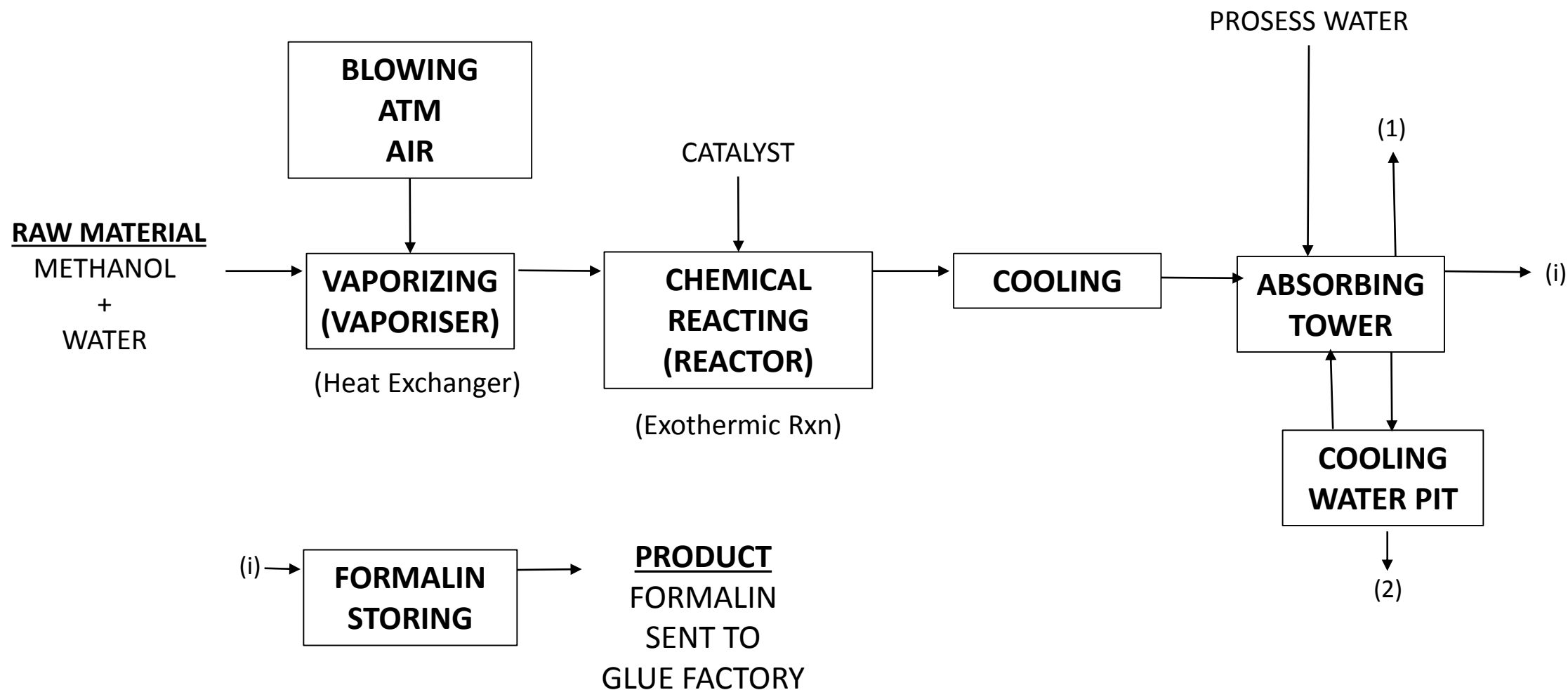
RAW MATERIAL

- LOW AMMONIA LATEX
- AMMONIA
- SODIUM HYPOCHLORITE
- CALCIUM NITRATE
- ZINC OXIDE
- TITANIUM DIOXIDE
- PIGMENT
- CALCIUM CARBONATE





SYNTHETIC RESIN – FORMALIN
(PRODUCTION PROCESS DESCRIPTION)

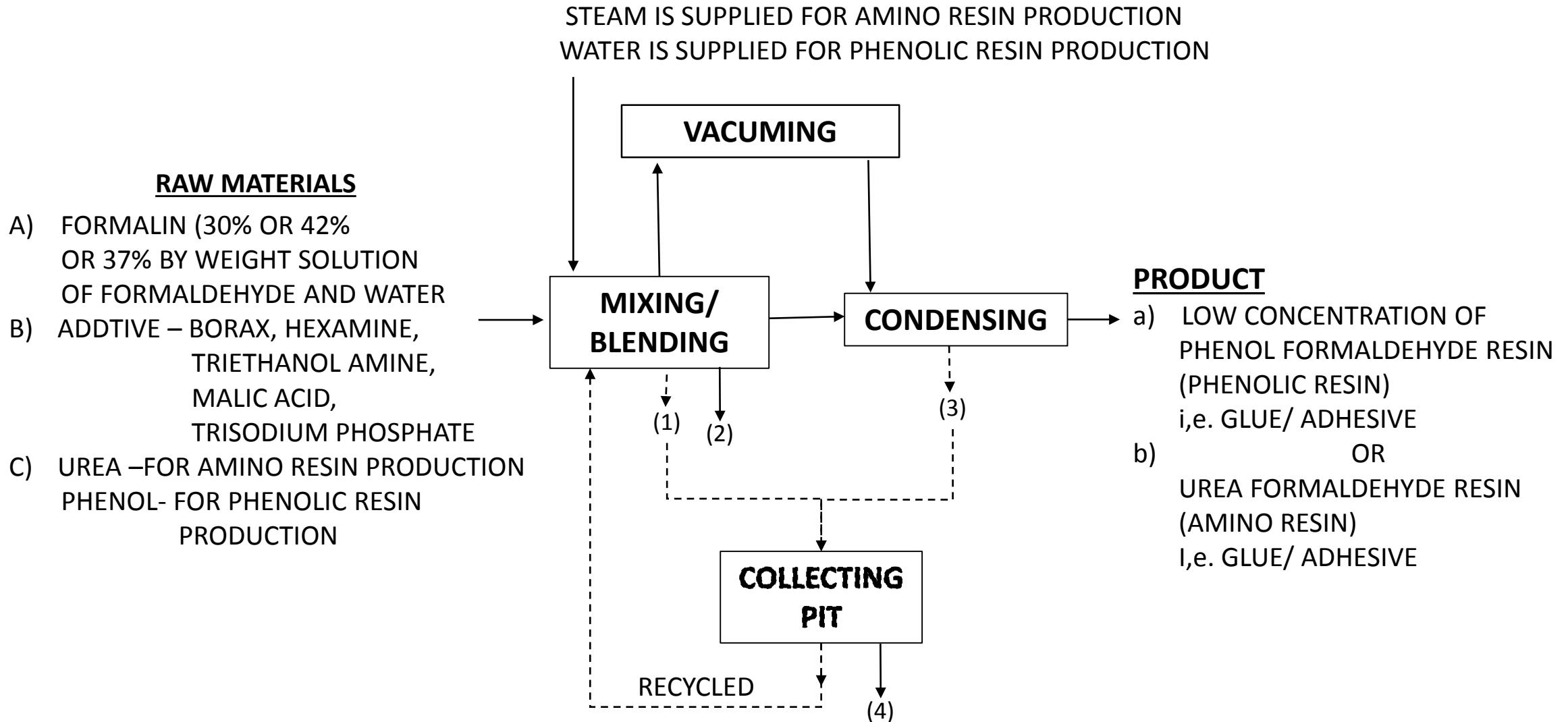


SYNTHETIC RESIN – FORMALIN
WASTE DESCRIPTION

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Absorbing tower (Formaldehyde dissolve in water)	-	Formaldehyde gas	Gas
2.	- do -	-	Aqueous Formalin	Liquid

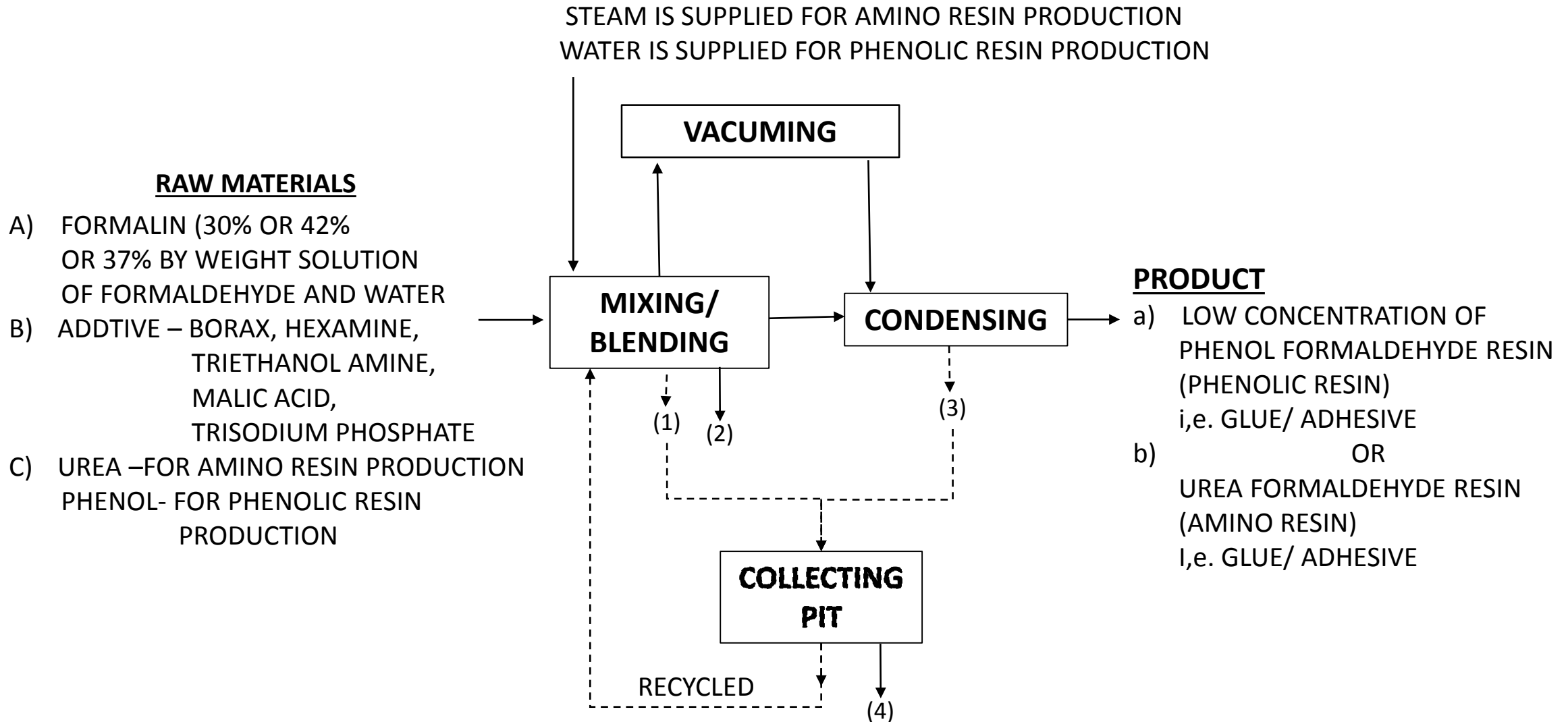
SYNTHETIC RESIN – MAKING OF GLUE/ ADHESIVE (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.073



SYNTHETIC RESIN – MAKING OF GLUE/ ADHESIVE (PRODUCTION PROCESS DESCRIPTION)

JAS/PNG/88/R.073



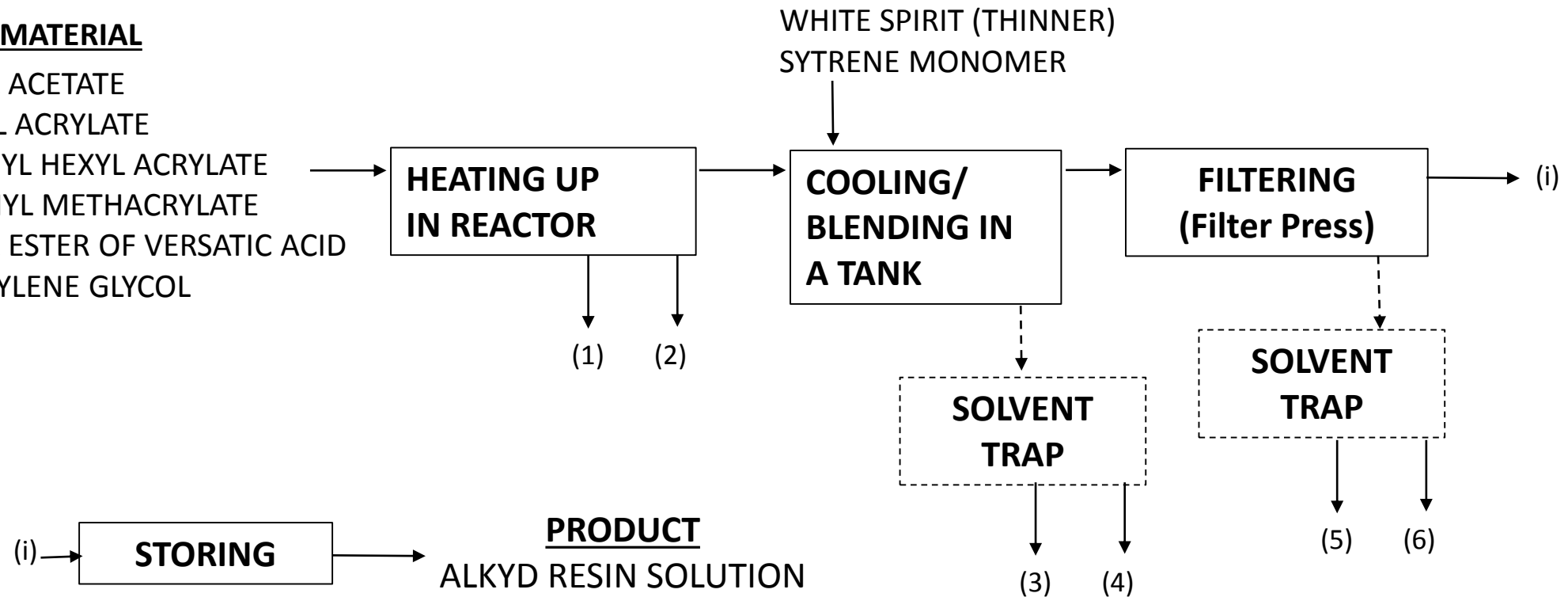
SYNTHETIC RESIN – GLUE/ ADHESIVE
WASTE DESCRIPTION

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Mixing/ Blending (Cleaning Of Mixing/ Blending Reactor)	-	Aqueous Resin (Recycled)	Liquid
2.	- do -	-	Resin Sludge	Semi- Solid
3.	Condensing	-	Aqueous Resin (Recycled)	Liquid
4.	Collecting Pit	-	Resin Sludge	Semi- Solid

SYNTHETIC RESIN – MAKING OF ALKYD RESIN SOLUTION (PRODUCTION PROCESS DESCRIPTION)

RAW MATERIAL

- VINYL ACETATE
- BUTYL ACRYLATE
- 2-ETHYL HEXYL ACRYLATE
- METHYL METHACRYLATE
- VINYL ESTER OF VERSATIC ACID
- PROPYLENE GLYCOL

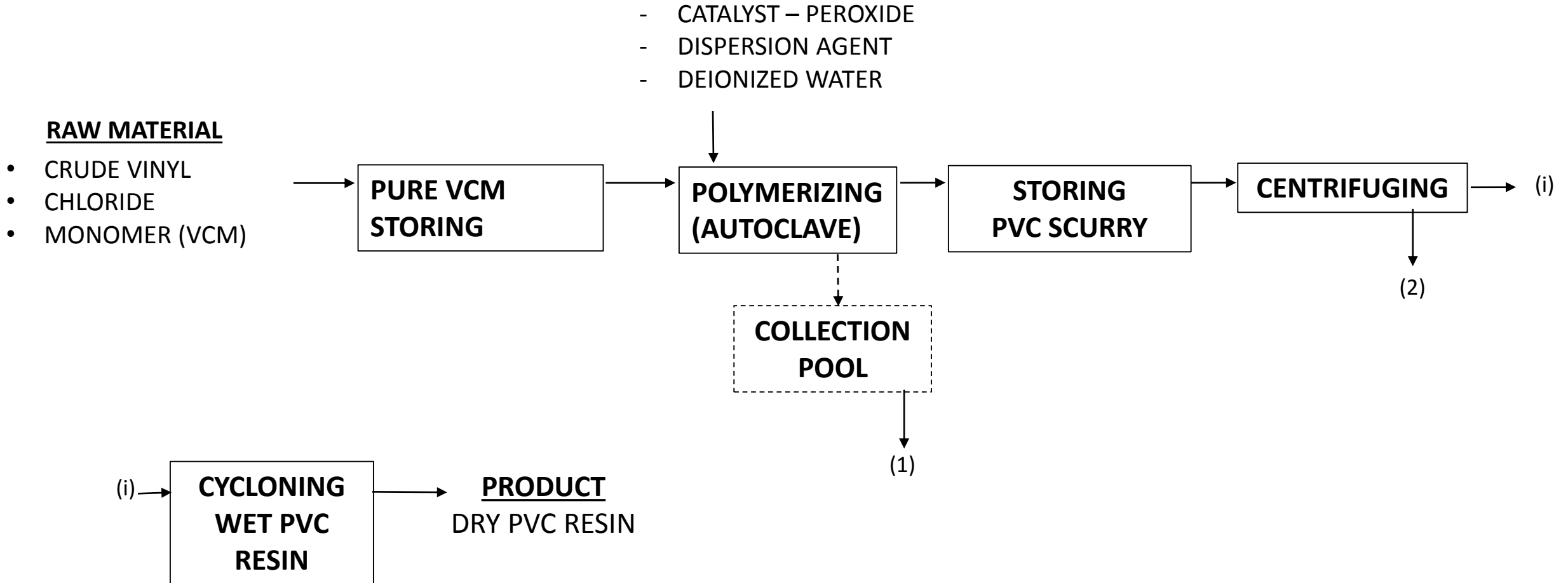


SYNTHETIC RESIN – MAKING OF ALKYD RESIN SOLUTION

WASTE DESCRIPTION

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Heating Up In Reactor (Cleaning Of Reactor)	-	Cleaning With NaoH – (Waste – Naoh Effluent)	Liquid
2.	Heating Up In Reactor (Cleaning Of Reactor)	-	Resin Sludge	Semi- Solid
3.	Solvent Trap	-	White Spirit	Liquid
4.	Solvent Trap	-	Solvent Resin Sludge	Semi- Solid
5.	Solvent Trap (Filtering)	-	White Spirit (Cleaning Of Filter Press)	Liquid
6.	Solvent Trap	-	Solvent Resin Sludge (Cleaning Of Filter Press)	Semi- Solid

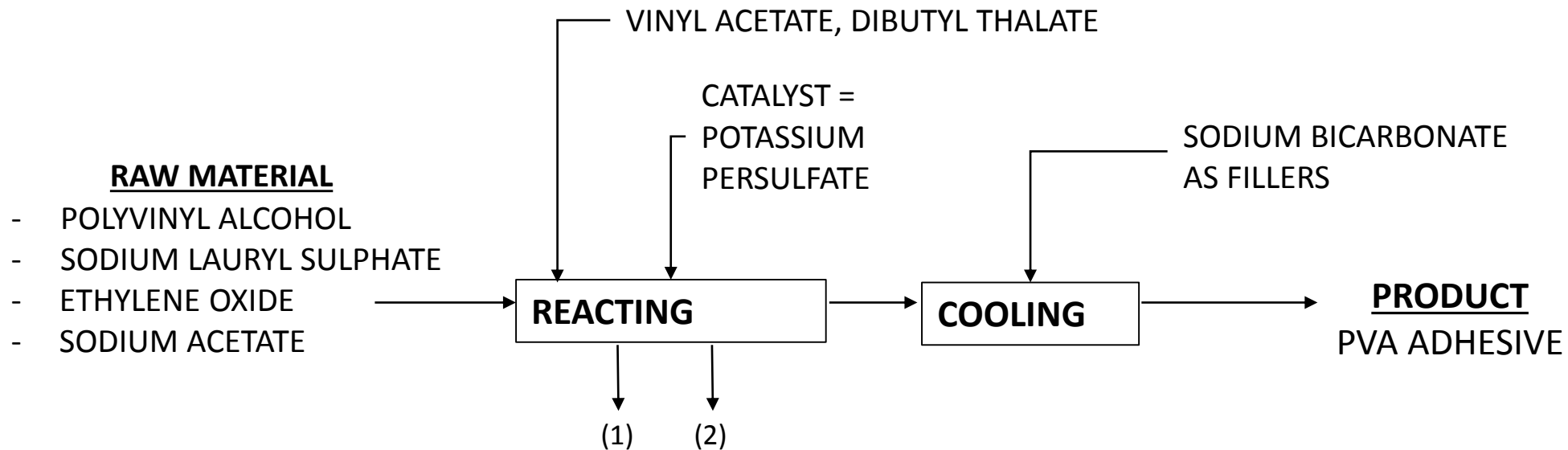
SYNTHETIC RESIN – MAKING OF PVC RESIN (PRODUCTION PROCESS DESCRIPTION)



SYNTHETIC RESIN – MAKING OF PVC RESIN
WASTE DESCRIPTION

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Collecting Pool	-	PVC Effluent	Liquid
2.	Centrifuging	-	PVC Effluent	Liquid

SYNTHETIC RESIN – PVA ADHESIVE PRODUCTION (PRODUCTION PROCESS DESCRIPTION)



SYNTHETIC RESIN – PVA ADHESIVE PRODUCTION
WASTE DESCRIPTION

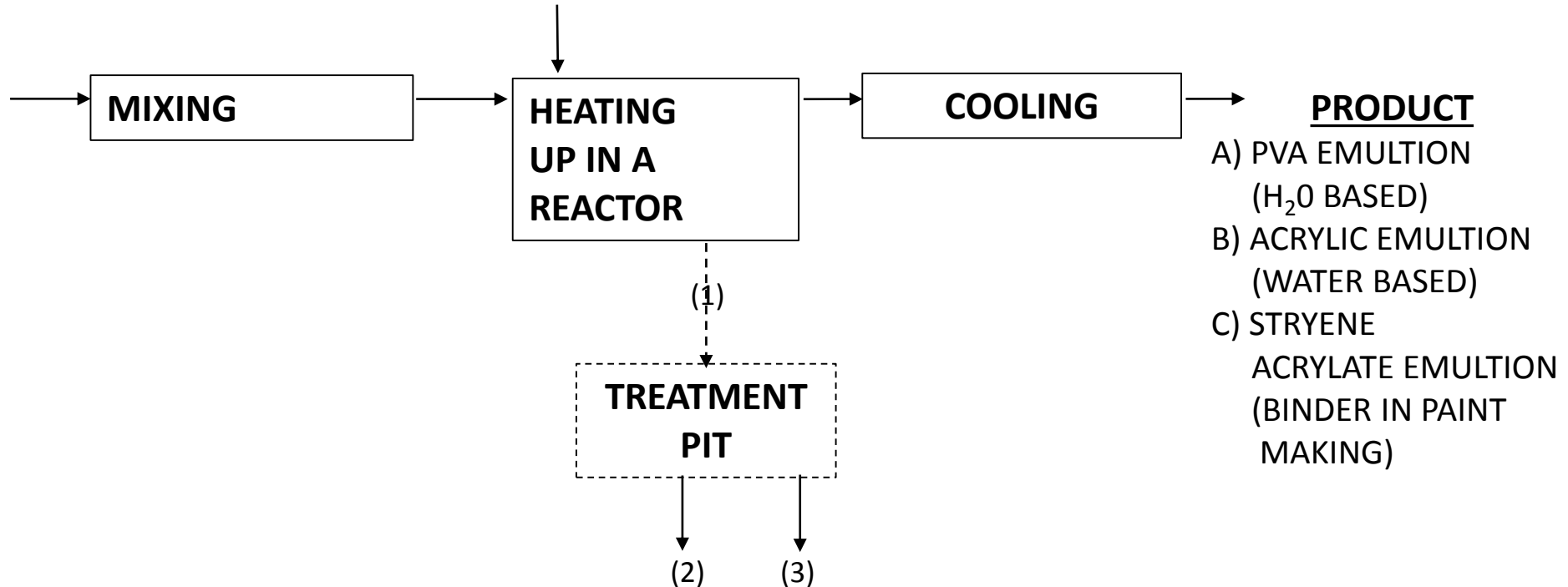
Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Reacting	-	Effluent	Liquid
2.	- do -	-	Resin & Sludge	Semi - Solid

SYNTHETIC RESIN – PVA EMULTION / ACRYLIC EMULTION / STRYENE – ACRYLATE EMULTIONS (PRODUCTION PROCESS DESCRIPTION)

- H₂O + SURFACTANT
- CATALYST POTASSIUM PERSULFATE (K₂S₂O₈)
- POLYVINYL ALCOHOL

RAW MATERIAL

- A) - VINYL ACETATE MONOMER
- 2 - ETHYL HEXYL ACRYLATE MONOMER
- BUTYL ACRYLATE MONOMER
- B) - 2 – ETHYL HEXYL ACRYLATE MONOMER
- METHYL METHA CRYLATE/ BUTYL ACRYLATE MONOMER
- C) - STYRENE + BUTYL ACRYLATE MONOMER



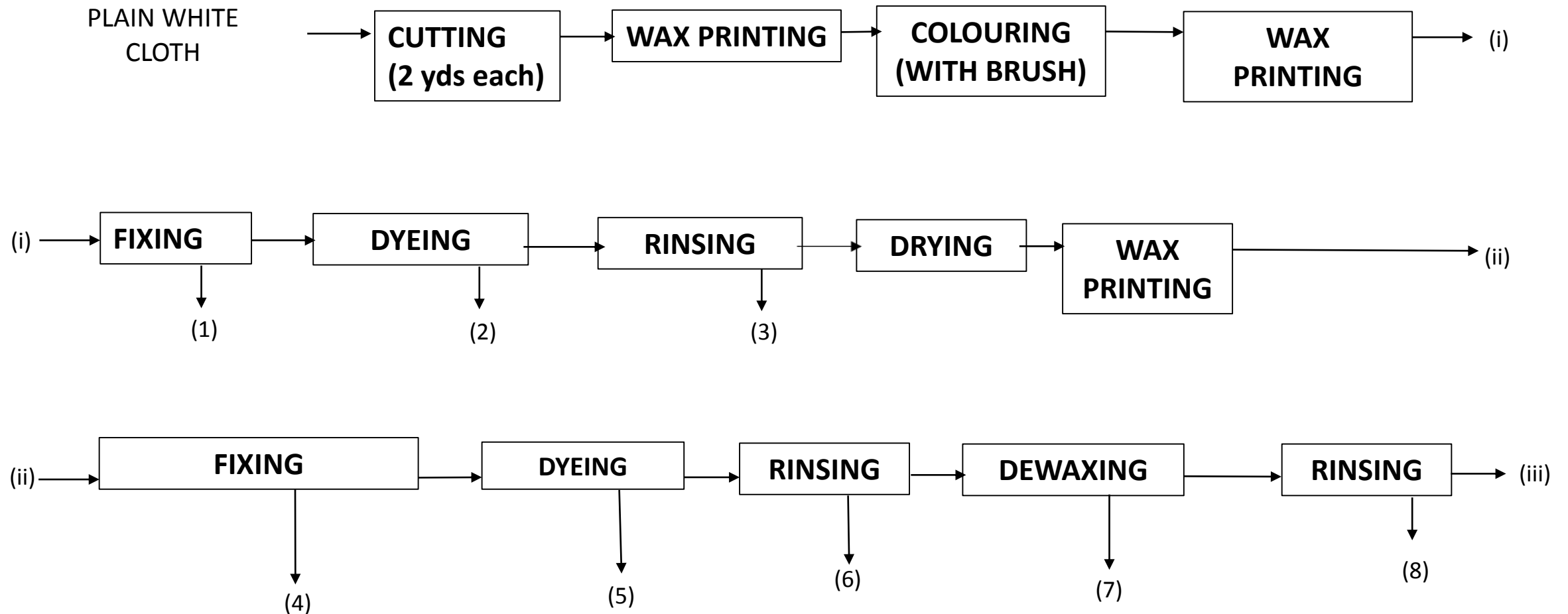
SYNTHETIC RESIN – PVA EMULTION / ACRYLIC EMULTION EMULTION / STRYENE – ACRYLATE EMULTIONS
WASTE DESCRIPTION

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Cooling	-	Waste Water	Liquid
2.	Treatment Pit	Fe Cl ₃ Flocculating Agent	Waste Water	Liquid
3.	Treatment Pit	- do -	Resin Sludge	Semi - Solid

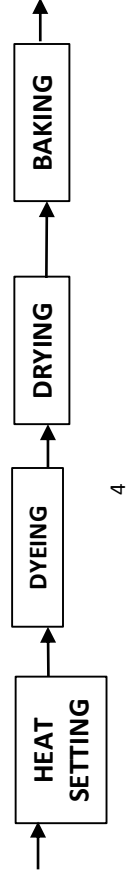
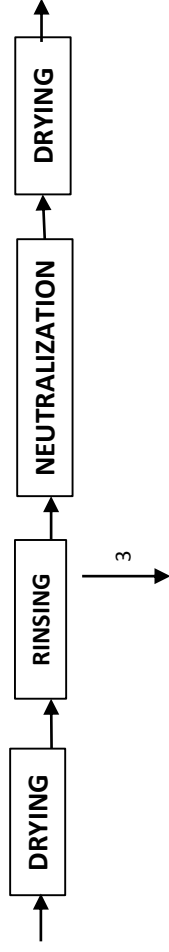
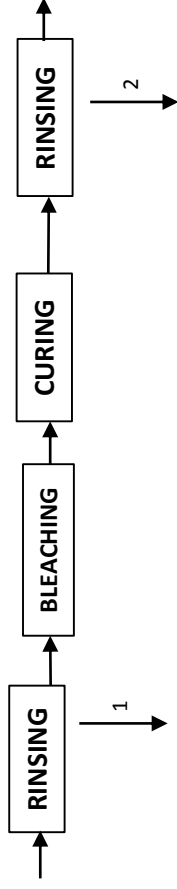
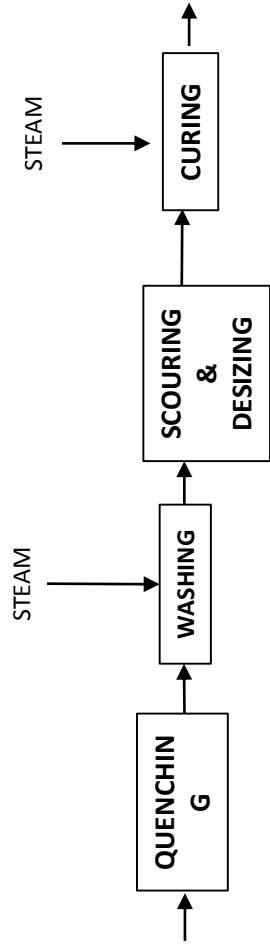
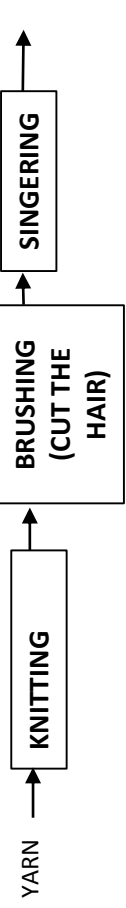
BATIK – 4 LAYER BATIK
(PRODUCTION PROCESS DESCRIPTION)

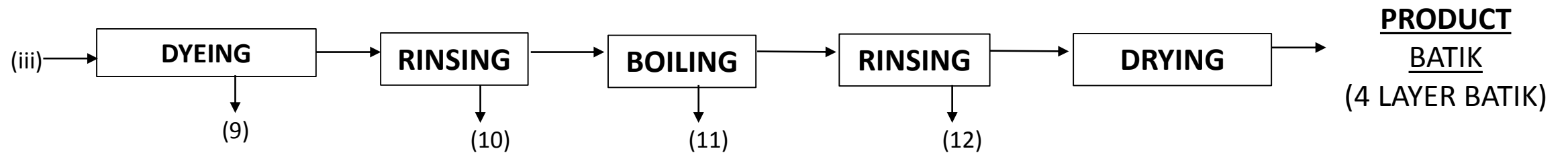
JAS/PNG/88/R.078

RAW MATERIAL



TEXTILE – FABRIC
(PRODUCTION PROCESS DESCRIPTION)

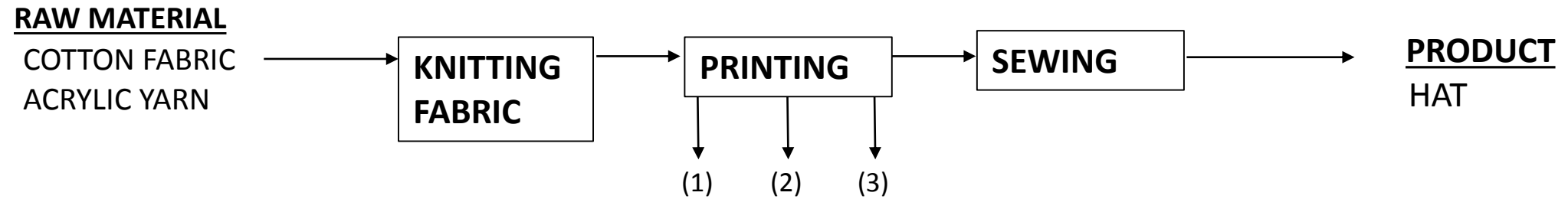




BATIK – 4 LAYER BATIK (WASTE DESCRIPTION)

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Fixing	Naphthol + Caustic Soda	Naphthol + Caustic Soda	Liquid
2.	Dyeing	Dye + H ₂ O	Spent Dyestuff	Liquid
3.	Rinsing	Dye + H ₂ O	Aqueous Dyestuff	Liquid
4.	Fixing	Naphthol + Caustic Soda	Naphthol + Caustic Soda	Liquid
5.	Dyeing	Dye + H ₂ O	Spent Dyestuff	Liquid
6.	Rinsing	H ₂ O + Dye	Aqueous Dyestuff	Liquid
7.	Dewaxing	Wax - Dye	Aqueous Dyestuff + Wax	- do -
8.	Rinsing	Naphthol + Caustic Soda	Naphthol + Caustic Soda	Liquid
9.	Dyeing	Dye + H ₂ O	Spent Dyestuff	Liquid
10.	Rinsing	Water	Aqueous Dyestuff	Liquid
11.	Boiling	Wax + Dye + Soda Ash	Aqueous Dyestuff + Wax + Soda Ash	Liquid / Semi - Solid
12.	Rinsing	- do -	Aqueous Dye + Soda Ash + Wax	Liquid / Semi - Solid

TEXTILE – FABRIC HAT
(PRODUCTION PROCESS DESCRIPTION)

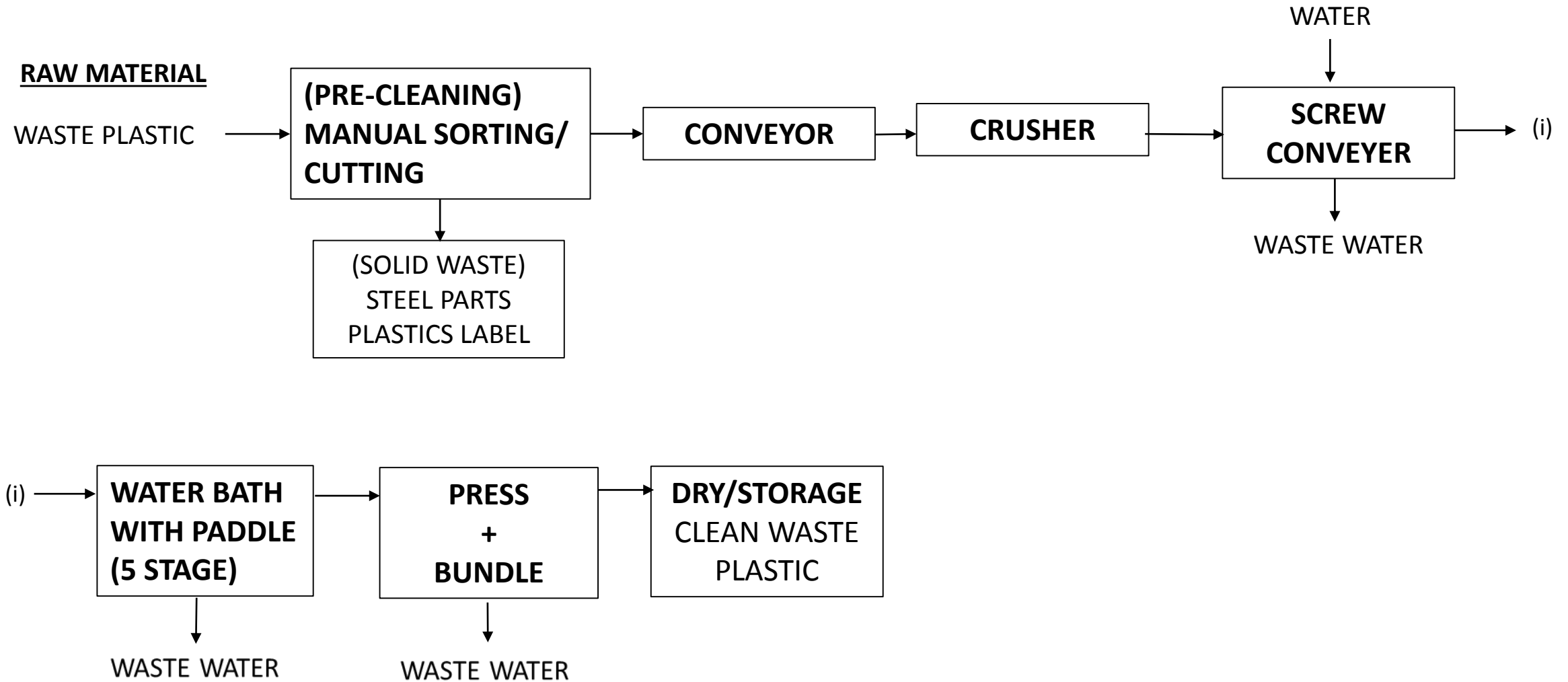


TEXTILE – FABRIC HAT
WASTE DESCRIPTION

Waste Ref. No.	Process That Generates Waste / Waste Source	Typical Chemical Used In The Process	Type Of Waste	Nature Of Waste
1.	Printing / Scraping of photo Photo emulsion ink from Printing block	-	Ink (Chlorine Based)	Solid
2.	Printing/ Gum Cleaning	-	Thinner	Liquid
3.	Printing / Washing of Printing block	-	Aqueous Dye + Ink	Liquid

RECYCLE PLASTIC - CRUSHING
(PRODUCTION PROCESS DESCRIPTION)

JAS/UIH/2018/R.081 (i)



RECYCLE PLASTIC – PALLETE MAKING (PRODUCTION PROCESS DESCRIPTION)

JAS/UIH/2018/R.081 (ii)

