FORM – 1

WITH

BASIC INFORMATION FOR OBTAINING ENVIRONMENTAL CLEARANCE

OF

PROPOSED PROJECT

M/s. Hexane Pharmachem Industries

Project Location

Plot No.4, Block No.253, Village: Nananpur,
Taluka: Prantij, District: Sabarkantha, Gujarat.

Project Proponent

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MAY 2017

LIST OF ANNEXURES

ANNEXURE – 1 : LIST OF PRODUCTS & RAW MATERIALS

LIST OF PRODUCTS

Sr. No.	Products List	Quantity (MT/Month)
1	Benzyl Triphenyl Phosphonium Choride	1
2	Cetramide	1
3	Cetramide Strong Solution 40 %	1
4	Cetyl Pyridinium Choride	1
5	Cetyl Trimethyl Ammonium Bromide	1
6	Cetyl Trimethyl Ammonium Chloride 30 %	1
7	Ethyl Triphenyl Phosphonium Bromide	1
8	Lauryl Pyridinium Chloride	1
9	Methyl Tributyl Ammonium Chloride 75 %	5
10	Methyl Trioctyl Ammonium Chloride 95 %	1
11	Methyl Triphenyl Phosphonium Bromide	3
12	Phenyl Trimethyl Ammonium Chloride	2
13A	Tetra Butyl Ammonium Bromide (Powder)	10
13B	Tetra Butyl Ammonium Bromide (Solution)	25
14	Tetra Butyl Ammonium Chloride	2
15	Tetra Butyl Ammonium Hydrogen Sulphate	2
16	Tetra Butyl Ammonium Iodide	1
17	Tetra Methyl Ammonium Chloride	2
18	Tetra Octyl Ammonium Bromide	2
19	Tetra Ethyl Ammonium Bromide	5
20	Tri Ethyl Benzyl Ammonium Chloride	5
21	Benzalkonium Chloride 50 %	1
22	Benzyl Tri Butyl Ammonium Bromide	1
23	Benzyl Tri Butyl Ammonium Chloride	1
24	Butyl Triphenyl Phosphonium Bromide	2
25	Butyl Triphenyl Phosphonium Chloride	1
26	Cetyl Dimethyl Benzyl Ammonium Bromide	1
27	Cetyl Dimethyl Benzyl Ammonium Chloride	1
28	Dodecyl Trimethyl Ammonium Chloride	1
29	Mesetronium Ethosulphate	1
30	Methyl Triphenyl Phosphonium Chloride	2
31	Methyl Triphenyl Phosphonium Iodide	1
32	Tetra Phenyl Phosphonium Bromide	1
33	Tri Ethyl Methyl Ammonium Chloride	1
34	Tri Ethyl Butyl Ammonium Bromide	1
35	Benzyl Tri Methyl Ammonium Chloride (Powder)	16
	Total	**105**

LIST OF RAW MATERIALS

Product	Batches (Nos./Month)	Raw Material	Requirement	
			Kg/batch	MT/Month
1. Benzyl Triphenyl Phosphonium Choride	1	Tri phenyl phosphine	700	0.70
		Benzyl chloride	340	0.34
		toluene	420	0.42
2. Cetramide	1	myristyl dimethylamine	830	0.83
		dimethyl sulphate	500	0.50
		sodium bromide 40 %	1000	1.00
		iso propanol	80	0.08
		ethyl acetate	420	0.42
3. Cetramide Strong Solution 40 %	1	myristyl dimethylamine	180.00	0.18
		lauryl dimethylamine	130.00	0.13
		dimethyl sulphate	200.00	0.20
		sodium bromide 40 %	500.00	0.50
		iso propanol	80.00	0.08
		epitol	70.00	0.07
		ethanol	80.00	0.08
		water	420.00	0.42
4. Cetyl Pyridinium Choride	1.00	pyridine	250.00	0.25
		cetyl chloride	850.00	0.85
		acetone	1000.00	1.00
		water	200.00	0.20
5. Cetyl Trimethyl Ammonium Bromide	1	cetyl dimethyl amine	830.00	0.83
		dimethyl sulphate	500.00	0.50
		sodium bromide 40 %	1000.00	1.00
		ethyl acetate	420.00	0.42
		iso propanol	80.00	0.08
6. Cetyl Trimethyl Ammonium Chloride 30 %	1	cetyl dimethyl amine	250.00	0.25
		methyl chloride	68.00	0.07
		iso propanol	100.00	0.10
		epitol	10.00	0.01
		water	580.00	0.58
7. Ethyl Triphenyl Phosphonium Bromide	1	Tri phenyl phosphine	720.00	0.72
		ethyl bromide	330.00	0.33
		acetonitrile	1100.00	1.10
8. Lauryl Pyridinium Chloride	1	pyridine	315.00	0.32
		lauryl chloride	700.00	0.70
		water	50.00	0.05
		acetone	1000.00	1.00
9. Methyl Tributyl Ammonium Chloride 75 %	5	tri butyl amine	600.00	3.00
		methyl chloride	155.00	0.78
		acetonitrile	350.00	1.75
		charcoal	10.00	0.05

		water	250.00	1.25
10. Methyl Trioctyl Ammonium Chloride 95 %	1	tri octylamine	770	0.77
		methyl chloride	150	0.15
		iso propanol	230	0.23
		glycerine	10	0.01
		octyl alcohol	10	0.01
		soda ash	10	0.01
		acetonitrile	230	0.23
11. Methyl Triphenyl Phosphonium Bromide	3	tri phenyl phosphine	800	2.40
		dimethyl sulphate	400	1.20
		sodium bromide 40 % soln	800	2.40
		toluene	600	1.80
12. Phenyl Trimethyl Ammonium Chloride	2	N N - dimethyl aniline	690.00	1.38
		methyl chloride	310.00	0.62
		methanol	750.00	1.50
		sodium hydro sulphide (Cat)	100.00	0.20
13. A. Tetra Butyl Ammonium Bromide (Powder)	11	tri n- butylamine	550.00	6.05
		butyl bromide	450.00	4.95
		acetonitrile	300.00	3.30
		ethyl acetate	400.00	4.40
13. B. Tetra Butyl Ammonium Bromide (Solution)	13	tetra butyl ammonium bromide (powder)	950	12.35
		water	940	12.22
14. Tetra Butyl Ammonium Chloride	2	tetra butyl ammonium bromide	1200.00	2.40
		potassium hydroxide	320.00	0.64
		toluene	2240.00	4.48
		hydrochloric acid (35 %)	480.00	0.96
		methanol	2640.00	5.28
15. Tetra Butyl Ammonium Hydrogen Sulphate	2	tetra butyl ammonium bromide	960.00	1.92
		butanol	1200.00	2.40
		sulphuric acid	400.00	0.80
		sodium hydrogen sulphate	120.00	0.24
		soda ash	120.00	0.24
		methyl isobutyl ketone	800.00	1.60
		methylene dichloride	800.00	1.60
16. Tetra Butyl Ammonium Iodide	1	tetra butyl ammonium bromide	1000.00	1.00
		potassium iodide	500.00	0.50
		ethyl acetate	1000.00	1.00
		methanol	2000.00	2.00
17. Tetra Methyl Ammonium Chloride	2	tri methyl amine	540.00	1.08
		methyl chloride	460.00	0.92
		iso propanol	500.00	1.00

18. Tetra Octyl Ammonium Bromide	2	tri octylamine	610.00	1.22
		octyl bromine	350.00	0.70
		acetonitrile	460.00	0.92
		ethyl acetate	460.00	0.92
		iso propanol	40.00	0.08
19. Tetra Ethyl Ammonium Bromide	5	tri ethyl amine	460.00	2.30
		ethyl bromide	530.00	2.65
		toluene	300.00	1.50
		iso propanol	60.00	0.30
20. Tri Ethyl Benzyl Ammonium Chloride	5	tri ethylamine	440.00	2.20
		benzyl chloride	520.00	2.60
		toluene	290.00	1.45
		iso propanol	60.00	0.30
		dimethyl formamide	20.00	0.10
21. Benzalkonium Chloride 50 %	1	myristyl dimethylamine	170.00	0.17
		lauryl dimethylamine	160.00	0.16
		benzyl chloride	260.00	0.26
		water	410.00	0.41
22. Benzyl Tri Butyl Ammonium Bromide	1	Tri Butyl benzyl Ammonium Chloride	1000.00	1.00
		potassium hydroxide	330.00	0.33
		methanol	2000.00	2.00
		Hydro bromic acid	830	0.00
		toluene	2000	0.00
23. Benzyl Tri Butyl Ammonium Chloride	1	tri n-butylamine	540.00	0.54
		Benzyl chloride	380.00	0.38
		toluene	1850.00	1.85
24. Butyl Triphenyl Phosphonium Bromide	2	tri phenyl phosphine	630.00	1.26
		butyl bromide	320.00	0.64
		toluene	1260.00	2.52
25. Butyl Triphenyl Phosphonium Chloride	1	tri phenyl phosphine	750.00	0.75
		butyl chloride	250.00	0.25
		toluene	980.00	0.98
26. Cetyl Dimethyl Benzyl Ammonium Bromide	1	cetyl dimethyl benzyl ammonium chloride	1000	1.00
		potassium hydroxide	167	0.17
		methanol	2000	2.00
		hydro bromic acid	500	0.50
27. Cetyl Dimethyl Benzyl Ammonium Chloride	1	cetyl dimethyamine	670.00	0.67
		benzyl chloride	330.00	0.33
		ethyl acetate	1500.00	1.50
28. Dodecyl Trimethyl Ammonium Chloride	1	dodecyl dimethylamine	830.00	0.83
		methyl chloride	160.00	0.16
		acetone	1500.00	1.50
29. Mesetronium Ethosulphate	1	cetyl dimethylamine	670.00	0.67
		diethyl sulphate	330.00	0.33

		ethyl acetate	1500.00	1.50
30. Methyl Triphenyl Phosphonium Chloride	2	tri phenyl phosphine	830.00	1.66
		methyl chloride	170.00	0.34
		toluene	1330.00	2.66
31. Methyl Triphenyl Phosphonium Iodide	1	tri phenyl phosphine	670.00	0.67
		methyl iodide	330.00	0.33
		toluene	1670.00	1.67
32. Tetra Phenyl Phosphonium Bromide	1	tri phenyl phosphine	670.00	0.67
		bromo benzene	330.00	0.33
		ethyl cellosolve	1250.00	1.25
33. Tri Ethyl Methyl Ammonium Chloride	1	tri ethyl amine	670.00	0.67
		methyl chloride	330.00	0.33
		acetonitrile	1250.00	1.25
34. Tri Ethyl Butyl Ammonium Bromide	1	tri ethyl amine	430.00	0.43
		butyl bromide	570.00	0.57
		methyl ethyl ketone	1140.00	1.14
35. Benzyl Tri Methyl Ammonium Chloride (Powder)	16	tri methyl amine	330.00	5.28
		benzyl chloride	670.00	10.72
		iso propanol	1330.00	21.28

ANNEXURE – 2

PLANT LAY-OUT

LAYOUT PLAN

Total Site Area = 6077.00 sq.mts.
Built up Area = 1902.00 sq.mts.
Green Belt Area = 2085.00 sq.mts.
Open Area = 2090.00 sq.mts.

All dim. are in meter.

Hexane Pharmachem Industries.
Plot No:-4, Block No.:-2B,
Village:- Nanapar, Taluka:-Prantij,
District:-Sabarkantha.

Project Manager:- Navneet Patel
Mo. No:- 9426186096

1:- Solvent & Raw Material Storage
2:- Drying Grinding & Packing
3:- Quarantine
4:- Productio Plant -1
5:- Utility
6:- E.T.P Plant
7:- Finish Goods Storage
8:- Office
9:- Security Cabin

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SITE PLAN

HEXANE PHARMACHEM INDUSTRIES.

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ANNEXURE – 3

MANUFACTURING PROCESS WITH MASS BALANCE, CHEMICAL REACTION & PROCESS FLOW DIAGRAM

1. Benzyl Triphenyl Phosphonium Chloride

Manufacturing Process:

Toluene and Tri phenyl phosphine will be taken in the reactor. At 40 °C and Benzyl chloride will be charged in to it. That mixture will be stirred well for about 1 hr. Temperature will be maintained 80 °C in the reactor. Now reflux will be done at 90 °C for 36 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C than packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri phenyl phosphine + Benzyl Chloride $\xrightarrow{\text{Toluene}}$ Benzyl Triphenyl Phosphonium Chloride

$C_{18}H_{15}P + C_7H_7Cl \xrightarrow{\text{Toluene}} C_{25}H_{22}PCl$

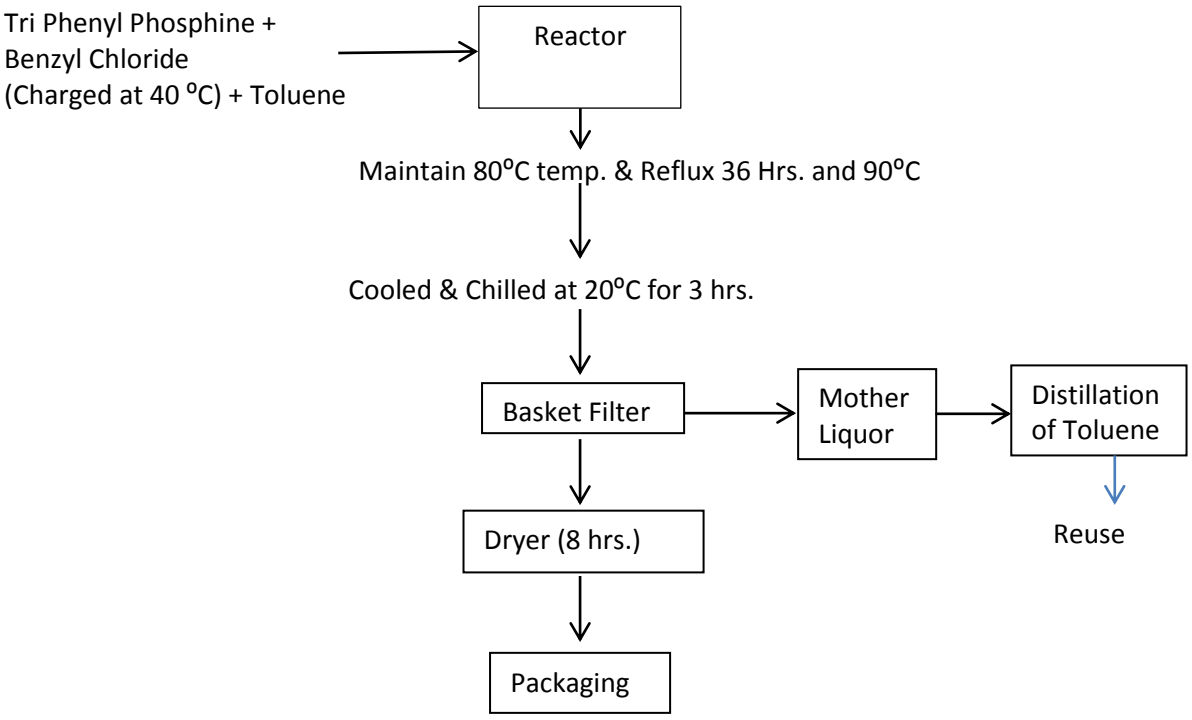
(262) + (126.5) (388.5)

Mass Blanace :

Input	kg/batch	Output	kg/batch	Remark
Tri phenyl phosphine	700.00	Benzyl triphenyl phosphonium chloride	1000	
Benzyl chloride	340.00			
toluene	420.00	drying loss	40	
		Solvent recovered	403.00	Reuse after distillation
		distillation residue	10	for common incineration
		handling loss	7	
TOTAL	**1460.00**	**TOTAL**	**1460.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
toluene	420.00	403.00	17	96.0%

Process Flow Diagram :



2. Cetramide

Manufacturing Process:

First of all sodium bromide & dimethyl sulphate will be taken in other reactor at 30 °C to generate Methyl bromide gas, at the end of reaction sodium sulphate slurry will be generated & it will be disposed to common incinerator.

In main reactor Iso propanol, Myristyl dimethyl amine and Ethyl acetate mixture will be taken. Methyl bromide gas will be passed into the reaction mixture. Thus mixture will be stirred well for about 12 hr. temperature will be maintained 50 °C in the reactor. Now reflux will be done at 70 °C for 6 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and packed it in the drum. The Mother liquor from the filter will be collected & reuse in next batch and Distillation residue will be sent to incinerator.

Chemical reaction :

First stage :

Sodium Bromide + Di Methyl Sulphate $\longrightarrow$ Methyl Bromide + Sodium Sulphate

$2NaBr + CH_3SO_4CH_3 \longrightarrow 2CH_3Br + Na_2SO_4$

(206) + (126) $\longrightarrow$ 2(95) + 142.06

Second stage :

Myristyl dimethyl amine + Methyl Bromide $\xrightarrow{\text{Ethyl acetate + Isopropanol}}$ **Cetramide**

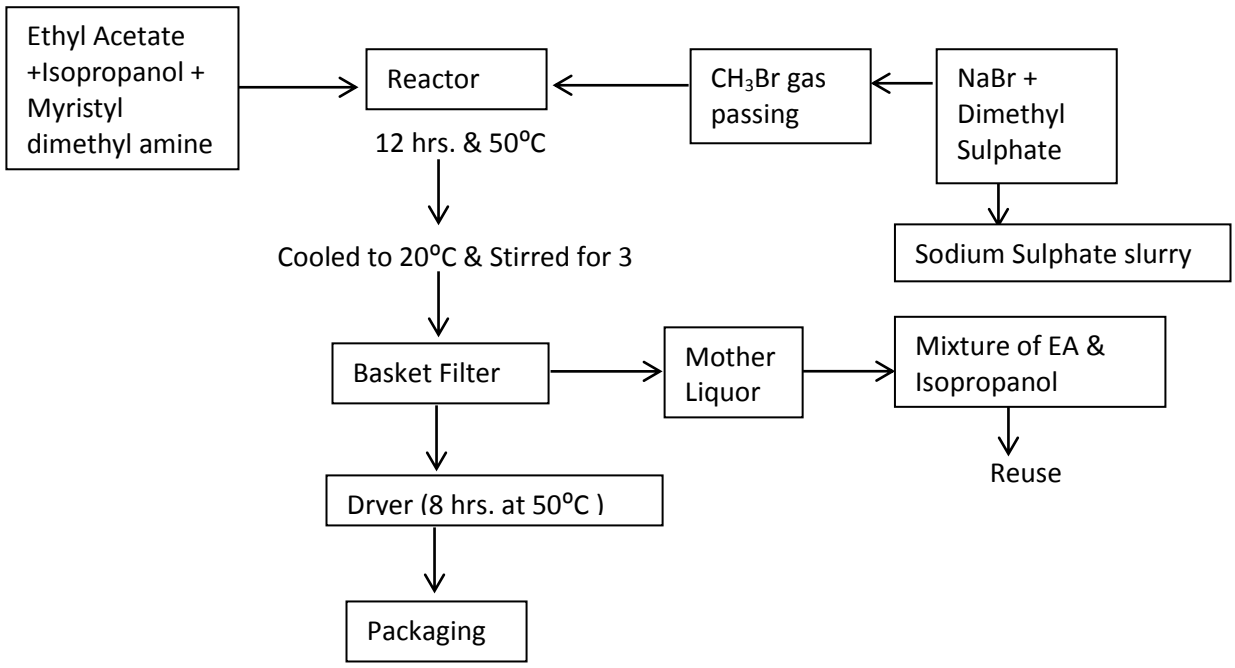
$C_{16}H_{35}N + CH_3Br \xrightarrow{\text{Ethyl acetate + Isopropanol}} C_{17}H_{38}NBr$

(241.46) (95) $\longrightarrow$ (336.46)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
myristyl dimethylamine	830	cetramide	1000	
dimethyl sulphate	500			
sodium bromide 40 %	1000	sodium sulphate	1330	common incineration
iso propanol	80	recovered solvent	450	Reuse in next batch
ethyl acetate	420	distillation residue	35	common incineration
		handling loss	15.00	
TOTAL	**2830.00**	**TOTAL**	**2830.00**	
Item	**Input (kg/batch)**	**Recovery (kg/batch)**	**Loss (kg/batch)**	**% Recovery**
iso propanol	500.00	450.00	50	90.0%

Process Flow Diagram :



3 . Cetramide strong solution 40 %

Manufacturing Process:

First of all sodium bromide & dimethyl sulphate will be taken in other reactor at 30 °C to generate Methyl bromide gas, at the end of reaction sodium sulphate slurry will be generated & it will be disposed to common incinerator.

In main reactor, Iso Propanol, myristyl dimethyl amine and Lauryl dimethyl amine mixture will be taken. Methyl Bromide gas will be passed into reaction mixture. That mixture will be stirred well for about 10 hrs. Temperature will be maintained 50 °C in the reactor. Now reflux will be done at 70 °C for 12 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs. at 20 °C. And Make solution with water, Epitol and Ethanol up to 40% solution & packed it in the drum.

Chemical reaction :

First stage :

Sodium Bromide + Di Methyl Sulphate $\longrightarrow$ Methyl Bromide + Sodium Sulphate

$2NaBr + CH_3SO_4CH_3 \longrightarrow 2CH_3Br + Na_2SO_4$

(206) + (126) $\longrightarrow$ 2(95) + 142.06

Second stage :

Myristyl dimethyl amine + Methyl Bromide $\xrightarrow{\text{Epitol + Isopropanol + Ethanol}}$ **Cetramide**

$C_{16}H_{35}N + CH_3Br \xrightarrow{\text{Epitol + Isopropanol + Ethanol}} C_{17}H_{38}NBr$

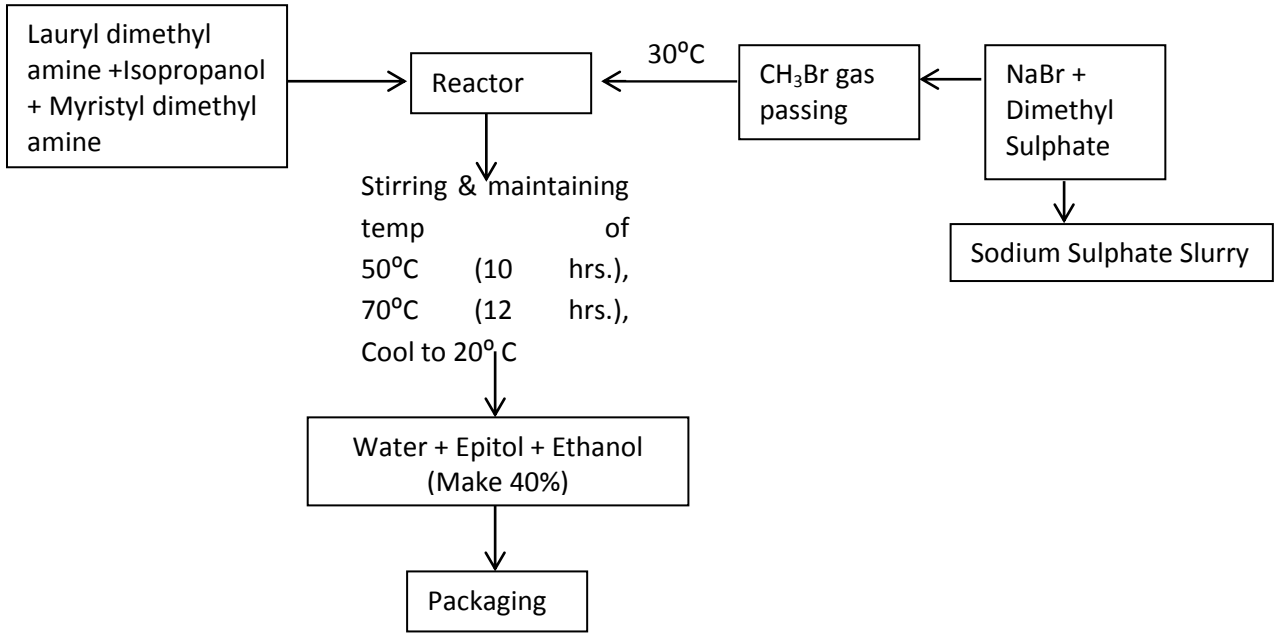
(241.46) (95) $\longrightarrow$ (336.46)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
myristyl dimethylamine	180.00	cetrimide strong solution 40 %	1075	
lauryl dimethylamine	130.00			
dimethyl sulphate	200.00	sodium sulphate	585.00	To common incineration
sodium bromide 40 %	500.00			
iso propanol	80.00			
epitol	70.00			
ethanol	80.00			
water	420.00			
TOTAL	**1660.00**	**TOTAL**	**1660.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
all solvents will remain in the product				

Process Flow Diagram :



4. Cetyl Pyridinium Chloride

Manufacturing Process :

The Water and pyridine will be taken in the reactor. At 40 °C and cetyl chloride will be charged in to it. That mixture will be stirred well for about 10 hr. Temperature will be maintained 80 °C in the reactor. Now reflux will be done at 100 °C for 10 hrs. This mixture will be cooled to 20 °C. Chilled and charge Acetone & stirred for about 3 hrs at 20 °C. The final mass will be filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C than packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Pyridine + Cetyl Chloride + Water $\xrightarrow{\text{Acetone}}$ **Cetyl Pyridinium Chloride**

$C_5H_5N + C_{16}H_{33}Cl + H_2O \xrightarrow{\text{Acetone}} C_{21}H_{38}NCl \cdot H_2O$

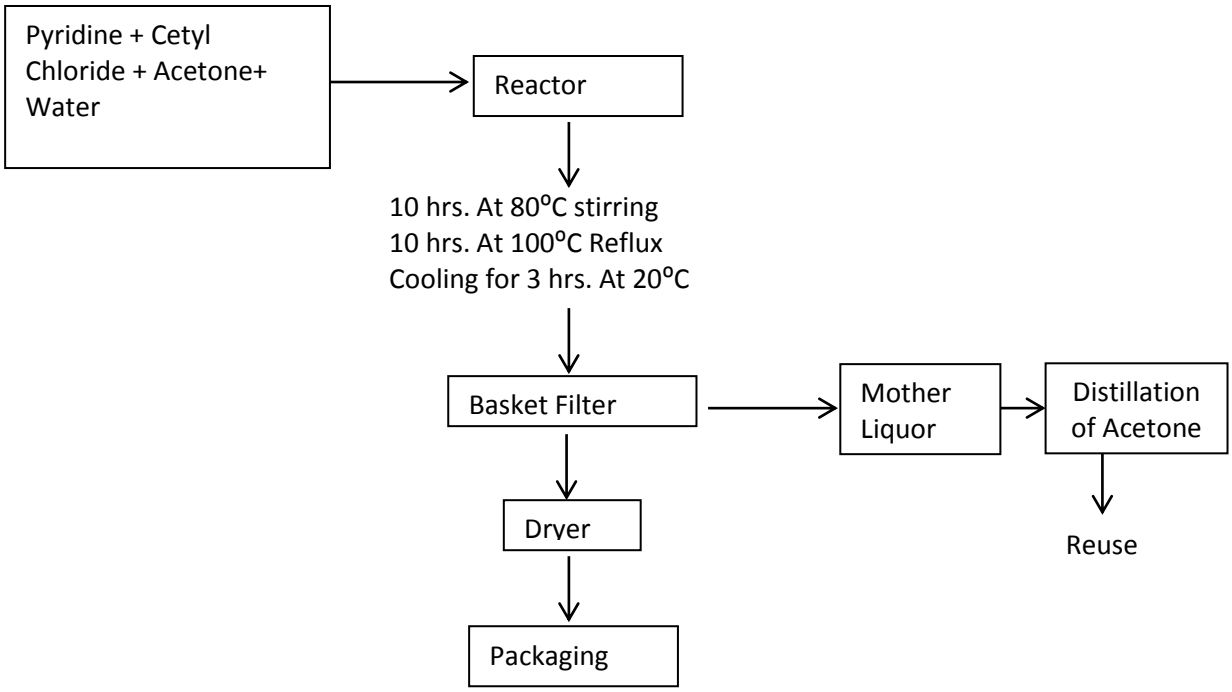
(79) + (260.5) + (18) $\longrightarrow$ (357.5)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
pyridine	250.00	cetyl pyridinium chloride	1000	
cetyl chloride	850.00			
acetone	1000.00	process residue	300	for incineration
water	200.00	recovered solvent	960.00	Reuse after distillation
		distillation residue	20.00	for incineration
		handling loss	20.00	
TOTAL	**2300.00**	**TOTAL**	**2300.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
acetone	1000.00	960.00	40.00	96%

Process Flow diagram :



5. Cetyl Trimethyl Ammonium Bromide

Manufacturing Process:

First of all Sodium bromide & Dimethyl sulphate will be taken in other reactor at 30 °C to generate Methyl bromide gas, at the end of reaction sodium sulphate slurry will be generated & it will be disposed to common incinerator.

In the main reactor Iso propanol, Ethyl Acetate and Cetyl dimethyl amine will be taken. Methyl Bromide gas will be passed into reaction mixture. That mixture will be stirred well for about 12 hrs. Temperature will be maintained 50 °C in the reactor. Now reflux will be done at 70 °C for 24 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass will be filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

First stage :

Sodium Bromide + Di Methyl Sulphate $\longrightarrow$ Methyl Bromide + Sodium sulphate

$2NaBr + CH_3SO_4CH_3 \longrightarrow 2CH_3Br + Na_2SO_4$

(206) + (126) $\longrightarrow$ 2(95) + 142.06

Second stage :

Cetyl dimethyl amine + Methyl Bromide $\xrightarrow{\text{Ethyl acetate + Isopropanol}}$ **Cetyl Trimethyl Ammonium Bromide**

$C_{18}H_{39}N + CH_3Br \xrightarrow{\text{Ethyl acetate + Isopropanol}} C_{19}H_{42}NBr$

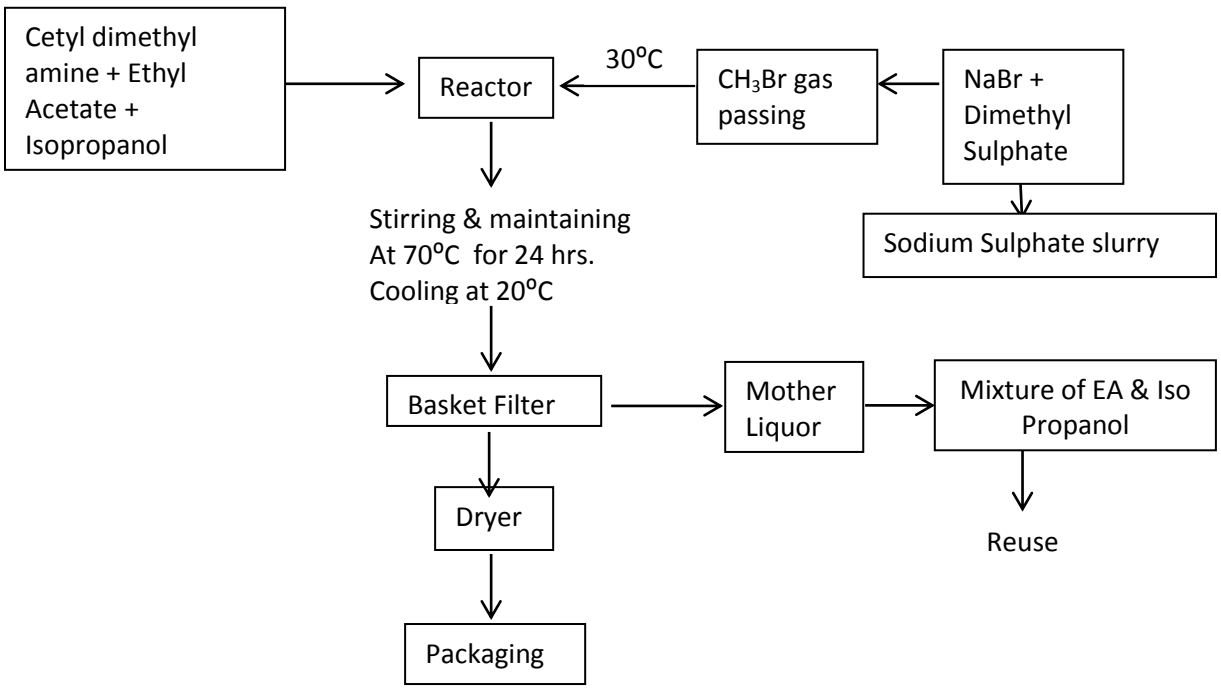
(269) + (95) $\longrightarrow$ (364)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
cetyl dimethyl amine	830.00	cetyl trimethyl ammonium bromide	1000	
dimethyl sulphate	500.00			
sodium bromide 40 %	1000.00	sodium sulphate	1330.00	for common incineration
ethyl acetate	420.00	recovered solvent	450.00	Reuse in next batch
iso propanol	80.00	distillation residue	35	for common incineration
		handling loss	15.00	
TOTAL	**2830.00**	**TOTAL**	**2830.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
ethyl acetate & iso propanol	500.00	450.00	50	90.0%

Process Flow Diagram :



6. Cetyl Trimethyl Ammonium Chloride (30% Solution)

Manufacturing Process:

The Water, Isopropanol and Epitol and Cetyl dimethyl amine will be taken in the reactor. At 20 °C methyl chloride gas will be purged in to it. That mixture will be stirred well for about 18 hrs. Temperature will be maintained 20 °C in the reactor. This mixture will be cooled to 15 °C. Chilled and stirred for about 3 hrs at 15 °C. The final solution will be packed in the drum after make-up it 30% solution.

Chemical reaction :

Cetyl dimethyl amine + Methyl Chloride $\xrightarrow{\text{Iso Propanol+Epitol+Water}}$ **Cetyl Trimethyl Ammonium Chloride**

$C_{18}H_{39}N + CH_3Cl \xrightarrow{\text{Iso Propanol+Epitol+Water}} C_{19}H_{42}NCl$

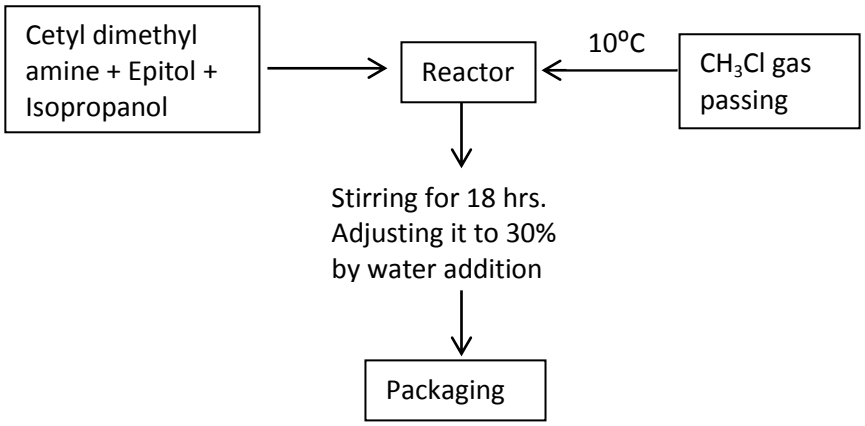
(269) + (50.5) $\longrightarrow$ (319.5)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
cetyl dimethyl amine	250.00	cetyl trimethyl ammonium chloride 30 %	1000	
methyl chloride	68.00			
iso propanol	100.00	handling loss	8.00	
epitol	10.00			
water	580.00			
TOTAL	**1008.00**	**TOTAL**	**1008.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
all solvents will be used in the process				

Process Flow Diagram:



7. Ethyl Triphenyl Phosphonium Bromide

Manufacturing Process:

The Acetonitrile and Tri phenyl phosphine will be taken in the reactor. At 20 °C ethyl bromide will be charged in to it. That mixture will be stirred well for about 12 hr. temperature will be maintained 80 °C in the reactor. Now reflux will be done at 80 °C for 24 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50°C than packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri Phenyl Phosphine + Ethyl Bromide $\xrightarrow{\text{Acetonitrile}}$ **Ethyl Triphenyl Phosphonium Bromide**

$C_{18}H_{15}P + C_2H_5Br \xrightarrow{\text{Acetonitrile}} C_{20}H_{20}PBr$

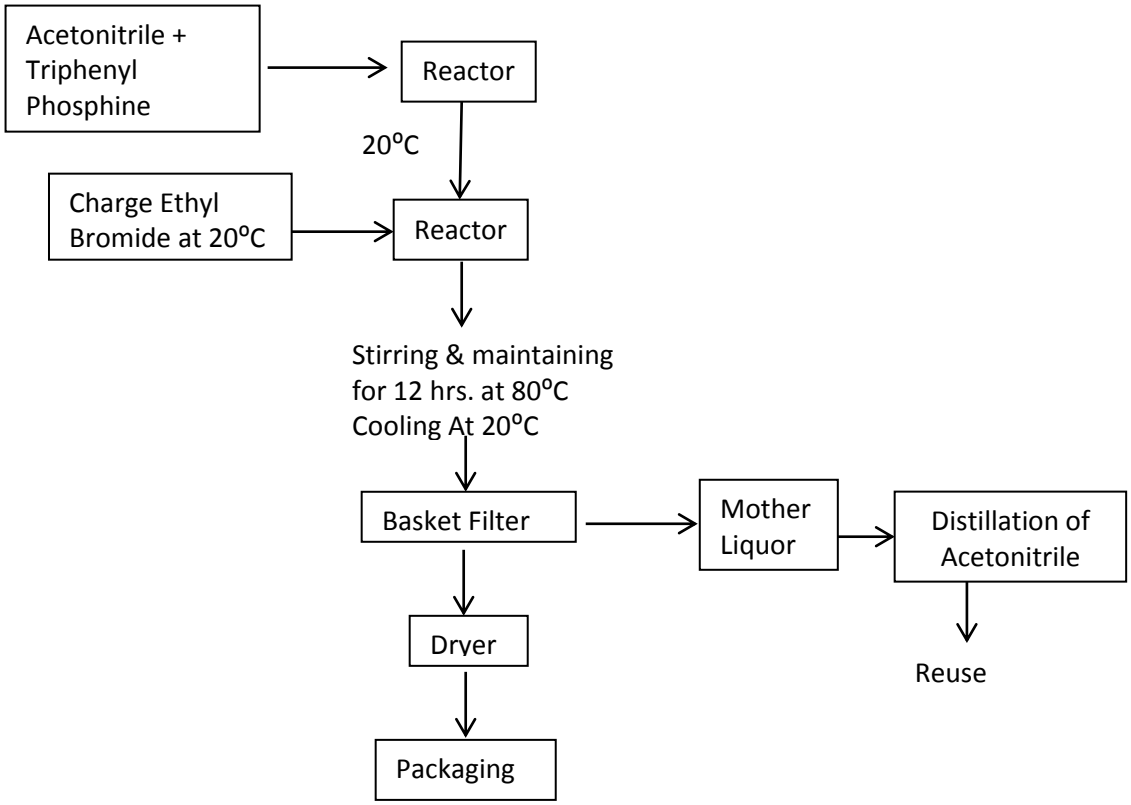
(262) + (109) $\longrightarrow$ (371)

Mass Balance :

Input	KG/BATCH	Output	KG/BATCH	Remark
Tri phenyl phosphine	720.00	ethyl triphenyl phosphonium bromide	1000	
ethyl bromide	330.00			
acetonitrile	1100.00	Drying loss	50	
		Solvent recovered	1070.00	Reuse after distillation
		distillation residue	25.00	for incineration
		handling loss	5.00	
TOTAL	**2150.00**	**TOTAL**	**2150.00**	

Item	Input (MT)	Recovery (MT)	Loss (MT)	% Recovery
acetonitrile	1100.00	1070.00	30	97.3%

Process Flow Diagram :



8. Lauryl Pyridinium Chloride

Manufacturing Process:

The Water and pyridine will be taken in the reactor. At 40 °C Lauryl chloride and water will be charged in to it. That mixture will be stirred well for about 10 hr. Temperature will be maintained 80 °C in the reactor. Now reflux will be done at 100°C for 30 hrs. This mixture will be cooled to 20 °C. Chilled and charge Acetone and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C than packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Pyridine + Lauryl Chloride + Water $\xrightarrow{\text{Acetone}}$ **Lauryl Pyridinium Chloride**

$C_5H_5N + C_{15}H_{22}Cl + H_2O \xrightarrow{\text{Acetonitrile}} C_{20}H_{27}NCl \cdot H_2O$

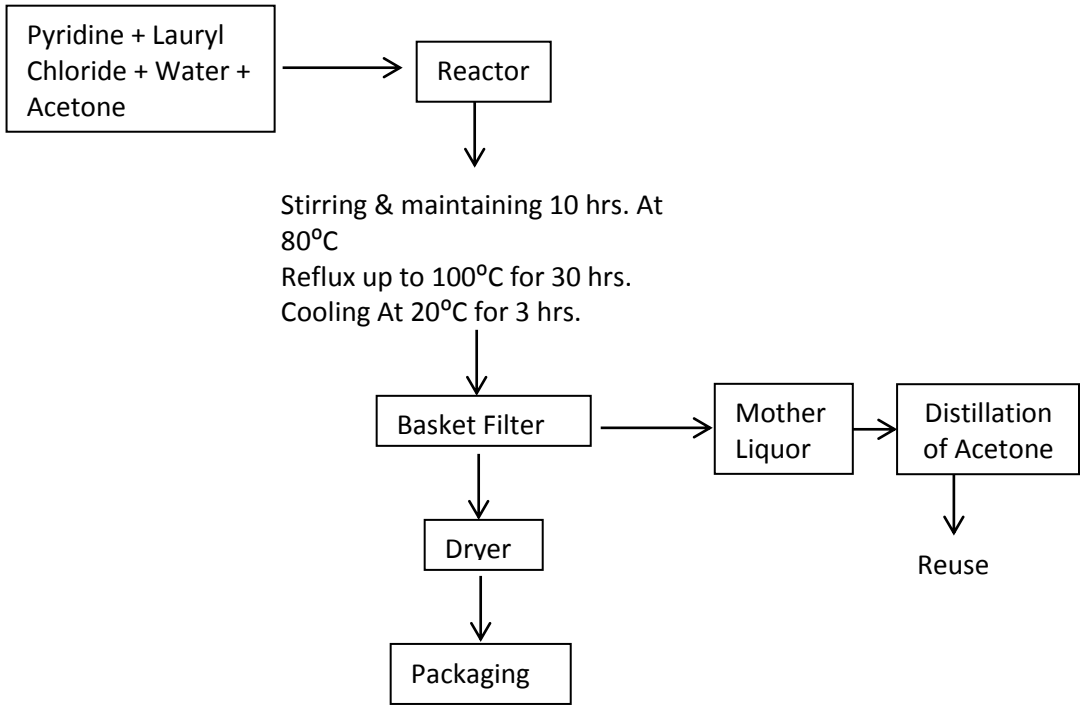
(79) + (237.5) + (18) $\longrightarrow$ (334.5)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
pyridine	315.00	lauryl pyridinium chloride	1000	
lauryl chloride	700.00			
water	50.00			
acetone	1000.00	drying loss	50	
		process residue	15.00	
		Solvent recovered	960.00	Reuse after distillation
		distillation residue	15.00	for incineration
		handling loss	25.00	
TOTAL	**2065.00**	**TOTAL**	**2065.00**	

Item	Input (kg)	Recovery (kg)	Loss (kg)	% Recovery
acetone	1000.00	960.00	40.00	96.0%

Process Flow Diagram :



9. Methyl Tri Butyl Ammonium Chloride.75% Solution

Manufacturing Process:

The Acetonitrile and Tri butyl amine will be taken in the reactor. At 30 °C Methyl chloride will be charged in to it. That mixture will be stirred well for about 24 hr. Temperature will be maintained 30 °C in the reactor and distilled out acetonitrile, Distilled then reused it for next batch of reactions. Charge water & this mixture will be cooled to 20 °C. Chilled and stirred for about 1 hr at 20 °C. Apply charcolization and the final mass filtered in cartage filter and packed it in the drum.

Chemical reaction :

Tri Butyl Amine + Methyl Chloride $\xrightarrow{\text{Acetonitrile+water}}$ **Methyl Tri Butyl Ammonium Chloride**

$C_{12}H_{27}N + CH_3Cl \xrightarrow{\text{Acetonitrile+water}} C_{13}H_{30}NCl$

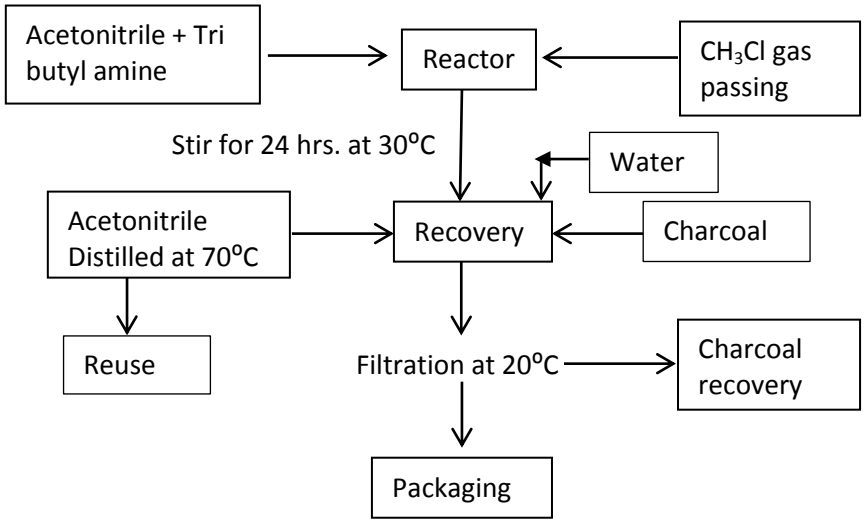
(185) + (50.50) $\longrightarrow$ (235.5)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri butyl amine	600.00	methyl tributyl ammonium chloride 75 %	1000	
methyl chloride	155.00			
acetonitrile	350.00	recovered solvent	335.00	Reuse after distillation
charcoal	10.00	distillation residue	10.00	for incineration
water	250.00	handling loss	5.00	
		spent charcoal	15.00	for incineration
TOTAL	**1365.00**	**TOTAL**	**1365.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
acetonitrile	350.00	335.00	15	95.7%

Process Flow Diagram :



10. Methyl Tri Octyl Ammonium Chloride. 85%

Manufacturing Process:

The Acetonitrile, Iso propanol and Tri octyl amine will be taken in the reactor. At 50 °C Methyl chloride will be charged in to it. That mixture will be stirred well for about 24 hrs. temperature will be maintained 70 °C in the reactor. This mixture will be cooled to 20 °C. Chilled charge Glycerine, Octyl alcohol and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The Recovered soda ash remove and clear Mother liquor will be charge into the same reactor and distilled out Acetonitrile up to final residual mass of MTOACL will be 85 % as per requirement. Final product packed into a drum by filtration.

Chemical reaction :

Acetonitrile+Iso Propanol

Tri Octyl Amine + Methyl Chloride ⟶ **Methyl Tri Octyl Ammonium Chloride**

Acetonitrile+Iso Propanol

$C_{24}H_{51}N$ + CH_3Cl ⟶ $C_{25}H_{54}NCl$

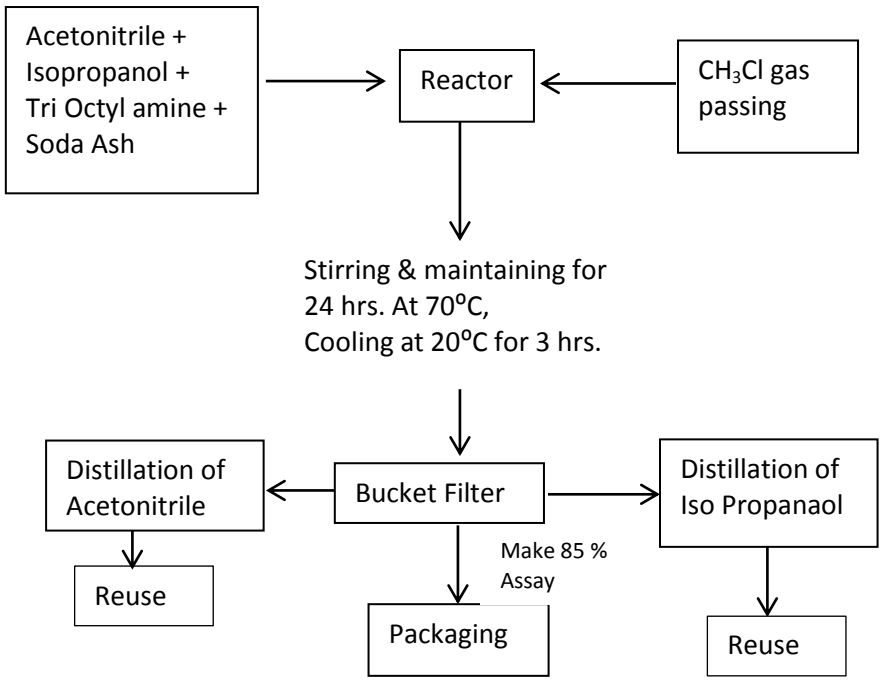
(353) + (50.50) ⟶ (403.5)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri octylamine	770	methyl trioctyl ammonium chloride 95 %	950	
methyl chloride	150			
iso propanol	230	recovered solvent	440	Reuse after distillation
glycerine	10	distillation residue	10	for common incineration
octyl alcohol	10	handling loss	10	
soda ash	10			
acetonitrile	230			
TOTAL	**1410.00**	**TOTAL**	**1410.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
iso propanol	230.00	220.00	10.00	96%
acetonitrile	230.00	220.00	10.00	96%

Process flow diagram :



11. Methyl Triphenyl Phosphonium Bromide

Manufacturing Process:

First of all sodium bromide & dimethyl sulphate will be taken in other reactor at 20 °C to generate Methyl bromide gas, at the end of reaction sodium sulphate slurry will be generated & it will be disposed to common incinerator.

In the main reactor Toluene and Tri phenyl phosphine will be taken. Methyl Bromide gas will be passed into reaction mixture. That mixture will be stirred well for about 5 hrs. Temperature will be maintained 40 °C in the reactor. Now reflux will be done at 80 °C for 12 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs. in the dryer at 50 °C. Then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

First stage :

Sodium Bromide + Di Methyl Sulphate $\longrightarrow$ Methyl Bromide + Sodium Sulphate

$2NaBr + CH_3SO_4CH_3 \longrightarrow 2CH_3Br + Na_2SO_4$

(206) + (126) $\longrightarrow$ 2(95) + 142.06

Second stage :

Tri phenyl phosphine + Methyl Bromide $\xrightarrow{\text{Toluene}}$ **Methyl Triphenyl Phosphonium Bromide**

$C_{18}H_{15}P + CH_3Br \xrightarrow{\text{Toluene}} C_{19}H_{18}PBr$

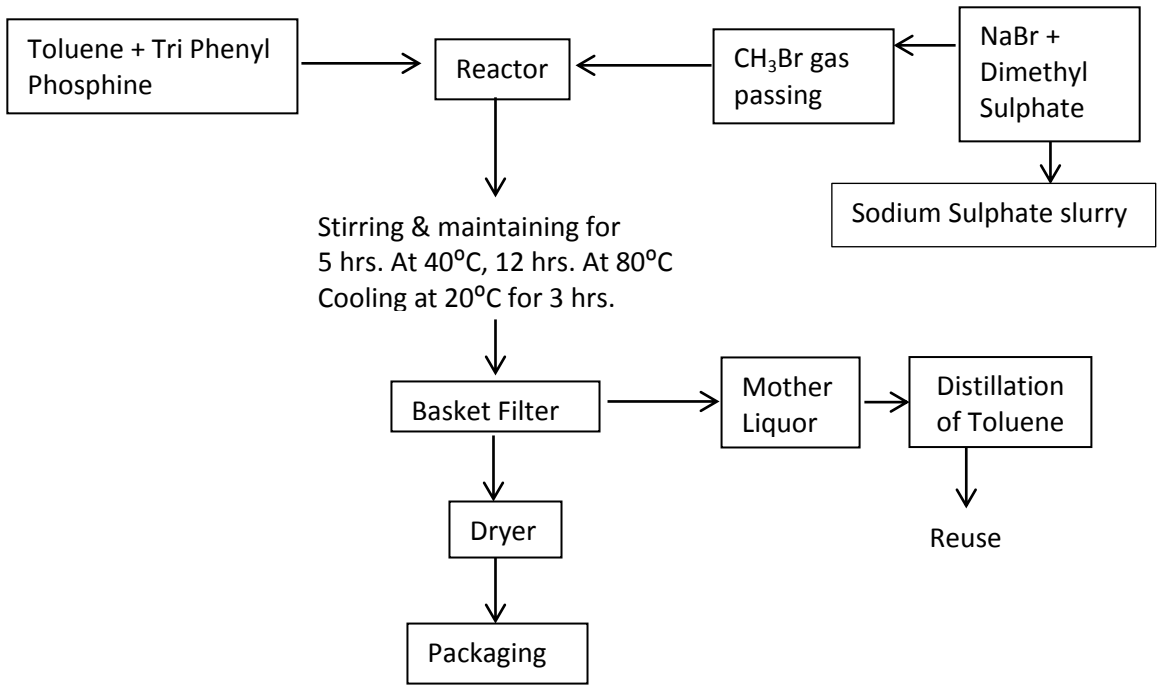
(262) + (95) $\longrightarrow$ (357)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri phenyl phosphine	800	methyl triphenyl phosphonium bromide	1000	
dimethyl sulphate	400			
sodium bromide 40 % soln	800	sodium sulphate	1000	for common incineration
toluene	600	recovered solvent	580	Reused after distillation
		distillation residue	15	for common incineration
		handling loss	5	
TOTAL	**2600.00**	**TOTAL**	**2600.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
toluene	**600**	**580**	**20**	**96.67**

Process Flow Diagram :



12. Phenyl Trimethyl Ammonium Chloride

Manufacturing Process:

The Methanol and N, N-Dimethyl Aniline are taken in the reactor. At 30 °C Methyl chloride is charged in to it. That mixture will be stirred well for about 28 hrs. Temperature will be maintained 30 °C, distilled out all methanol and Add Sodium Hydro sulphide in the reactor, distilled methanol will be reused it for next batch of reactions. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs. at 20 °C. This mixture will be cooled to 20 °C. Chilled and stirred for about 1 hr at 20 °C. The final mass filtered in cartage filter and packed it in the drum. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum.

Chemical reaction :

N N Di methyl aniline + Methyl Chloride $\xrightarrow{\text{Methanol}}$ **Phenyl Tri Methyl ammonium chloride**

$C_8H_{11}N + CH_3Cl \xrightarrow{\text{Methanol}} C_9H_{14}NCl$

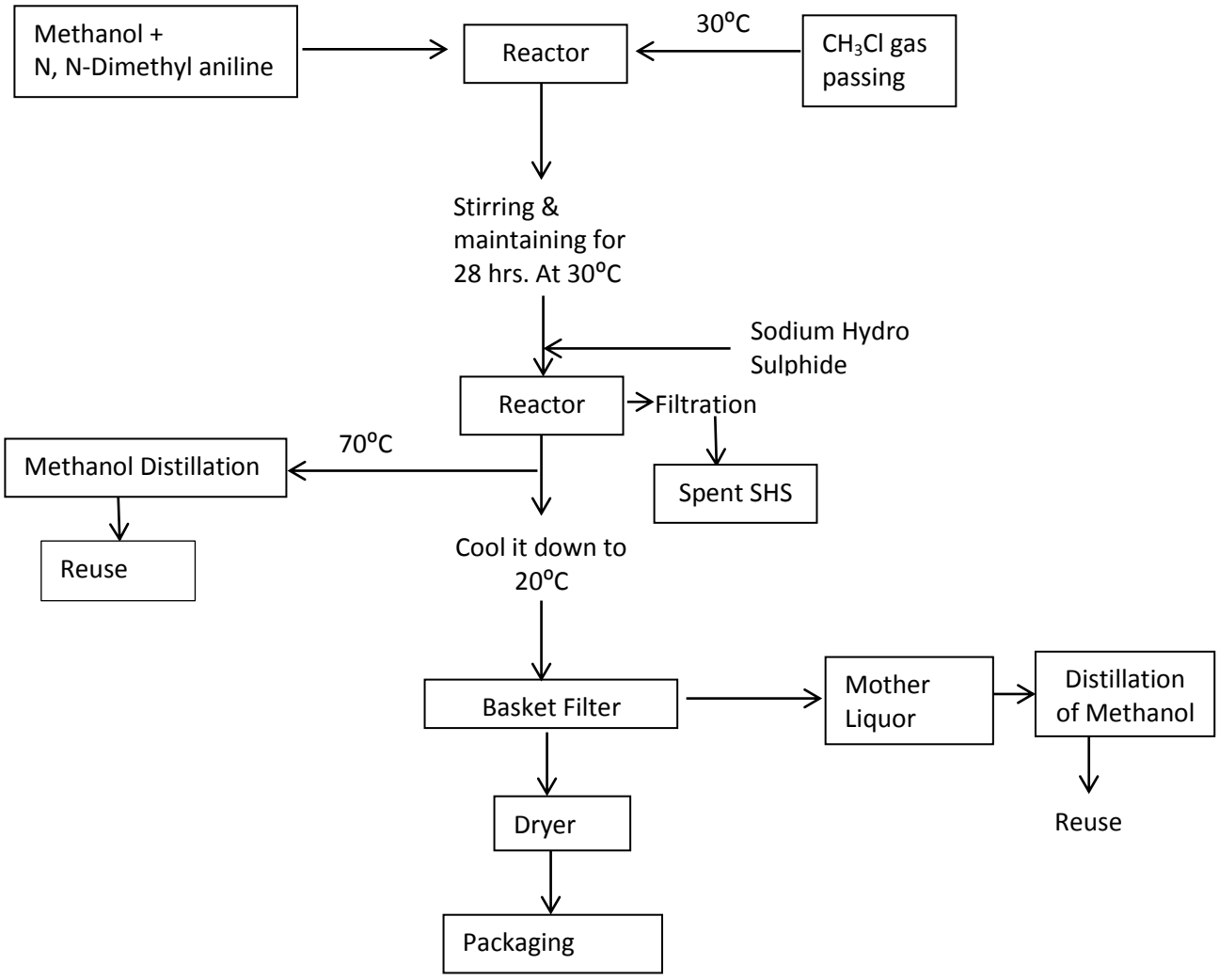
(121) + (50.50) $\longrightarrow$ (171.50)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
N N - dimethyl aniline	690.00	phenyl trimethyl ammonium chloride	958	
methyl chloride	310.00			
methanol	750.00	rec. solvent	735.00	Reuse after distillation
sodium hydro sulphide (Cat)	100.00	distillation residue	10	for common incineration
		handling loss	5	
		sodium hydro sulphide (Catalyst waste)	100.00	for common incineration
		process residue	42.00	for common incineration
TOTAL	**1850.00**	**TOTAL**	**1850.00**	

Item	Input (kg)	Recovery (kg)	Loss (kg)	% Recovery
methanol	750.00	735.00	15.00	98.0%

Process Flow Diagram :



13A. Tetra Butyl Ammonium Bromide (Powder)

Manufacturing Process:

The Acetonitrile and Tri n butyl amine will be taken in the reactor. At 50 °C Butyl bromide will be charged in to it. That mixture will be stirred well for about 24 hr. Temperature will be maintained 70 °C in the reactor. This mixture will be cooled at 50 °C. Distilled out & distilled Acetonitrile will be reused in next batch. Residual mass mix with ethyl acetate & stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and than packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri n Butyl Amine + Butyl Bromide $\xrightarrow{\text{Acetonitrile+Ethyl Acetate}}$ **Tetra Butyl Ammonium Bromide**

$C_{12}H_{27}N + C_4H_9Br \xrightarrow{\text{Acetonitrile+Ethyl Acetate}} C_{16}H_{36}NBr$

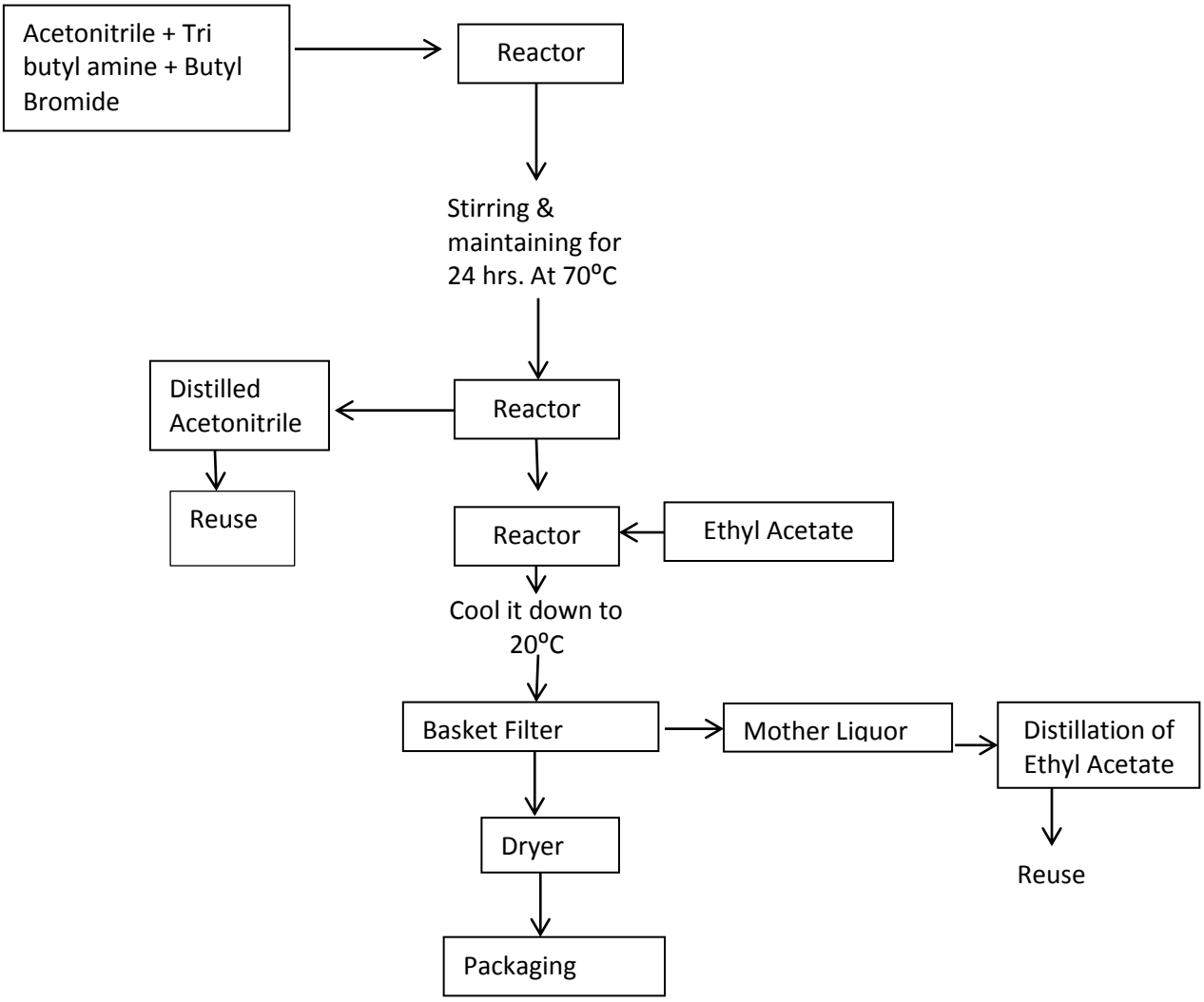
(185) + (137) $\longrightarrow$ (322)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri n- butylamine	550.00	tetra butyl ammonium bromide (powder)	950	
butyl bromide	450.00			
acetonitrile	300.00	product drying loss	50.00	
ethyl acetate	400.00	rec. solvent	670.00	Reuse after distillation
		handling loss	10.00	
		distillation residue	20.00	for common incineration
TOTAL	**1700.00**	**TOTAL**	**1700.00**	

Item	**Input (kg)**	**Recovery (MT)**	**Loss (kg)**	**% Recovery**
acetonitrile	**300.00**	**285**	**15**	**95**
ethyl acetate	**400.00**	**385**	**15**	**96.25**

Process Flow Diagram :



13B. Tetra Butyl Ammonium Bromide (Solution)

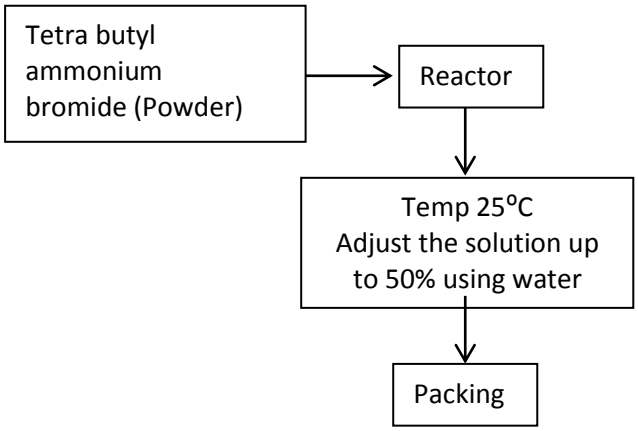
Manufacturing Process:

Tetra Butyl Ammonium Bromide (Powder) will be mixed with water to form solution of Tetra Butyl Ammonium Bromide.

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tetra butyl ammonium bromide (powder)	950	tetra butyl ammonium bromide (solution)	1880	
water	940	handling loss	10	
TOTAL	**1890**	**TOTAL**	**1890**	

Process Flow Diagram :



14. Tetra Butyl Ammonium Chloride

Manufacturing Process :

The Toluene, Methanol and Tetra butyl ammonium bromide will be taken in the reactor. At 50 °C potassium hydroxide will be charged in to it. That mixture will be stirred well for about 24 hrs. Temperature will be maintained 30 °C in the reactor. Apply filtration for Potassium Bromide powder removed. Mother Liquor will be cooled to 20 °C and charge Hydrochloric acid. And stirred for about 12 hrs at 20 °C. Distilled out all solvent up to powder formation the final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Toluene + Methanol

Tetra butyl ammonium bromide + Potassium Hydroxide + HCl → **Tetra butyl ammonium chloride** + Potassium Bromide + water

Toluene + Methanol

$C_{16}H_{36}NBr + KOH + HCl \longrightarrow C_{16}H_{36}NCl + KBr + H_2O$

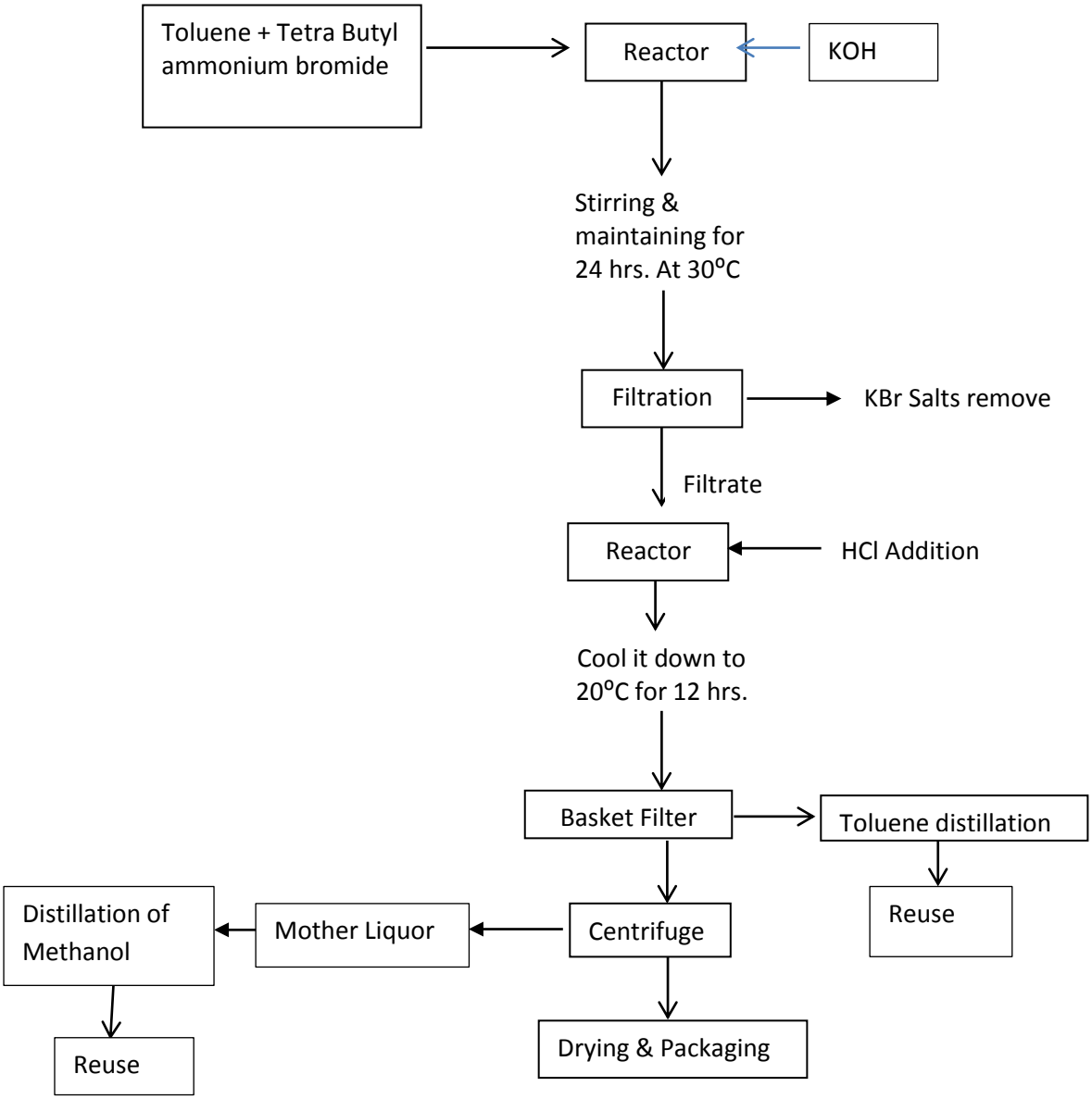
(321) + (56) + (36.5) → (277.5) + (118) + (18)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tetra butyl ammonium bromide	1200.00	tetra butyl ammonium chloride	900	
potassium hydroxide	320.00			
toluene	2240.00	drying loss	50.00	
hydrochloric acid (35 %)	480.00	potassium bromide salt	400	
methanol	2640.00	recovered solvent	4675.00	Reuse after distillation
		distillation residue	15.00	for incineration
		handling loss	190.00	
		process residue	450.00	for incineration

		waste water	200.00	to ETP
TOTAL	**6880.00**	**TOTAL**	**6880.00**	
Item	**Input (kg/batch)**	**Recovery (kg/batch)**	**Loss (kg/batch)**	**% Recovery**
toluene	2240.00	2150.00	90.00	96.0%
methanol	2640.00	2525.00	115.00	95.6%

Process flow diagram:



15. Tetra Butyl Ammonium Hydrogen Sulphate

Manufacturing Process :

Butanol and Tetra butyl ammonium bromide will be taken in the reactor. At 25 °C sulphuric acid will be charged in to it. That mixture will be stirred well for about 24 hrs. Temperature will be maintained 80 °C in the reactor. Distilled out Butanol &This mixture will be cooled to 20 °C. Chilled and charge MDC, Soda Ash & Sodium Hydrogen Sulphate and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions and after distillation collect residual sodium bromide powder as a process residue.

Chemical reaction :

Tetra Butyl ammonium bromide + Sodium hydrogen sulphate $\xrightarrow{\text{Butanol+MIBK+MDC}}$ **Tetra Butyl Ammonium hydrogen sulphate** + Sodium Bromide

$C_{16}H_{36}NBr + NaHSO_4 \xrightarrow{\text{Butanol+MIBK+MDC}} C_{16}H_{37}NSO_4 + NaBr$

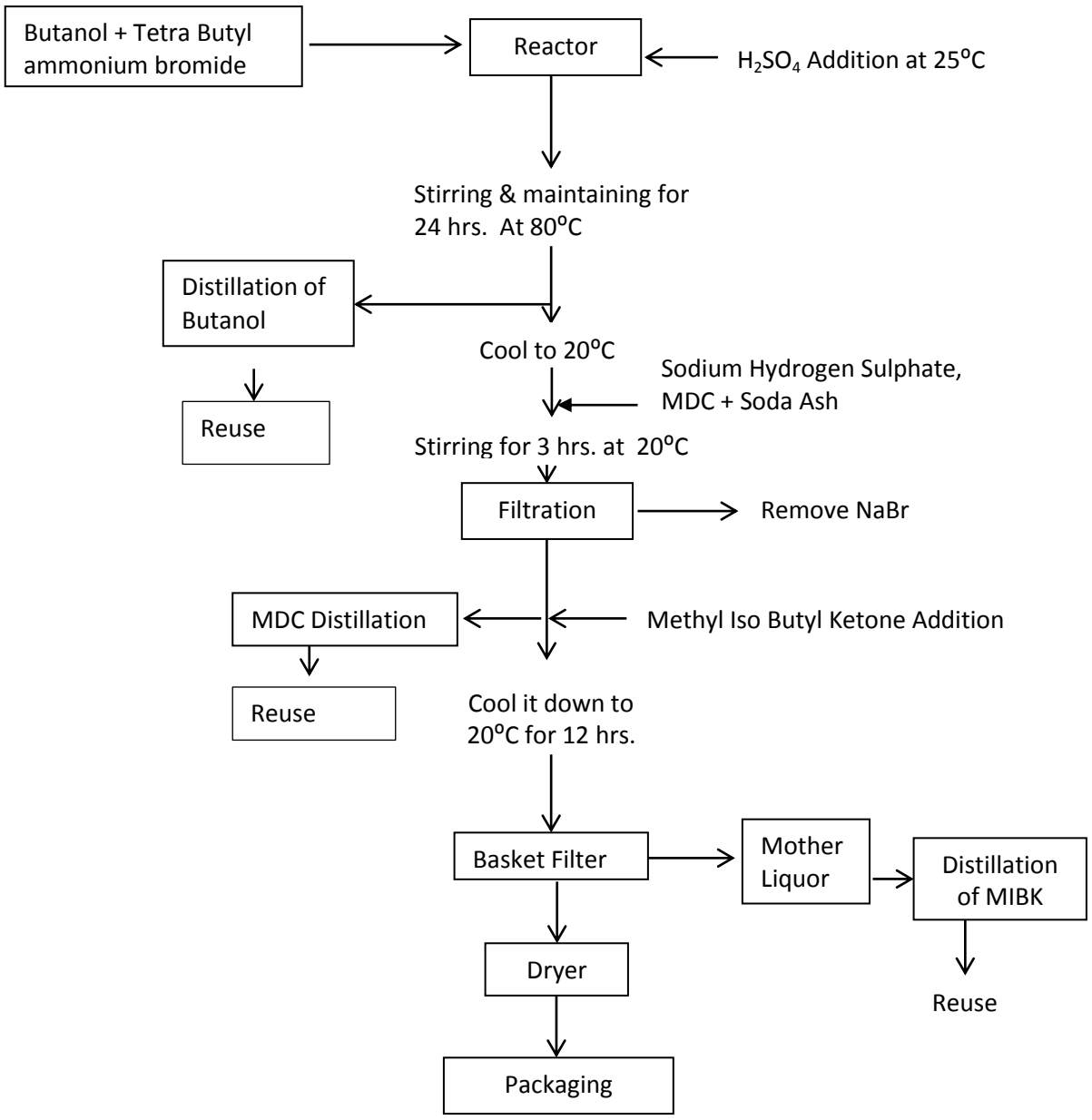
(322) + (120) $\xrightarrow{\text{Butanol+MIBK+MDC}}$ (339) + (103)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tetra butyl ammonium bromide	960.00	tetra butyl ammonium hydrogen sulphate	900	
butanol	1200.00			
sulphuric acid	400.00	sodium bromide	300.00	to TSDF
sodium hydrogen sulphate	120.00	recovered solvent	2690.00	Reuse after distillation
soda ash	120.00	distillation residue	100.00	for incineration
methyl isobutyl ketone	800.00	handling loss	10.00	
methylene dichloride	800.00	process residue	400.00	for incineration
TOTAL	**4400.00**	**TOTAL**	**4400.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
butanol	1200.00	1154.00	46.00	96%
methyl isobutyl ketone	800.00	768.00	32.00	96%
methylene dichloride	800.00	768.00	32.00	96%

Process Flow diagram :



16. Tetra Butyl Ammonium Iodide

Manufacturing Process

The methanol and Tetra butyl ammonium bromide will be taken in the reactor. At 50 °C potassium iodide will be charged in to it. That mixture will be stirred well for about 24 hr. temperature will be maintained 70 °C in the reactor distilled out methanol & charge ethyl acetate, this mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions and after distillation collect residual potassium bromide powder.

Chemical reaction :

Tetra butyl ammonium bromide + Potassium Iodide $\xrightarrow{\text{(Methanol+Ethyl Acetate)}}$ **Tetra Butyl Ammonium iodide** + Potassium Bromide

$C_{16}H_{36}NBr$ + KI $\xrightarrow{\text{(Methanol+Ethyl Acetate)}}$ $C_{16}H_{36}NI$ + KBr

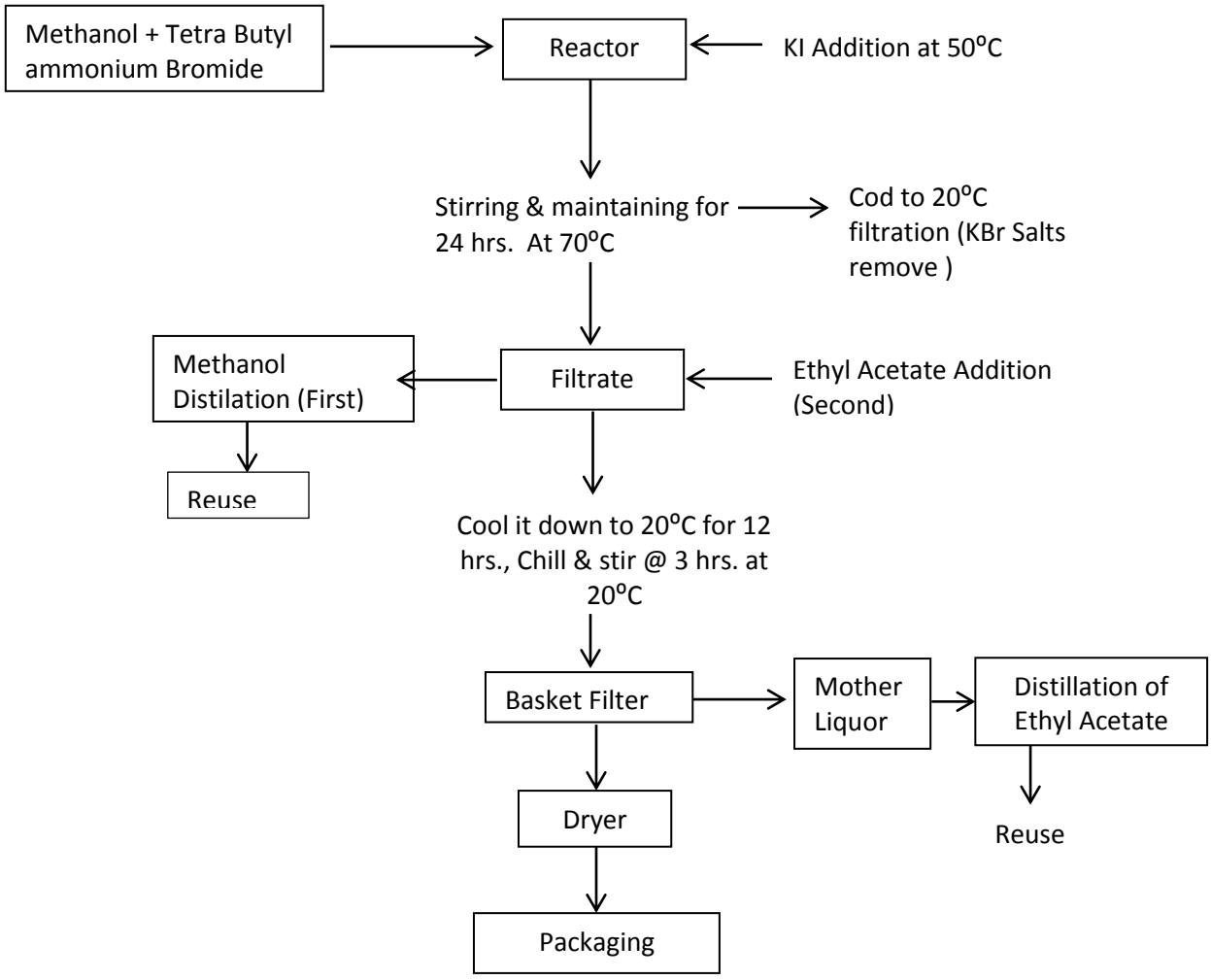
(322) + (166) $\longrightarrow$ (369) + (119)

Mass Balance :

Input	KG/BATCH	Output	KG/BATCH	Remark
tetra butyl ammonium bromide	1000.00	tetra butyl ammonium iodide	1000	
potassium iodide	500.00			
ethyl acetate	1000.00	potassium bromide salt	450.00	for TSDF site
methanol	2000.00	drying loss	50.00	
		recovered solvent	2890.00	Reuse after distillation
		loss of solvent	105.00	
		distillation residue	5.00	for common incineration
TOTAL	**4500.00**	**TOTAL**	**4500.00**	

Item	Input (KG/BATCH)	Recovery (KG/BATCH)	Loss (KG/BATCH)	% Recovery
ethyl acetate	1000.00	990	10	99%
methanol	2000.00	1900.00	100.00	95%

Process flow diagram :



17. Tetra Methyl Ammonium Chloride

Manufacturing Process :

Isopropanol will be taken in the reactor. At 30 °C Methyl chloride and Trimethyl amine will be charged in to it. That mixture will be stirred well for about 28 hrs. Temperature will be maintained 70 °C .This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. This mixture will be cooled to 15 °C. Chilled and stirred for about 1 hr. at 15 °C and filtration through basket filter, the powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. From mother liquor distilled out solvent and re-use in next batch.

Chemical reaction :

Tri Methyl Amine + Methyl Chloride $\xrightarrow{\text{Iso Propanol}}$ **Tetra Methyl Ammonium Chloride**

$C_3H_9N + CH_3Cl \xrightarrow{\text{Iso Propanol}} C_4H_{12}NCl$

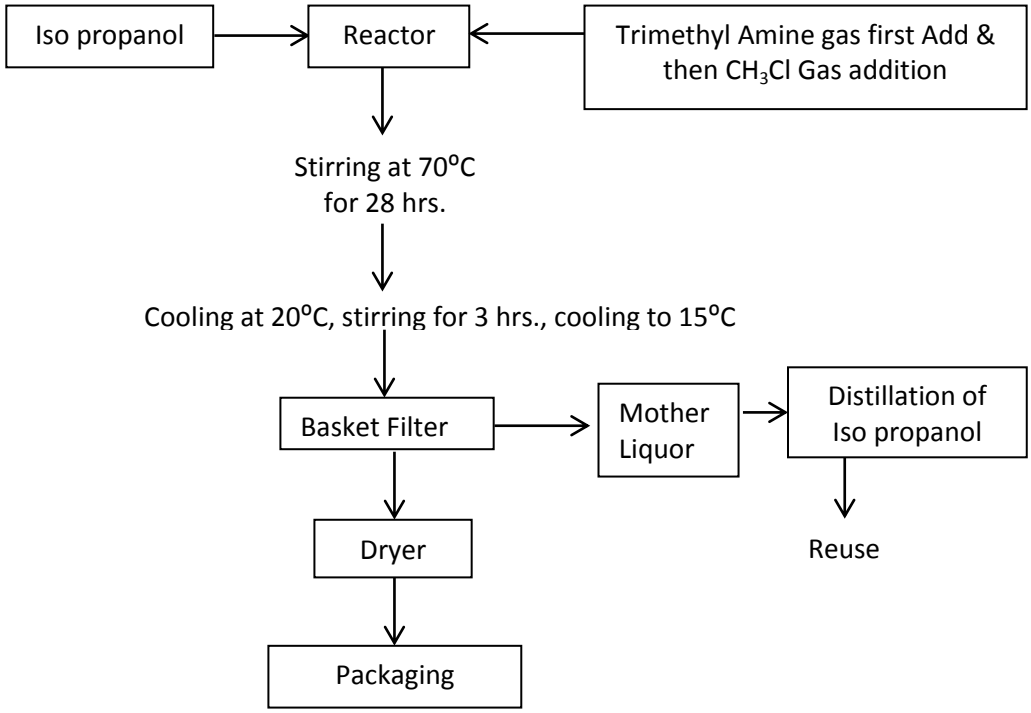
(59) + (90) $\longrightarrow$ (91)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri methyl amine	540.00	tetra methyl ammonium chloride	950	
methyl chloride	460.00			
iso propanol	500.00	drying loss	50	
		Solvent recovered	485.00	Reuse after distillation
		dist. Residue	8.00	for incineration
		handling loss	7.00	
TOTAL	**1500.00**	**TOTAL**	**1500.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
iso propanol	500.00	485.00	15.00	97.0%

Process Flow Diagram:



18. Tetra Octyl Ammonium Bromide

Manufacturing Process:

The Acetonitrile, Tri octyl amine and octyl bromide will be taken in the reactor. That mixture will be stirred well for about 24 hrs. Temperature will be maintained 70 °C in the reactor. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass will be filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri octyl Amine + Octyl bromide $\xrightarrow{\text{Acetonitrile+Ethyl Acetate+Iso Propanol}}$ **Tetra Octyl Ammonium Bromide**

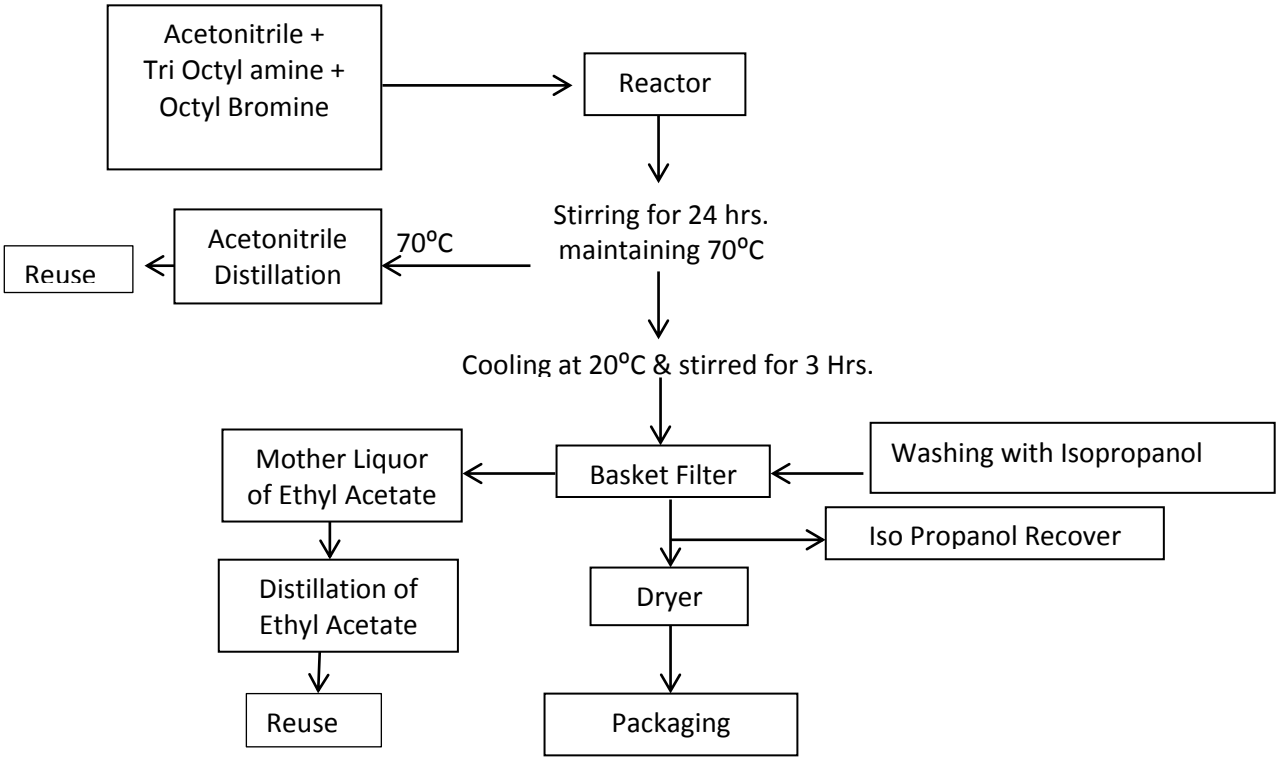
$C_{24}H_{51}N + C_8H_{17}Br \xrightarrow{\text{Acetonitrile+Ethyl Acetate+Iso Propanol}} C_{32}H_{68}NBr$

(353) + (193) $\longrightarrow$ (546)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri octyl amine	610.00	tetra octyl ammonium bromide	950	
octyl bromine	350.00			
acetonitrile	460.00	drying loss	10	
ethyl acetate	460.00	recovered solvent	920.00	Reuse after distillation
iso propanol	40.00	dist. Residue	22.00	for incineration
		handling loss	18.00	
TOTAL	**1920.00**	**TOTAL**	**1920.00**	
Item	**Input (MT)**	**Recovery (MT)**	**Loss (MT)**	**% Recovery**
acetonitrile	460.00	441.00	19.00	95.9%
ethyl acetate	460.00	441.00	19.00	95.9%
iso propanol	40.00	38.00	2.00	95.0%

Process Flow diagram :



19. Tetra Ethyl Ammonium Bromide

Manufacturing Process:

The Toluene and Tri ethyl amine will be taken in the reactor. At 15 °C Ethyl bromide will be charged in to it. That mixture will be stirred well for about 24 hr. Temperature will be maintained 70 °C in the reactor. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri ethyl Amine + Ethyl Bromide $\xrightarrow{\text{Toluene+Iso Propanol}}$ **Tetra Ethyl Ammonium Bromide**

$C_6H_{15}N + C_2H_5Br \xrightarrow{\text{Toluene+Iso Propanol}} C_8H_{20}NBr$

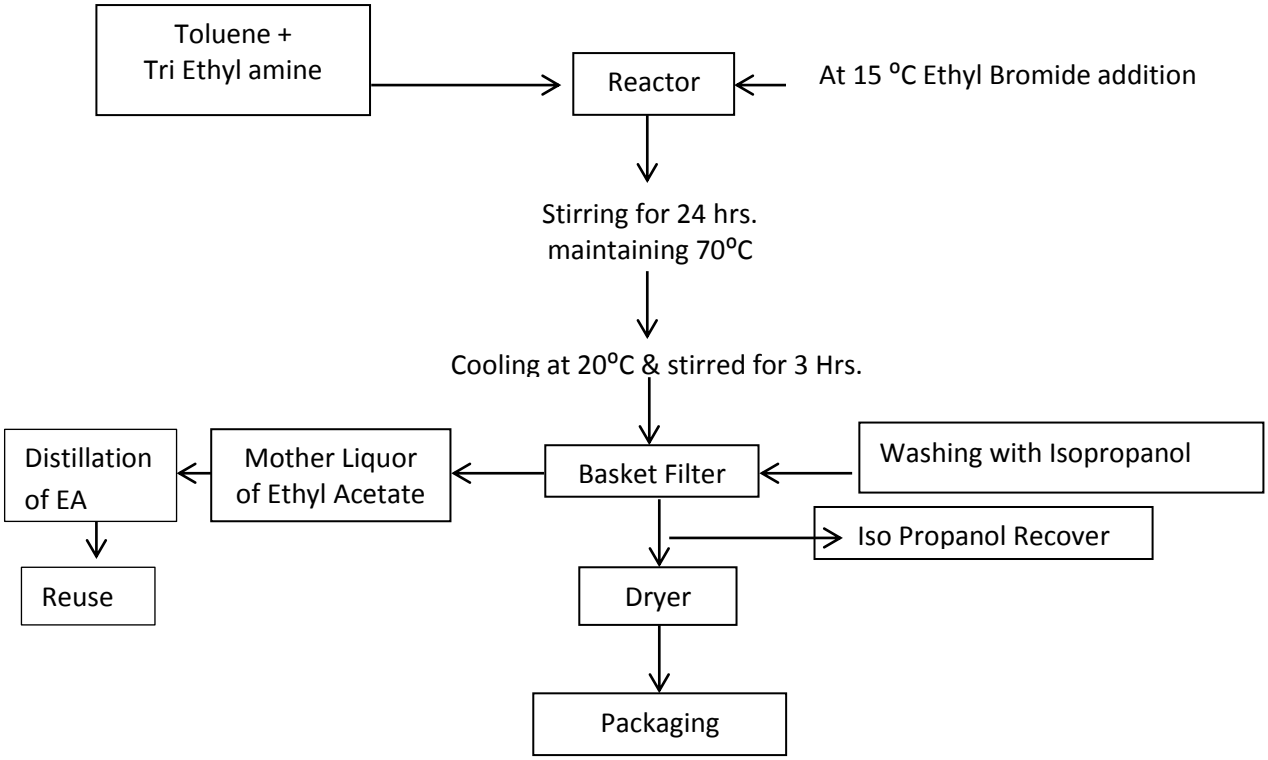
(101) + (109) $\longrightarrow$ (210)

Mass Balance :

Input	Kg/batch	Output	Kg/batch	Remark
tri ethyl amine	460.00	tetra ethyl ammonium bromide	975	
ethyl bromide	530.00			
toluene	300.00			
iso propanol	60.00	drying loss	15.00	
		Solvent recovered	340.00	Reuse after distillation
		distillation residue	10	for common incineration
		handling loss	10	
TOTAL	**1350.00**	**TOTAL**	**1350.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
toluene	**300.00**	**290**	**10**	**96.67%**
iso propanol	**60.00**	**50.00**	**10**	**83.33%**

Process Flow Diagram :



20. Benzyl Triethyl Ammonium Chloride

Manufacturing Process:

Toluene, Iso propanol and Triethyl amine are taken in the reactor. At 50 °C and Benzyl chloride will be charged in to it. That mixture will be stirred well for about 10 hr. temperature will be maintained 40 °C in the reactor. Now reflux will be done at 40 °C for 46 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri ethyl Amine + Benzyl Chloride $\xrightarrow{\text{Toluene + Iso Propanol}}$ **Benzyl Triethyl Ammonium Chloride**

$C_6H_{15}N + C_7H_7Cl \xrightarrow{\text{Toluene + Iso Propanol}} C_{13}H_{22}NCl$

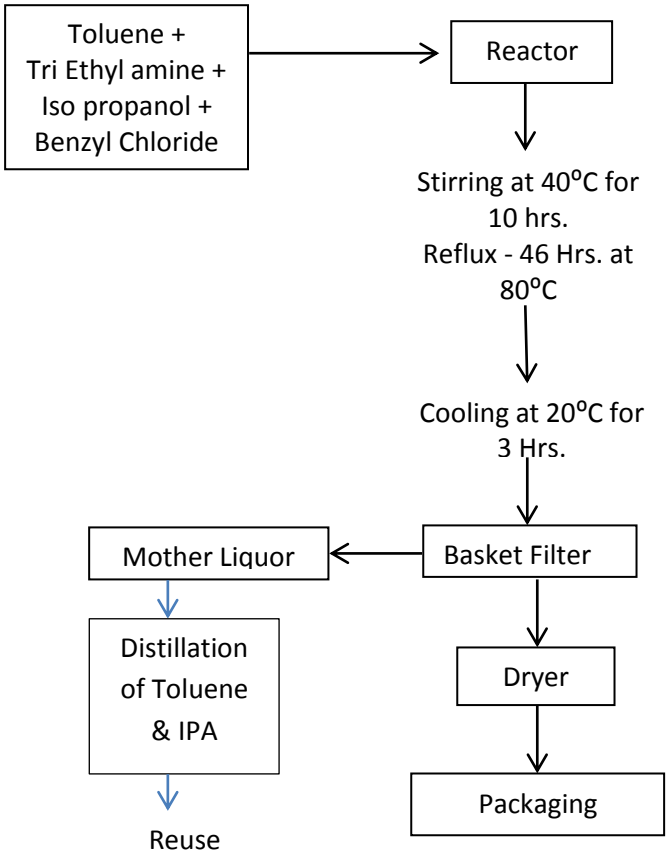
(101) + (126.5) $\longrightarrow$ (227.5)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri ethylamine	440.00	benzyl tri ethyl ammonium chloride	930	
benzyl chloride	520.00			
toluene	290.00	drying loss	30	
iso propanol	60.00	process residue	20	for incineration
dimethyl formamide	20.00	recovered solvent	330.00	Reuse after distillation
		distillation residue	10.00	for incineration
		handling loss	10.00	
TOTAL	**1330.00**	**TOTAL**	**1330.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
toluene	290.00	280	10.00	96.55
iso propanol	60.00	50.00	10.00	83.33

Process Flow Diagram :



21. Benzalkonium Chloride 50% Solution

Manufacturing Process:

The Water, Dimethyl formamide and Lauryl Dimethyl amine + Myristyl dimethyl amine mixture are taken in the reactor. At 20 °C and Benzyl chloride will be charged in to it. That mixture will be stirred well for about 18 hr. temperature will be maintained 20 °C in the reactor. This mixture will be cooled to 15 °C. Chilled and stirred for about 3 hrs at 15 °C. The final solution filtered and then packed it in the drum after make-up it 50% solution.

Chemical reaction :

(Myristyl Dimethyl Amine + Benzyl Choride + Lauryl Dimethyl Amine) $\xrightarrow{\text{DMF+Water}}$ **Benzalkonium Chloride**

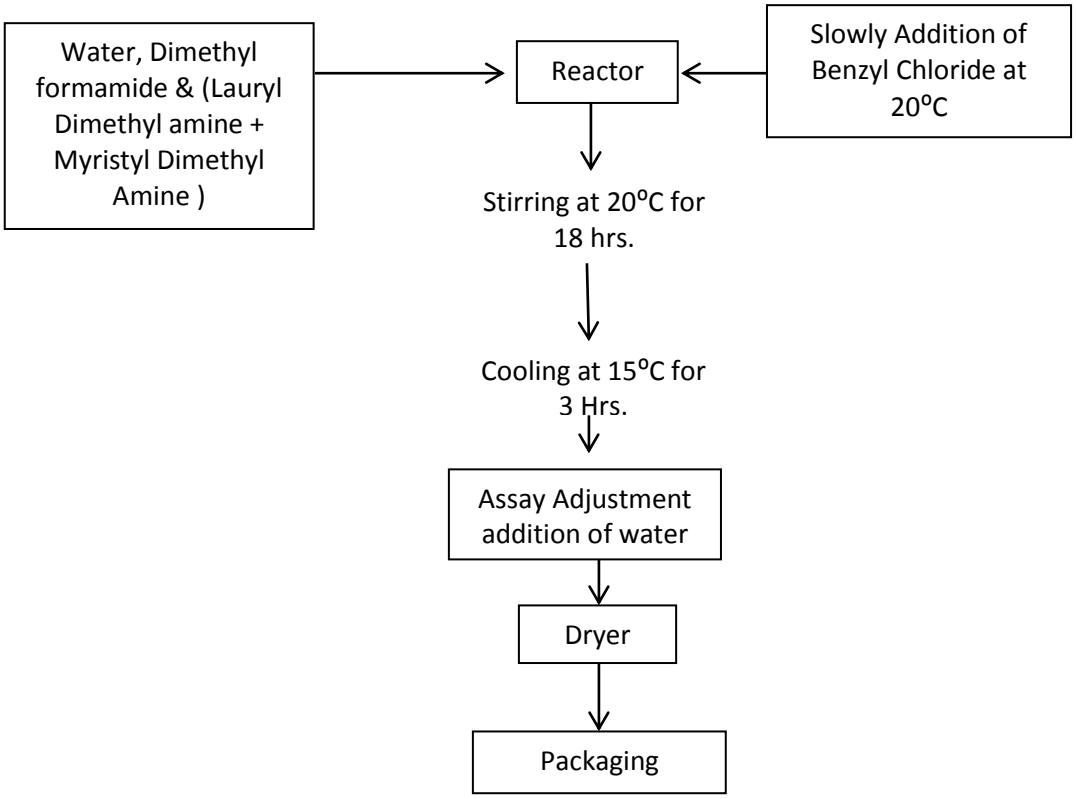
$C_6H_{35}N + C_7H_7Cl \xrightarrow{\text{DMF+Water}} C_{13}H_{42}NCl$

(121) + (126.5) $\longrightarrow$ (247.5)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
myristyl dimethylamine	170.00	benzalkonium chloride 50 %	1000	
lauryl dimethylamine	160.00			
benzyl chloride	260.00			
water	410.00			
TOTAL	**1000.00**	**TOTAL**	**1000.00**	

Process Flow diagram :



22. Tri Butyl Benzyl Ammonium Bromide

Manufacturing Process:

STAGE-1: TRI BUTYL BENZYL AMMONIUM HYDROXIDE 40% IN METHANOL

The Methanol, Tributyl benzyl ammonium chloride & potassium hydroxide will be taken in the reactor. That mixture will be stirred well for about 24 hrs. Temperature will be maintained 50 °C in the reactor. Apply filtration for potassium chloride salts removal. Clear mother liquor will be cooled to 20 °C and transfer into drum. As an intermediate it will be used in next stage-2.

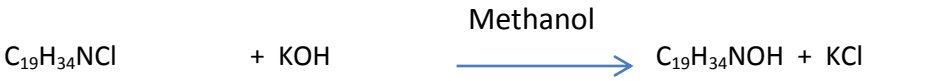
STAGE-2: TRIBUTYL BENZYL AMMONIUM BROMIDE

Charge Tri butyl benzyl ammonium hydroxide in methanol solution into reactor. Add Hydro Bromic acid and stirred for about 12 hrs at 40 °C. The final Product will be filtered in basket filter. The powder will be dried for 8 hrs. in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Stage 1:

tri butyl benzyl ammonium chloride + Potassium Hydroxide —(Methanol)→ Tri butyl benzyl ammonium hydroxide + Potassium Chloride

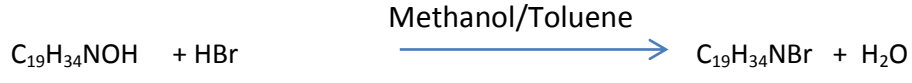


$C_{19}H_{34}NCl + KOH \xrightarrow{Methanol} C_{19}H_{34}NOH + KCl$

(311.5) + (56) → (293) + (74.5)

Stage 2:

Tri butyl benzyl ammonium hydroxide + Hydro bromic acid —(Methanol/Toluene)→ **Tri Butyl Benzyl Ammonium Bromide+** water



$C_{19}H_{34}NOH + HBr \xrightarrow{Methanol/Toluene} C_{19}H_{34}NBr + H_2O$

(293) + (81) → (356) + (18)

Mass balance :

STAGE - 1

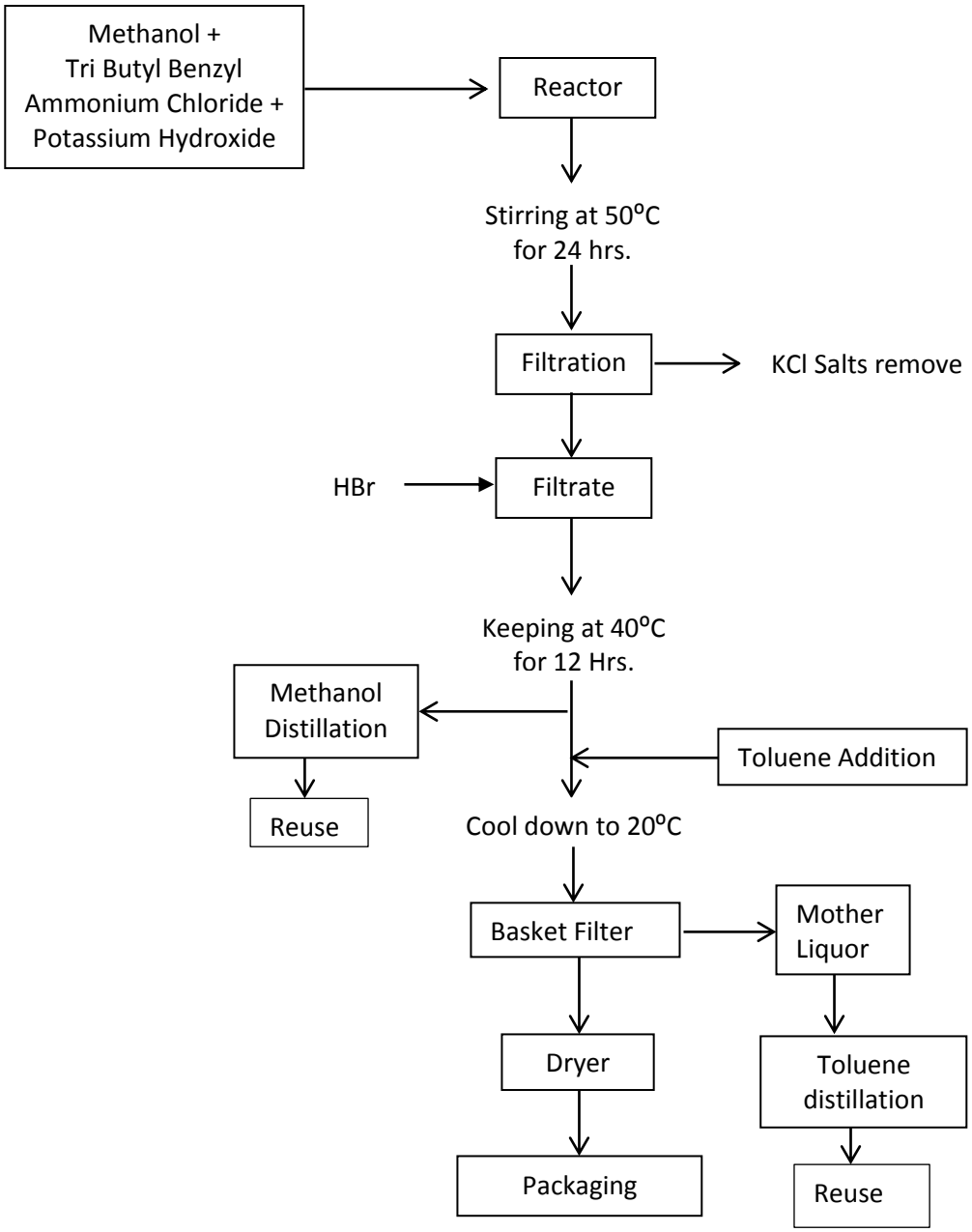
Input	kg/batch	Output	kg/batch	Remark
Tri Butyl benzyl Ammonium Chloride	1000	tri butyl benzyl ammonium hydroxide (stage-1 product)	2500	
potassium hydroxide	330			
methanol	2000	potassium chloride	830	To TSDF
TOTAL	**3330**	**TOTAL**	**3330**	

STAGE - 2

Input	kg/batch	Output	kg/batch	Remark
tri butyl benzyl ammonium hydroxide (stage-1 product)	2500	tri butyl benzyl ammonium bromide	1000	
Hydro bromic acid	830	drying loss	50	
toluene	2000	recovered Methanol + water	1900 +280 = 2180	Reuse in next batch
		Recovered Toluene	1950	Reuse in next batch
		distillation residue	25.00	for incineration
		handling loss	125.00	
TOTAL	**5330**	**TOTAL**	**5330**	

Item	Input (MT)	Recovery (MT)	Loss (MT)	% Recovery
methanol	2000.00	1900.00	100.00	95
toluene	2000.00	1950.00	50.00	97.5

Process Flow diagram :



23. Benzyl Tributyl Ammonium Chloride

Manufacturing Process :

The Toluene and Tri Butyl amine will be taken in the reactor. At 50 °C Benzyl chloride will be charged in to it. This mixture will be stirred well for about 10 hr. Temperature will be maintained 40 °C in the reactor. Now reflux will be done at 80 °C for 46 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass will be filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri Butyl Amine + Benzyl Chloride $\xrightarrow{\text{Toluene}}$ **Benzyl Tributyl Ammonium Chloride**

$C_{12}H_{27}N + C_7H_7Cl \xrightarrow{\text{Toluene}} C_{19}H_{34}NCl$

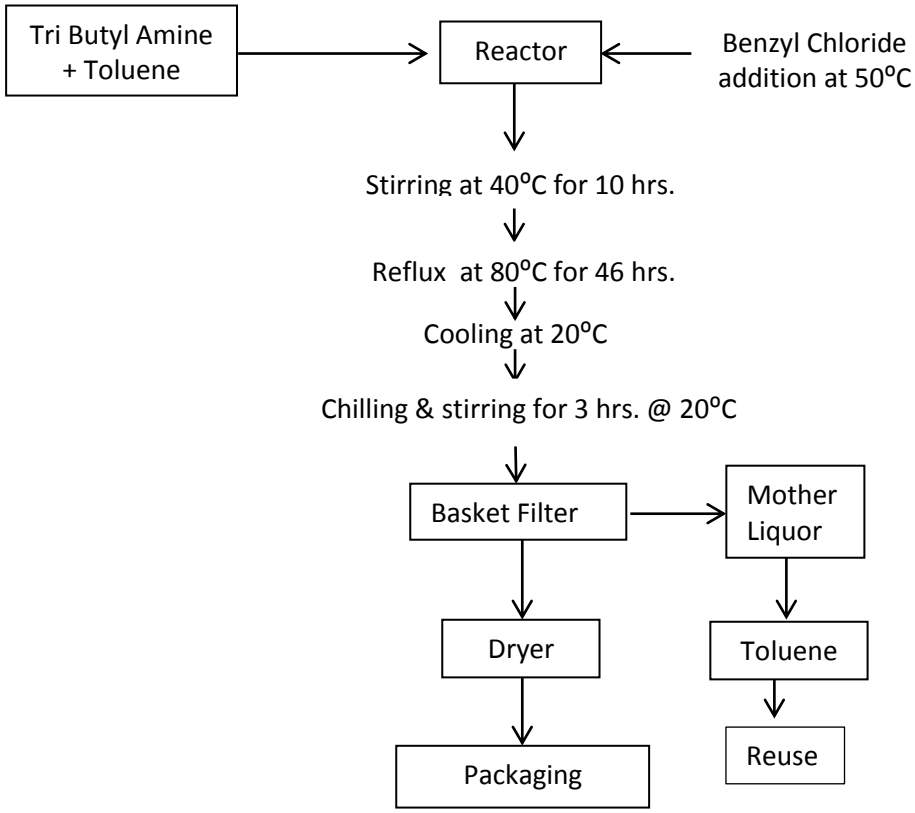
(185) + (126.5) $\longrightarrow$ (311.5)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri n-butylamine	540.00	benzyl tri butyl ammonium chloride	900	
Benzyl chloride	380.00			
toluene	1850.00	drying loss	20	
		Solvent recovered	1780.00	Reuse after distillation
		distillation residue	50.00	for incineration
		handling loss	20.00	
TOTAL	**2770.00**	**TOTAL**	**2770.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
toluene	1850.00	1780.00	70.00	96.2%

Process Flow Diagram :



24. Butyl Triphenyl Phosphonium Bromide

Manufacturing Process :

The Toluene and Tri phenyl phosphine will be taken in the reactor. At 20 °C Butyl bromide will be charged in to it. That mixture will be stirred well for about 12 hr. Temperature will be maintained 20 °C in the reactor. Temperature will be maintained 80 °C for 24 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass will be filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C then packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri Phenyl Phosphine + Butyl Bromide $\xrightarrow{\text{Toluene}}$ **Butyl Triphenyl Phosphonium Bromide**

$C_{18}H_{15}P + C_4H_9Br \xrightarrow{\text{Toluene}} C_{22}H_{24}PBr$

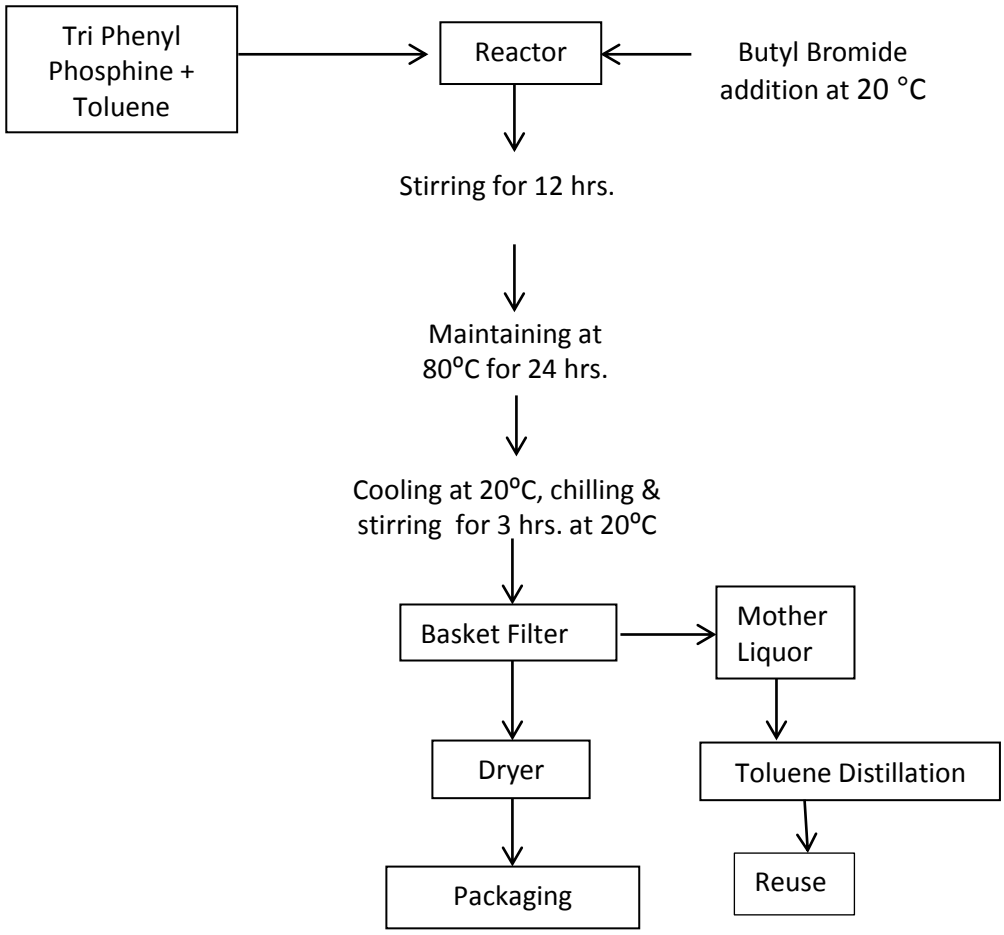
(262) + (137) $\longrightarrow$ (399)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tri phenyl phosphine	630.00	butyl triphenyl phosphonium bromide	935	
butyl bromide	320.00			
toluene	1260.00	drying loss	15	
		Solvent recovered	1185.00	Reuse after distillation
		dist. Residue	12.00	for incineration
		handling loss	63.00	
TOTAL	**2210.00**	**TOTAL**	**2210.00**	

Item	Input (MT)	Recovery (MT)	Loss (MT)	% Recovery
toluene	1260.00	1185.00	75.00	94.0%

Process Flow Diagram :



25. Butyl Triphenyl Phosphonium Chloride

Manufacturing Process :

The Toluene and Tri phenyl phosphine will be taken in the reactor. At 20 °C and Butyl Chloride will be charged in to it. That mixture will be stirred well for about 12 hrs. Temperature will be maintained 50 °C in the reactor. Now reflux will be done at 80 °C for 24 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs. at 20 °C. The final mass filtered in basket filter. The powder will be dried for 8 hrs. in the dryer at 500C than packed it in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri Phenyl Phosphine + Butyl Chloride $\xrightarrow{\text{Toluene}}$ **Butyl Triphenyl Phosphonium Chloride**

$C_{18}H_{15}P + C_4H_9Cl \xrightarrow{\text{Toluene}} C_{22}H_{24}PCl$

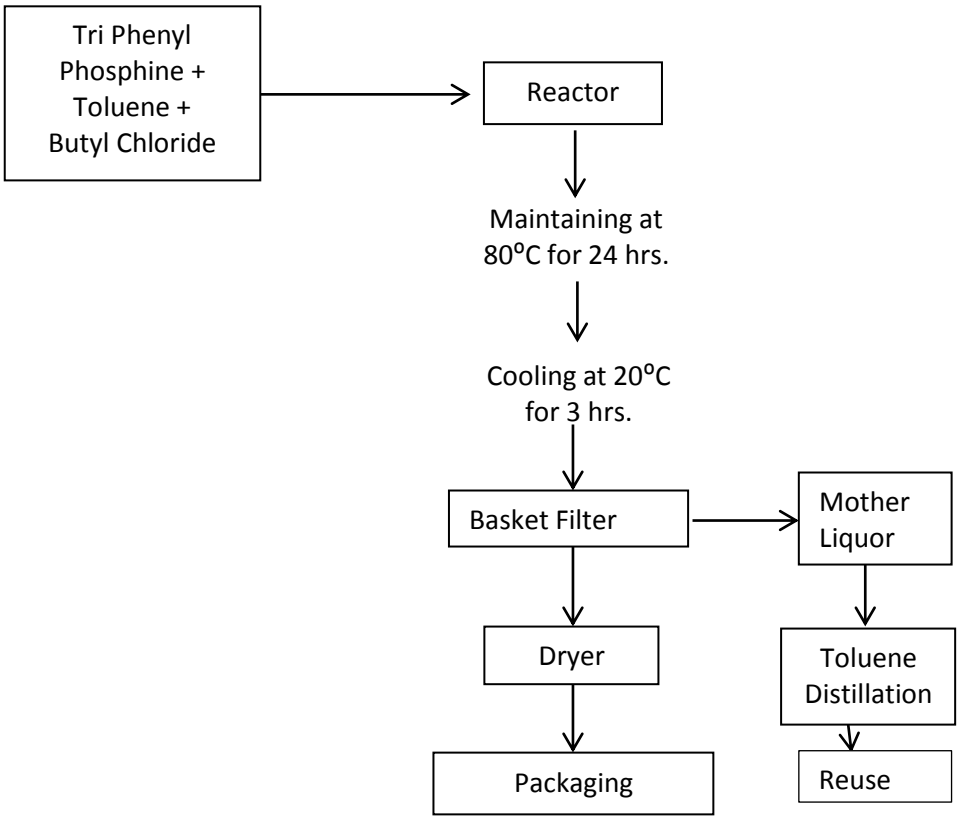
(262) + (92.5) $\longrightarrow$ (354.5)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tri phenyl phosphine	750.00	butyl triphenyl phosphonium chloride	940	
butyl chloride	250.00			
toluene	980.00	drying loss	60	
		Solvent recovered	960.00	Reuse after distillation
		dist. Residue	11.00	for incineration
		handling loss	9.00	
TOTAL	**1980.00**	**TOTAL**	**1980.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
toluene	980.00	960.00	20.00	98.0%

Process Flow Diagram :



26. Cetyl Dimethyl Benzyl Ammonium Bromide

Manufacturing Process:

Stage-1: Cetyl Dimethyl Benzyl Ammonium Hydroxide 40% In Methanol

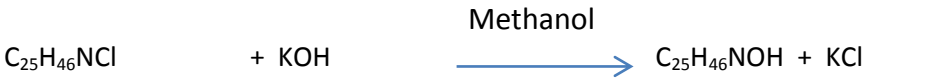
The Methanol, Cetyl dimethyl benzyl ammonium chloride and Potassium hydroxide will be taken in the reactor. That mixture will be stirred well for about 24 hr. Temperature will be maintained 50 °C in the reactor. Apply filtration for potassium chloride removal clear mother liquor will be cooled to 30 °C and transfer into drum as an intermediate. It will be used in next stage-02.

Stage-2: Cetyl Dimethyl Benzyl Ammonium Bromide

Charge Cetyl dimethyl benzyl ammonium hydroxide in methanol solution into reactor. Add Hydro Bromic acid and stirred for about 12 hrs at 40 °C. The final Product will be filtered in basket filter. Filtrate will be cooled to 20 °C. The powder will be dried for 8 hrs. in the dryer and then packed it in the drum. The Mother liquor from the filter will be collected and Distilled methanol then reused it for next batch of reactions.

Stage 1:

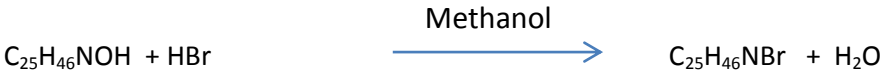
Cetyl dimethyl benzyl ammonium chloride + Potassium Hydroxide $\xrightarrow{\text{Methanol}}$ Cetyl Dimethyl Benzyl Ammonium hydroxide + Potassium Chloride



(395.5) + (56) $\longrightarrow$ (377) + (74.5)

Stage 2:

Cetyl Dimethyl benzyl ammonium hydroxide + Hydro bromic acid $\xrightarrow{\text{Methanol /Water}}$ **Cetyl Dimethyl Benzyl Ammonium Bromide+** water



(377) + (81) $\longrightarrow$ (440) + (18)

Mass balance :

STAGE - 1

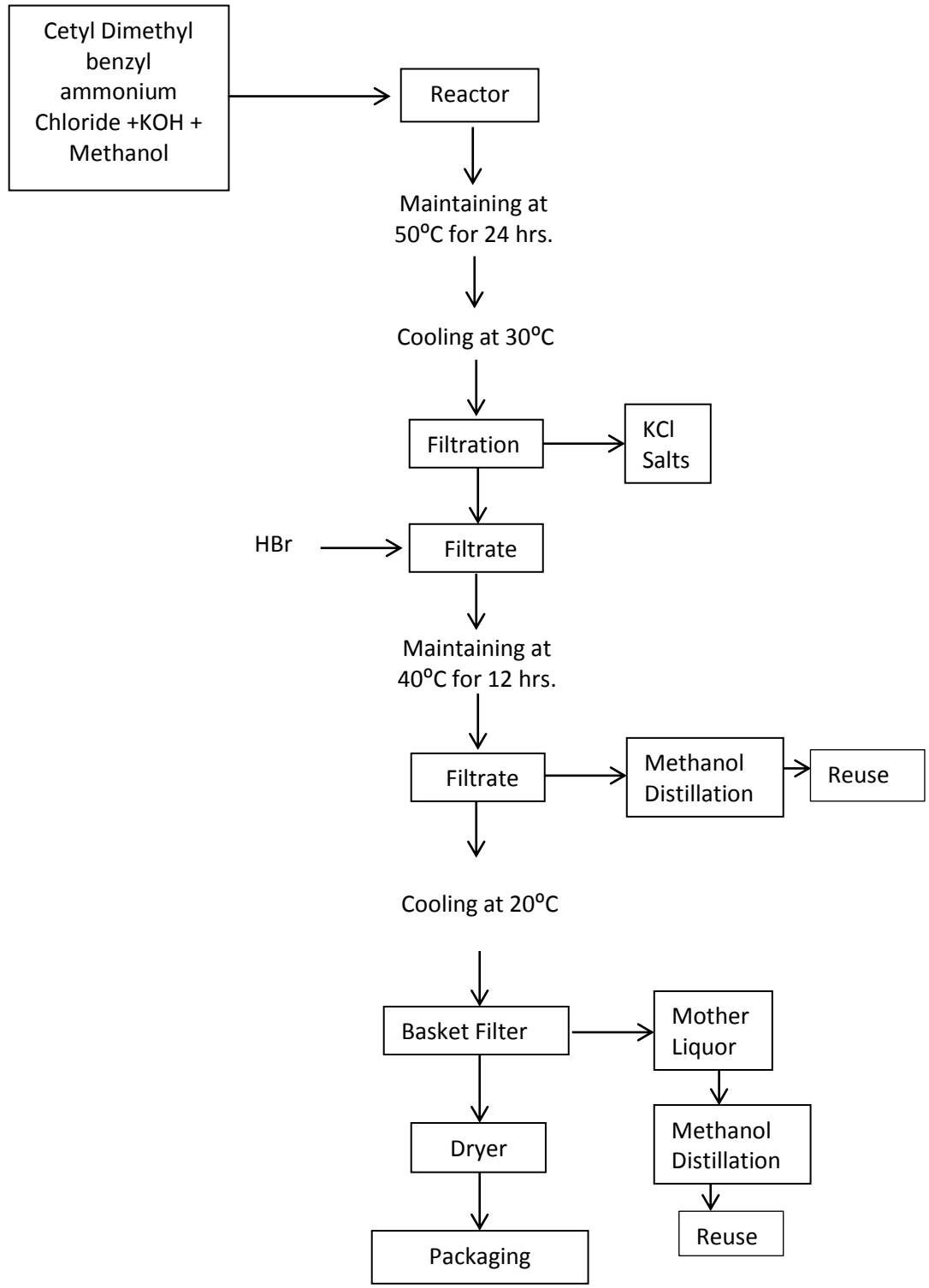
Input	kg/batch	Output	kg/batch	Remark
cetyl dimethyl benzyl ammonium chloride	1000	cetyl dimethyl benzyl ammonium hydroxide (stage-1 product)	2500	
potassium hydroxide	167			
methanol	2000	potassium chloride	667	to TSDF Site
TOTAL	**3167**	**TOTAL**	**3167**	

STAGE - 2

Input	kg/batch	Output	kg/batch	Remark
cetyl dimethyl benzyl ammonium hydroxide (stage-1 product)	2500	cetyl dimethyl benzyl ammonium bromide	1000	
hydro bromic acid	500	recovered solvent	1950	Reuse in next batch
		handling loss	50	
TOTAL	**3000**	**TOTAL**	**3000**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
methanol	2000.00	1950.00	50.00	98%

Process Flow Diagram :



27. Cetyl Dimethyl Benzyl Ammonium Chloride

Manufacturing Process:

The Ethyl Acetate, Cetyl dimethyl amine and Benzyl chloride will be taken in the reactor. This mixture will be stirred well for about 18 hrs. Temperature will be maintained 20 °C in the reactor. This mixture will be cooled to 15 °C. Chilled and stirred for about 3 hrs at 15 °C. And then apply centrifuge filtration to collect Cetyl dimethyl benzyl ammonium chloride product. The mother liquor will be distilled out by simple distillation. Collect distilled Ethyl acetate which will be Re-used in next batch.

Chemical reaction :

Cetyl dimethyl amine + Benzyl Chloride $\xrightarrow{\text{Ethyl Acetate}}$ **Cetyl Dimethyl Benzyl Ammonium Chloride**

$C_{18}H_{39}N + C_7H_7Cl \xrightarrow{\text{Ethyl Acetate}} C_{25}H_{46}NCl$

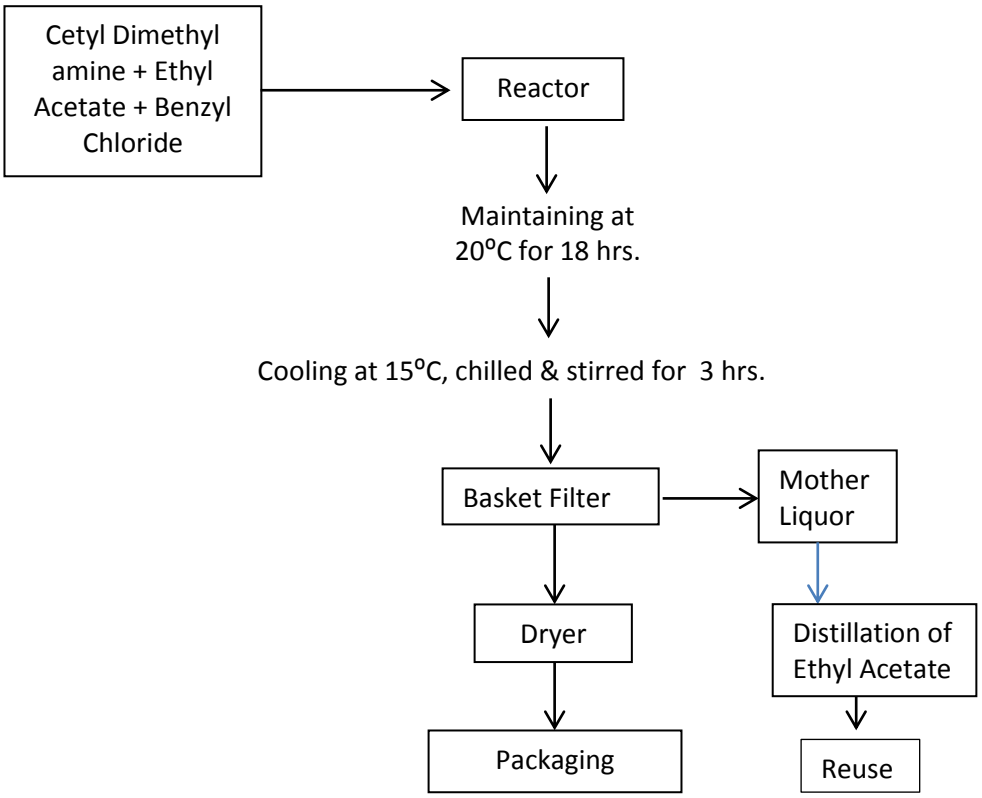
(269) + (126.5) $\longrightarrow$ (395.5)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
cetyl dimethyamine	670.00	cetyl dimethyl benzyl ammonium chloride	950	
benzyl chloride	330.00			
ethyl acetate	1500.00	drying loss	50	
		Solvent recovered	1450.00	
		distillation residue	25.00	
		handling loss	25.00	
TOTAL	**2500.00**	**TOTAL**	**2500.00**	

Item	Input (MT)	Recovery (MT)	Loss (MT)	% Recovery
ethyl acetate	1500.00	1450.00	50.00	96.7%

Process flow diagram :



28. Dodecyl Trimethyl Ammonium Chloride

Manufacturing Process :

Dodecyl dimethyl amine & Acetone will be taken in the reactor. At 20 °C methyl chloride gas will be purged in to it. That mixture will be stirred well for about 18 hrs. Temperature will be maintained 20 °C in the reactor. This mixture will be cooled to 15 °C. Chilled and stirred for about 3 hrs at 15 °C. The final solution will be filtered and then packed it in the drum after make-up it 30% solution.

Chemical reaction :

Dodecyl dimethyl amine + Methyl Chloride $\xrightarrow{\text{Acetone}}$ Dodecyl trimethyl ammonium chloride

$C_{14}H_{31}N + CH_3Cl \xrightarrow{\text{Acetone}} C_{15}H_{34}NCl$

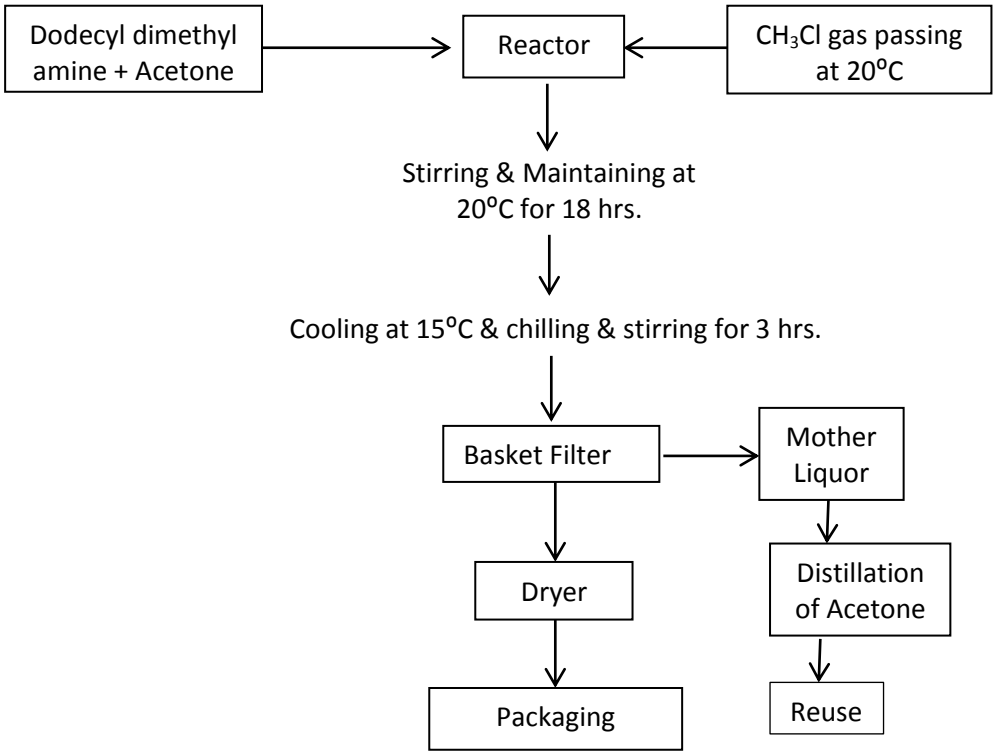
(213) + (50.5) $\longrightarrow$ (263.5)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
dodecyl dimethylamine	830.00	dodecyl trimethyl ammonium chloride	960.00	
methyl chloride	160.00			
acetone	1500.00	drying loss	40.00	
		Solvent recovered	1440.00	
		distillation residue	35.00	
		handling loss	15.00	
TOTAL	**2490.00**	**TOTAL**	**2490.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
acetone	1500.00	1440.00	60.00	96.0%

Process flow diagram :



29. Mesetronium Ethosulphate

Manufacturing Process :

The Ethyl Acetate and Cetyl dimethyl amine will be taken in the reactor. At 20 °C and Diethyl sulphate will be charged in to it. That mixture will be stirred well for about 18 hr. temperature will be maintained 20 °C in the reactor. This mixture will be cooled to 15 °C. Chilled and stirred for about 3 hrs at 15 °C. And then Apply centrifuge filtration to collect Mesetronium ethosulphate product. The mother liquor distilled out by simple distillation. Collect distilled Ethyl acetate which will be Re-use in next batch.

Chemical reaction :

Cetyl dimethyl amine + Diethyl sulphate $\xrightarrow{\text{Ethyl acetate}}$ **Mesetronium Ethosulphate**

$C_{18}H_{39}N + C_4H_{10}SO_4 \xrightarrow{\text{Ethyl acetate}} C_{22}H_{49}NSO_4$

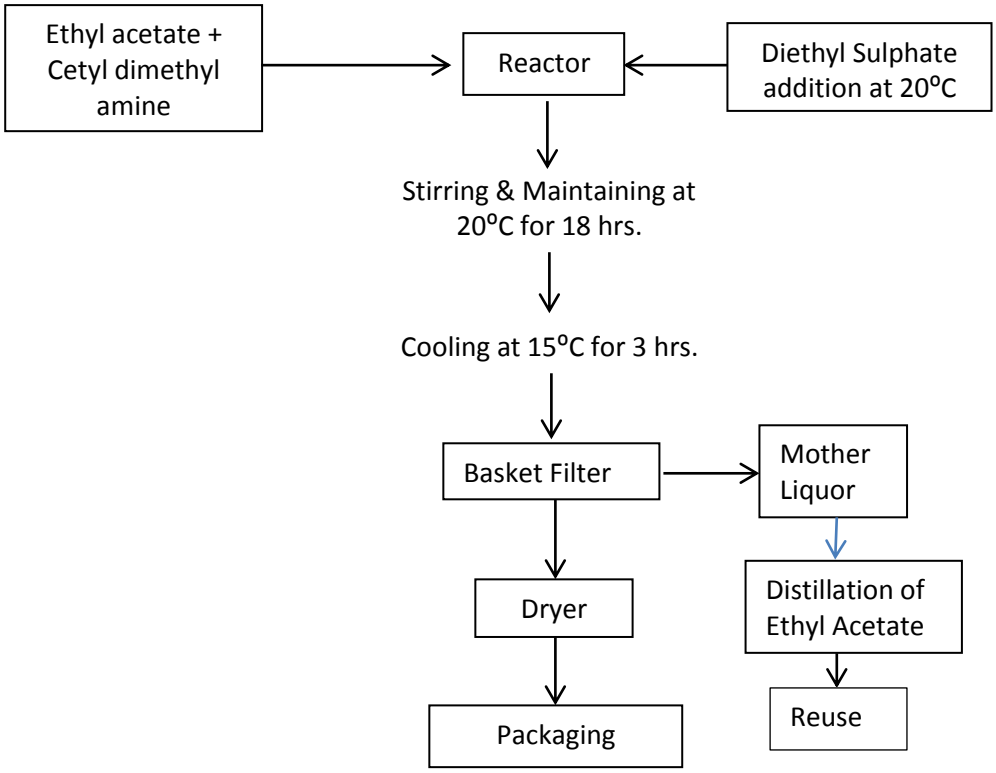
(269) + (154) $\longrightarrow$ (423)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
cetyl dimethylamine	670.00	mesetronium ethosulphate	950	
diethyl sulphate	330.00			
ethyl acetate	1500.00	drying loss	50	
		Solvent recovered	1440	Reuse after distillation
		distillation residue	30.00	for incineration
		handling loss	30.00	
TOTAL	**2500.00**	**TOTAL**	**2500.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
ethyl acetate	1500.00	1440.00	60.00	96.0%

Process flow diagram :



30. Methyl Triphenyl Phosphonium Chloride

Manufacturing Process :

Toluene and Triphenyl phosphine will be charged in the reactor & at 20° C Methyl chloride will be purged in to it. That mixture will be stirred well for about 2 hrs. and then raise temperature up to 80 °C in the reactor. At the time of temperature raise Reactor pressure also increase up to 4 Kg/cm^2. Maintain Temperature 80 °C and pressure 4 Kg/cm^2 constantly for 48 hrs. After 48 hrs apply cooling up to 25 to 30 °C. Release pressure and then Apply centrifuge filtration to collect Methyl triphenyl phosphonium Chloride as a product. The mother liquor will be distilled out by simple distillation. Collect distilled Toluene which will be Re-used in next batch. Methyl triphenyl phosphonium Chloride materials transfer in to drum.

Chemical reaction :

Tri Phenyl Phosphine + Methyl Chloride $\xrightarrow[80°C/48\ hrs.]{Toluene/5\ kg/cm^2}$ **Methyl tri phenyl Phosphonium Chloride**

$$C_{18}H_{15}P + CH_3Cl \xrightarrow{Toluene/5\ kg/cm^2} C_{19}H_{18}PCl$$

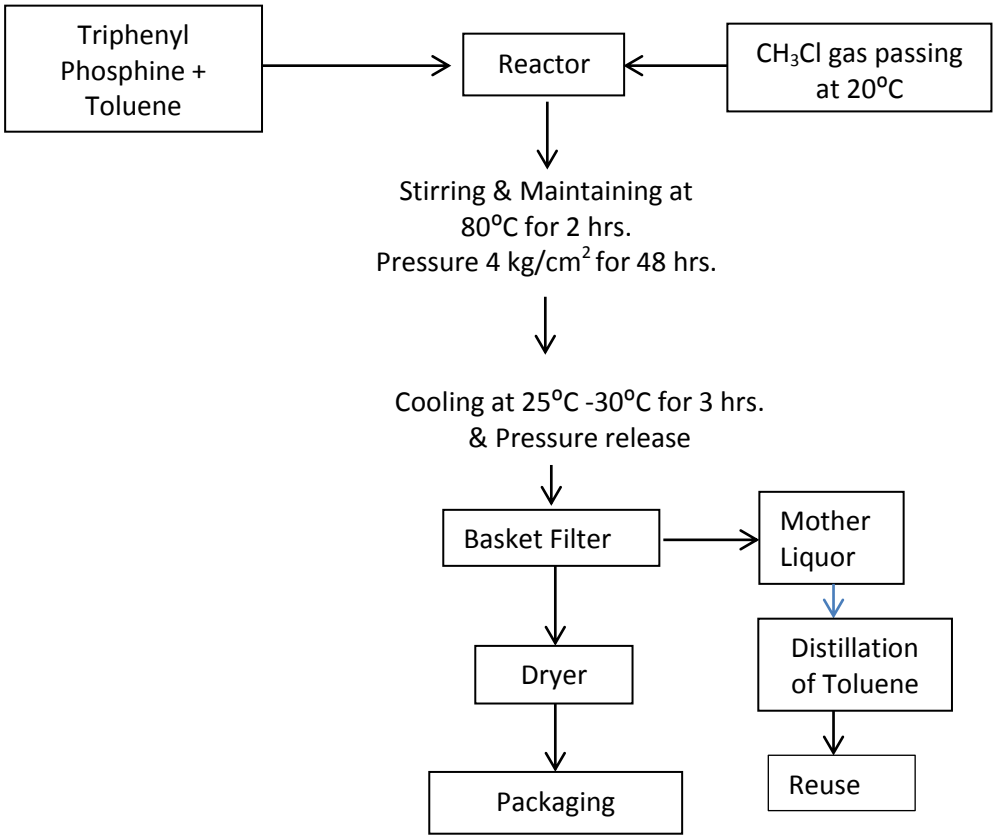
(262) + (50.5) → (312.5)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tri phenyl phosphine	830.00	methyl triphenyl phosphonium chloride	950	
methyl chloride	170.00			
toluene	1330.00	drying loss	50	
		Solvent recovered	1280.00	Reuse after distillation
		dist. Residue	30.00	for incineration
		handling loss	20.00	
TOTAL	**2330.00**	**TOTAL**	**2330.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
toluene	1330.00	1280.00	50.00	96.2%

Process flow diagram :



31. Methyl Triphenyl Phosphonium Iodide

Manufacturing Process :

The Toluene, Triphenyl phosphine & Methyl Iodide will be charged in the reactor. That mixture will be stirred well for about 2 hrs. And then raise the temperature up to 80 °C in the reactor. At the time of temperature raise, Reactor pressure will also be increased up to 4 Kg/cm^2. Maintain Temperature 80 °C and pressure 4 Kg/cm^2 constantly for 48 hrs. After 48 hrs., Apply cooling up to 25 °C to 30 °C. Release pressure and then Apply centrifuge & filtration to collect Methyl triphenyl phosphonium Iodide as a product. The mother liquor distilled out by simple distillation. Collect distilled Toluene which will be Re-used in next batch. Methyl triphenyl phosphonium Iodide material will be transferred in to drum.

Chemical reaction :

Tri Phenyl Phosphine + Methyl Iodide $\xrightarrow[80°C/48\ hrs.]{Toluene/4\ kg/cm^2}$ **Methyl tri phenyl Phosphonium Iodide**

$C_{18}H_{15}P + CH_3I \xrightarrow[80°C/48\ hrs.]{Toluene/4\ kg/cm^2} C_{19}H_{18}PI$

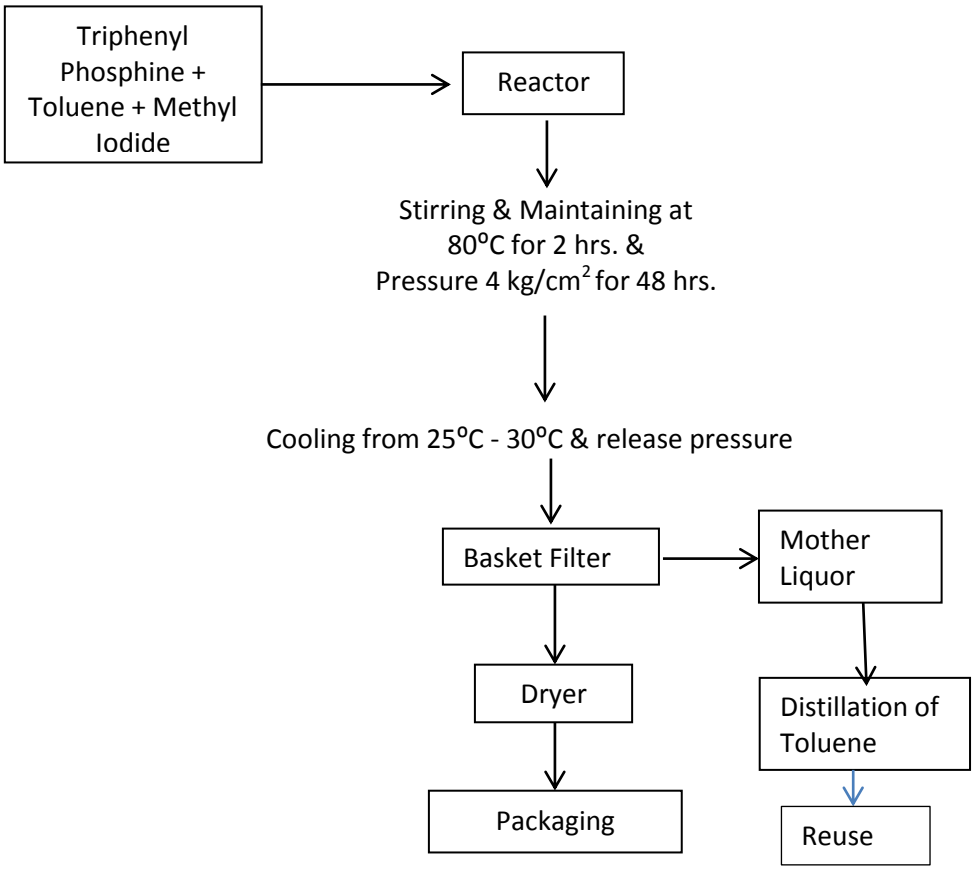
(262) + (142) $\longrightarrow$ (404)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tri phenyl phosphine	670.00	methyl triphenyl phosphonium iodide	950	
methyl iodide	330.00			
toluene	1670.00	drying loss	50	
		Solvent recovered	1610.00	Reuse after distillation
		distillation residue	30.00	for incineration
		handling loss	30.00	
TOTAL	**2670.00**	**TOTAL**	**2670.00**	

Item	Input (MT)	Recovery (MT)	Loss (MT)	% Recovery
toluene	1670.00	1610.00	60.00	96.4%

Process flow diagram :



32. Tetra Phenyl Phosphonium Bromide

Manufacturing Process :

The Ethyl Cellosolve, Tri phenyl phosphine and Bromo benzene will be taken in the reactor. At 20 °C will be charged in to it. Temperature will be maintained 80 °C in the reactor. This mixture will be stirred well for about 24 hrs. This mixture will be cooled to 20 °C. Chilled and stirred for about 3 hrs at 20 °C. The final mass will be filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C. Then product will be packed in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri Phenyl Phosphine + Bromo Benzene $\xrightarrow{\text{Ethyl Cellosolve}}$ **Tetra Phenyl Phosphonium Bromide**

$C_{18}H_{15}P + C_6H_5Br \xrightarrow{\text{Ethyl Cellosolve}} C_{24}H_{20}PBr$

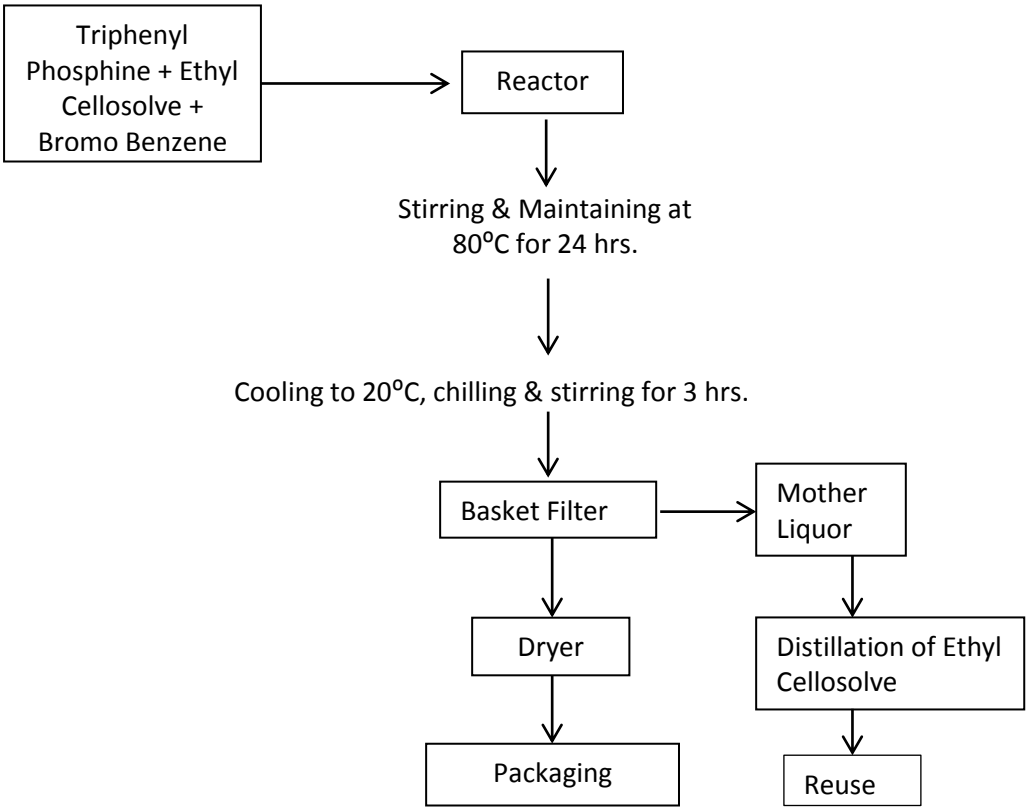
(262) + (157) $\longrightarrow$ (419)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri phenyl phosphine	670.00	tetra phenyl phosphonium bromide	950	
bromo benzene	330.00			
ethyl cellosolve	1250.00	drying loss	50	
		Solvent recovered	1200.00	Reuse after distillation
		distillation residue	25.00	for incineration
		handling loss	25.00	
TOTAL	**2250.00**	**TOTAL**	**2250.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
ethyl cellosolve	1250.00	1200.00	50.00	96.0%

Process flow diagram :



33. Triethyl Methyl Ammonium Chloride

Manufacturing Process

Acetonitrile and Tri Ethyl amine will be charged in the reactor & at 20 °C Methyl chloride will be purged in to it. This mixture will be stirred well for about 2 hrs and then raise temperature up to 90 °C in the reactor. At the time of temperature raise Reactor pressure also increase up to 4 Kg/cm^2. Maintain Temperature 90 °C and pressure 4 Kg/cm^2 constantly for 48 hrs. After 48 hrs., apply cooling to 25 °C. Release pressure and then Apply centrifuge & filtration to collect Tri Ethyl methyl Ammonium Chloride product. The mother liquor distilled out by simple distillation. Collect distilled Acetonitrile which will be Re-used in next batch. Tri Ethyl methyl Ammonium Chloride materials will be dried in tray dryer and then transferred in to drum.

Chemical reaction :

Tri Ethyl Amine + Methyl Chloride $\xrightarrow[90\ °C\ /\ 48\ hrs.]{Acetonitrile/4\ Kg/cm^2}$ **Triethyl Methyl Ammonium Chloride**

$C_6H_{15}N + CH_3Cl \xrightarrow[90\ °C\ /\ 48\ hrs.]{Acetonitrile/4\ Kg/cm^2} C_7H_{18}NCl$

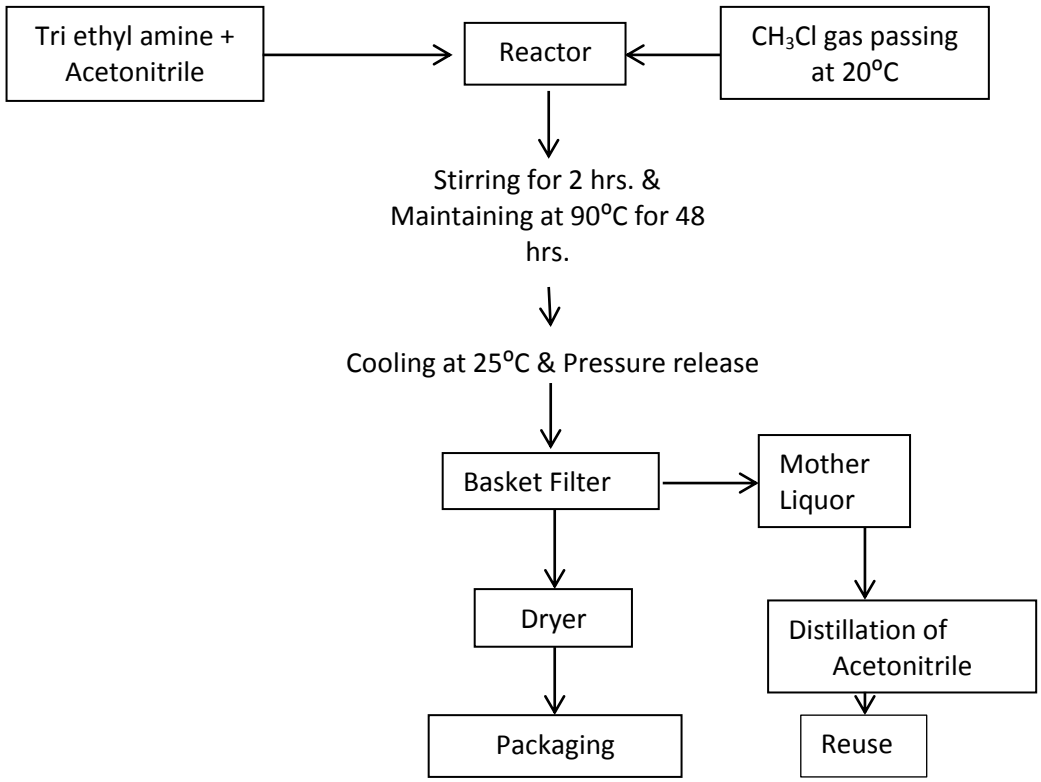
(101) + (50.50) $\longrightarrow$ (151.5)

Mass Balance :

Input	kg/batch	Output	kg/batch	Remark
tri ethyl amine	670.00	tri ethyl methyl ammonium chloride	950	
methyl chloride	330.00			
acetonitrile	1250.00	drying loss	50	
		Solvent recovered	1200.00	Reuse after distillation
		distillation residue	25.00	for incineration
		handling loss	25.00	
TOTAL	**2250.00**	**TOTAL**	**2250.00**	

Item	Input (kg/batch)	Recovery (kg/batch)	Loss (kg/batch)	% Recovery
acetonitrile	1250.00	1200.00	50.00	96.0%

Process flow diagram :



34. Triethyl Butyl Ammonium Bromide

Manufacturing Process :

Methyl ethyl ketone, Tri Ethyl amine and Butyl bromide will be charged in the reactor. That mixture will be stirred well for about 2 hrs. And then raise temperature up to 80 °C in the reactor. At the time of temperature raise Reactor pressure also increase up to 4 Kg/cm^2. Maintain Temperature 80 °C and pressure 4 Kg/cm^2 constantly for 48 hrs. After 48 hrs, apply cooling up to 25 °C. Release pressure and then Apply centrifuge filtration to collect Tri Ethyl Butyl Ammonium Bromide product. The mother liquor will be distilled out by simple distillation. Collect distilled Acetonitrile which will be Re-used in next batch. Tri Ethyl Butyl Ammonium Bromide material will be transferred in to drum.

Chemical reaction :

Tri Ethyl Amine + Butyl Bromide $\xrightarrow[80\ °C\ /\ 48\ hrs.]{\text{Methyl ethyl ketone/4 Kg/cm}^2}$ **Triethyl Butyl Ammonium Bromide**

$C_6H_{15}N + C_4H_9Br \xrightarrow[80\ °C\ /\ 48\ hrs.]{\text{Methyl ethyl ketone /4 Kg/cm}^2} C_{10}H_{24}NCl$

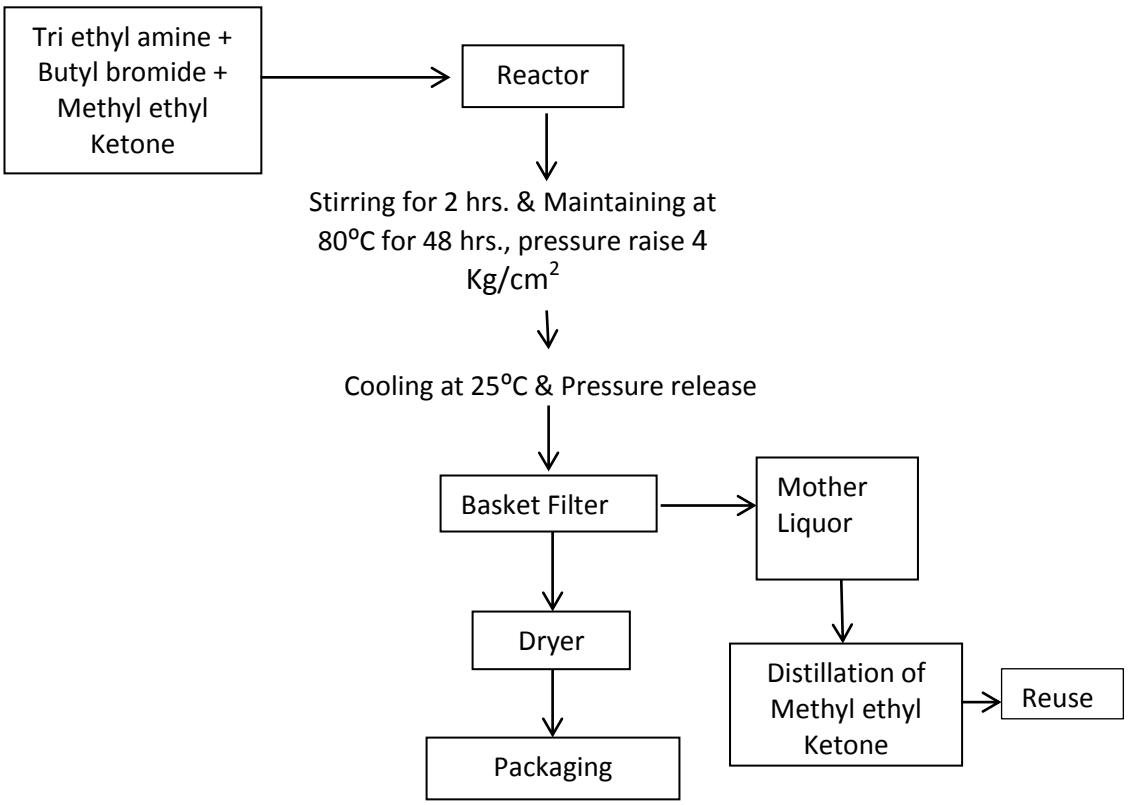
(101) + (137) $\longrightarrow$ (238)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tri ethyl amine	430.00	tri ethyl butyl ammonium bromide	950	
butyl bromide	570.00			
methyl ethyl ketone	1140.00	drying loss	50	
		Solvent recovered	1100.00	Reuse after distillation
		distillation residue	20.00	for incineration
		handling loss	20.00	
TOTAL	**2140.00**	**TOTAL**	**2140.00**	

Item	Input (kg)	Recovery (kg)	Loss (kg)	% Recovery
methyl ethyl ketone	1140.00	1100.00	40.00	96.5%

Process flow diagram :



35. Benzyl Trimethyl Ammonium Chloride

Manufacturing Process:

Iso propanol and Benzyl chloride will be taken in the reactor. At 20 °C Trimethyl amine will be charged in to it. That mixture will be stirred well for about 1 hr. Temperature will be maintained 70 °C & pressure raised to 2 kg/cm^2 in the reactor & maintaining for 48 hrs. This mixture will be cooled to 20 °C. Then after pressure is released. Chilled and stirred for about 3 hrs at 20 °C. The final mass will be filtered in basket filter. The powder will be dried for 8 hrs in the dryer at 50 °C and then packed in the drum. The Mother liquor from the filter will be collected and Distilled then reused it for next batch of reactions.

Chemical reaction :

Tri Methyl Amine + Benzyl Chloride $\xrightarrow{\text{Iso Propanol}}$ **Benzyl Trimethyl Ammonium Chloride**

$C_3H_9N + C_7H_7Cl \xrightarrow{\text{Iso Propanol}} C_{10}H_{16}NCl$

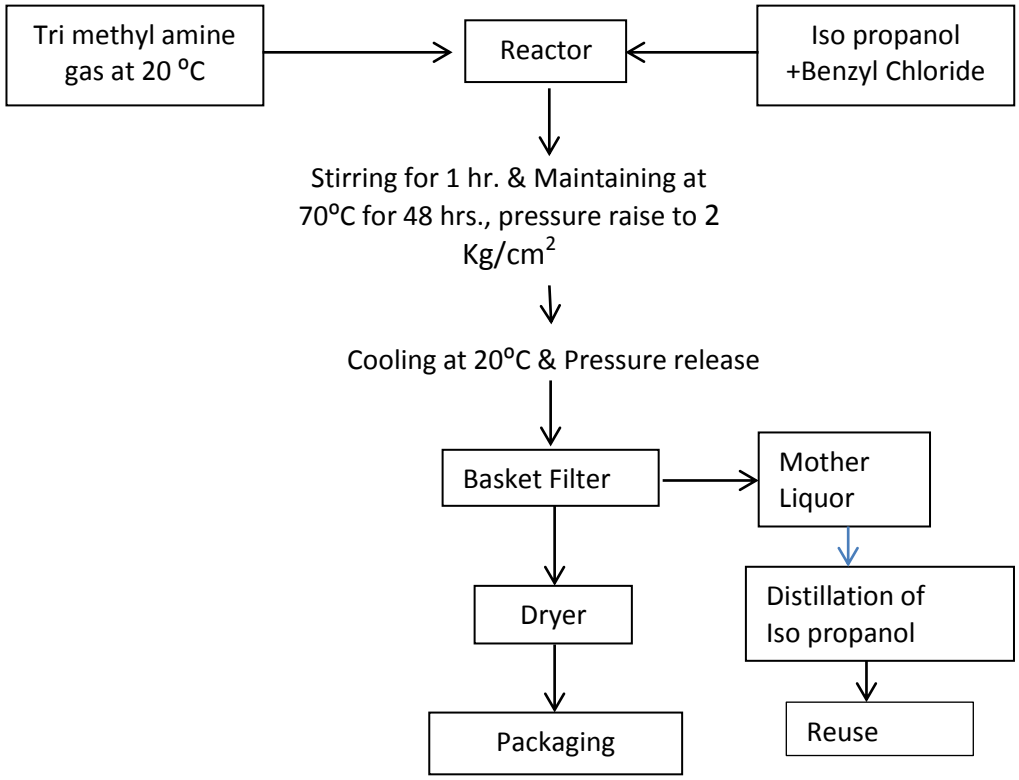
(59) + (126.5) $\longrightarrow$ (185.5)

Mass balance :

Input	kg/batch	Output	kg/batch	Remark
tri methyl amine	330.00	Benzyl tri methyl ammonium chloride	950	
benzyl chloride	670.00			
iso propanol	1330.00	drying loss	50	
		Solvent recovered	1280.00	Reuse after distillation
		distillation residue	25.00	for incineration
		handling loss	25.00	
TOTAL	**2330.00**	**TOTAL**	**2330.00**	

Item	Input (kg)	Recovery (kg)	Loss (kg)	% Recovery
methyl ethyl ketone	1330.00	1280.00	0	96.2%

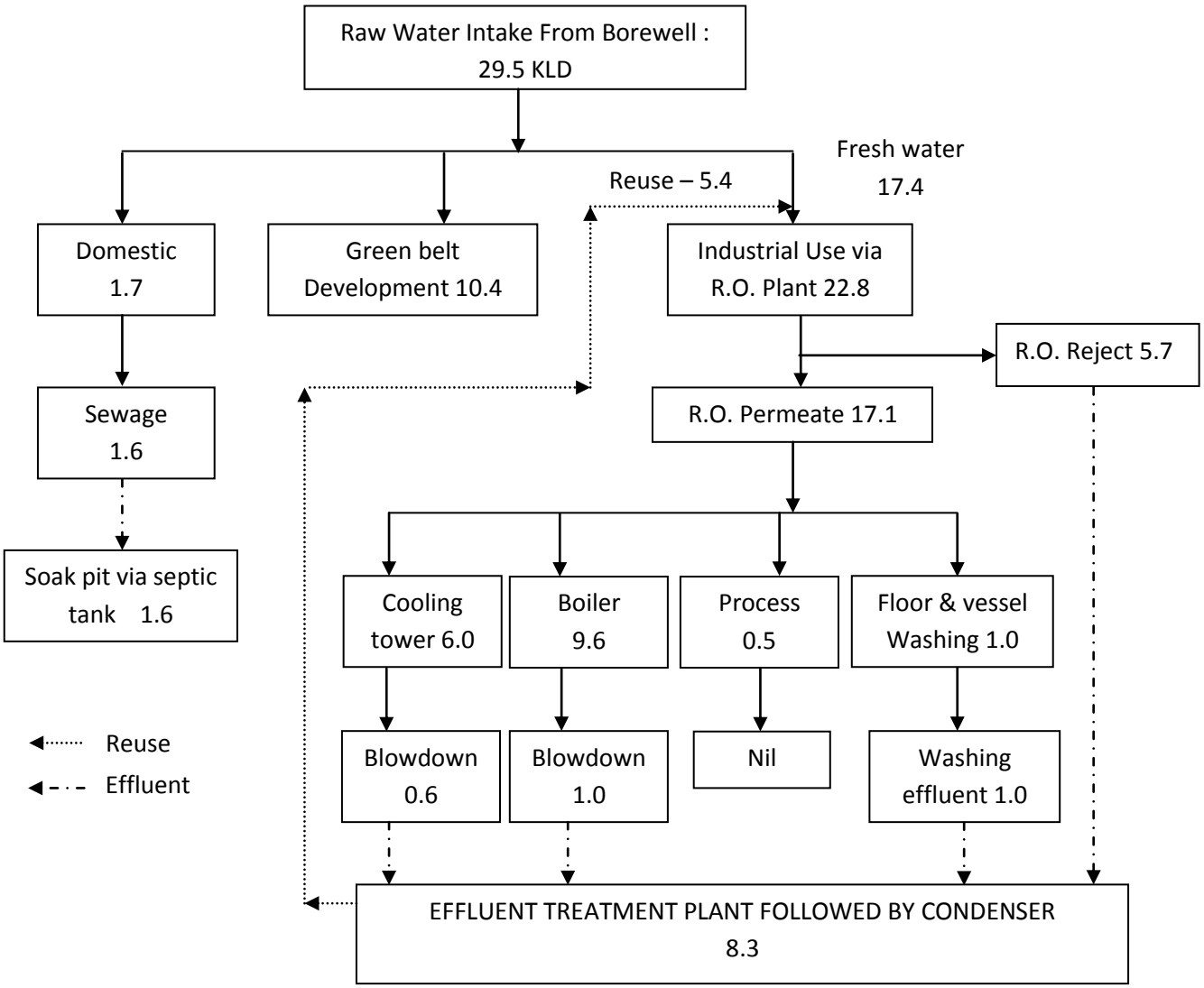
Process flow diagram :



ANNEXURE – 4

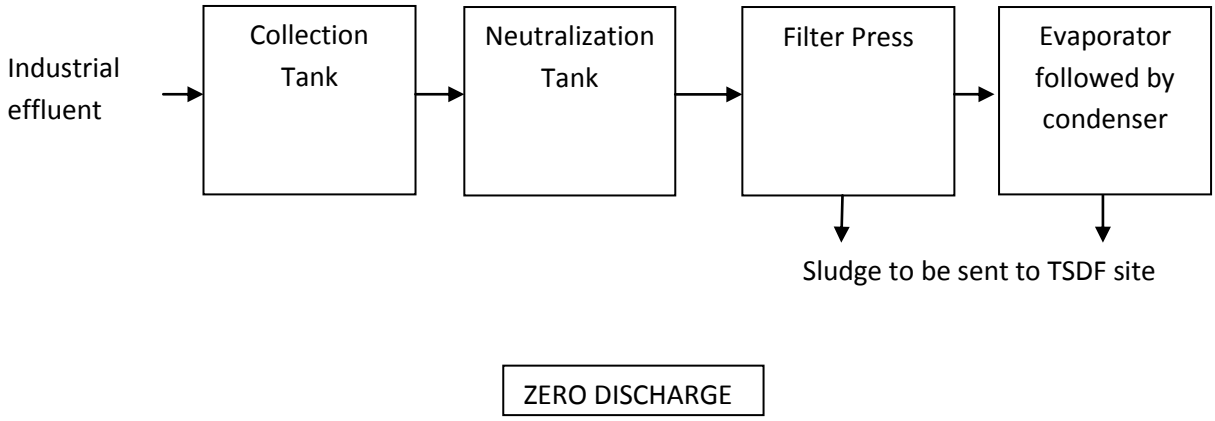
WATER BALANCE DIAGRAM

Note : All quantities are in KLD



ANNEXURE – 5

DETAILS OF ETP



ETP PROCESS

Industrial wastewater will be generated from boiler blow-down, cooling tower blow-down, washing & RO-1 reject. All effluent will be collected in collection tank. Then wastewater will be given neutralization treatment. After completion of neutralization, wastewater will be taken to Filter Press for chemical sludge separation. Filtrate will be taken to an Evaporator followed by condenser. Condensate from evaporator will be reused in Borewell RO-1.

ETP sludge (from filter press) along with evaporation residue from evaporator will be disposed off at TSDF site. Thus, unit will maintain Zero Effluent Discharge.

ANNEXURE – 6

DETAILS OF SOLID/HAZARDOUS WASTE

There will be two types of Solid wastes generated from the project.

(a) Non Hazardous Solid waste.

There will be two types of Non hazardous waste generated:

1. The Municipal solid waste includes the paper wastes from Office as well as other domestic wastes.
2. Paper wastes would be sold to scrap vendors, while other wastes would be disposed off in a proper manner.

(b) Hazardous Solid waste.

The details different Hazardous wastes generated and its disposal is given in the table below.

Sr. No.	Description	Category	Quantity of waste generated (MT/Month)	Mode of Disposal
1	Discarded Bags/Barrels / Drums / Carboys	33.3	1.8	Collected, stored in storage area & Sell to GPCB authorised recyclers / reusers
2	Used Oil	5.1	0.004	Collected, stored in hazardous waste storage area & Sell to GPCB registered reprocessor.
3	Process waste	28.1	8.2	Collected, packed in bags, stored in hazardous waste storage area & Disposed off at CHWIF
4	Distillation residue	20.3	1.64	Collected, packed in bags, stored in hazardous waste storage area & Disposed off at CHWIF
5	Spent Charcoal + Spent carbon	28.2	2.66	Collected, packed in bags, stored in hazardous waste storage area & Disposed off at CHWIF
6	Off specification products	28.3	3.28	Collected, packed in bags, stored in hazardous waste storage area & Disposed off at approved TSDF site
7	ETP Sludge + Evaporation residue	34.3	5.0	Collected, packed, stored in hazardous waste storage area & Disposed off at approved TSDF site

ANNEXURE –7

DETAILS OF FLUE GAS STACKS

Sr. No.	Stack attached to	Height of the stack In meter	Fuel	APC System	Expected Pollutant	GPCB Limit
1	BOILER (2 TPH)	30	White coal / Briquettes : 4.4 MT/Day	Bag filter	SPM SO_2 NO_2	As per GPCB Norms
2	D. G. SET (60 KVA)	10	Diesel – 12 lit/hr.	N.A.	SPM SO_2 NO_2	As per GPCB Norms

DETAILS OF PROCESS GAS STACKS

Sr. No.	Stack attached to	Height of the stack In meter	APC System	Expected Pollutant	GPCB Limit
1	Ducting system attached with Dryer	10	Condenser followed by Activated carbon filter	VOC	As per GPCB Norms

ANNEXURE – 8

LIST OF HAZARDOUS CHEMICALS

Sr. No.	Name of Hazardous Chemicals
1	Benzyl chloride
2	Iso propanol
3	Toluene
4	Ethyl acetate
5	Pyridine
6	Methyl chloride
7	Acetonitrile
8	Methyl alcohol
9	Potassium hydroxide
10	Hydrochloric acid
11	Sulphuric acid
12	Methyl iso butyl ketone
13	Tri ethyl amine
14	Ethyl bromide
15	Hydro bromic acid
16	Acetone
17	Ethyl alcohol