**Annexure-I**

**LIST OF PRODUCTS**

| Sr. No. | Name of Products | Quantity (MT/Month) |
|---|---|---|
| 1. | Atrazine | 500 |
| 2. | Metribuzine | |
| 3. | Terbuthylazine | |
| 4. | Propazine | |
| 5. | Simazine | |
| 6. | Ametryne | 200 |
| 7. | Simetryne | |
| 8. | Terbutryne | |
| 9. | Promethryn | |
| 10. | Difenaconazole | 200 |
| 11. | Propiconazole | |
| 12. | Hexaconazole | |
| 13. | Metconazole | |
| 14. | Prothiconazole | |
| 15. | Tebuconazole | |
| 16. | Tricyclazole | |
| 17. | Cyproconazole | |
| 18. | Epoxyconazole | |
| 19. | Flutriafol | |
| 20. | Glyposate | 300 |
| 21. | Pendimethalin | 200 |
| 22. | Diuron | 300 |
| 23. | Thiophanate Methyle | 200 |
| 24. | Chlorothionil | 1000 |
| **Pesticide Intermediates** | | |
| 1. | Azoxystrobin | 650 |
| 2. | Benalaxyl | |
| 3. | Bis Pyribac sodium | |
| 4. | Clodinafop Propargyl | |
| 5. | DICMBA | |

| Sr. No. | Name of Products | Quantity (MT/Month) |
|---|---|---|
| 6. | Fenaxoprop P Methyl | |
| 7. | Sulfentrazone | |
| 8. | Kerosoxim Methyl | |
| 9. | Metalaxyl | |
| 10. | Oxyfluorfen | |
| 11. | Pethoxamid | |
| 12. | Miclobutanil | |
| 13. | Pretiachlor | |
| 14. | Quizalofop Ethyl | |
| 15. | Diclofop P Methyl | |
| 16. | Diclosulam | |
| 17. | 1,2 Pentane Dio | 500 |
| 18. | DCAP | |
| 19. | 1,2,4 Triazinone | |
| 20. | 1,2,4 Triazole | |
| 21. | OPDA | |
| 22. | Bromoketal | |
| 23. | 2,4 Dichloro Valerophe | |
| | **Total** | **4050** |

## LIST OF RAW MATERIALS

| Sr. no. | Product Name | Quantity MT/MT |
|---|---|---|
| 1 | **Atrazine** | |
| | Toluene | 0.020 |
| | Cyanuric Chloride | 0.905 |
| | Iso Propyl Amine | 0.420 |
| | NaOH | 0.395 |
| | Mono ethyl amine | 0.321 |
| 2 | **Metribuzine** | |
| | sulfuric acid | 1.246 |
| | Triazinone | 1.000 |
| | Dimethyl sulfate | 0.636 |
| | Soda ash | 1.882 |
| 3 | **Terbuthylazine** | |
| | Toluene | 0.020 |
| | Cyanuric chloride | 0.850 |
| | Tertiary Butyl Amine | 0.340 |
| | 25% NaOH | 0.395 |
| | Mono ethyl amine | 0.210 |
| 4 | **Propazine** | |
| | Toluene | 0.020 |
| | Cyanuric chloride | 0.905 |
| | NaOH | 0.395 |
| | Iso Propyle Amine | 0.420 |
| 5 | **Simazine** | |
| | Toluene | 0.020 |
| | Cyanuric chloride | 0.915 |
| | Mono ethyl amine | 0.450 |
| | NaOH | 0.395 |
| 6 | **Ametryne** | |
| | Atrazine | 0.985 |
| | SMM 20% Sol | 1.891 |
| | Caustic Solution | 0.100 |
| | HCl | 0.125 |
| 7 | **Simetryne** | |
| | Simazine | 0.995 |
| | SMM 20% Sol | 1.891 |
| | Caustic Solution | 0.100 |
| | HCl | 0.125 |
| 8 | **Terbutryne** | |
| | Terbutylazine | 0.988 |
| | SMM 20% Sol | 1.809 |
| | Caustic Solution | 0.013 |
| | HCl | 0.016 |
| 9 | **Prometryn** | |
| | Propazine | 0.990 |
| | SMM 20% Sol | 2.000 |
| | Caustic Solution | 0.012 |
| | HCl | 0.016 |
| 10 | **Difenaconazole** | |
| | 1,2,4-Triazole | 0.428 |

| | | |
|---|---|---|
| | DMSO | 0.039 |
| | Toluene | 0.100 |
| | KOH | 0.428 |
| | Bromoketal | 1.833 |
| | IPE | 0.083 |
| | PE | 0.167 |
| **11** | **Propiconazole** | |
| | DMSO | 0.039 |
| | Potassium hydroxide | 0.943 |
| | Triazole | 0.265 |
| **12** | **Hexaconazole** | |
| | Dimethyl sulfate | 0.482 |
| | sodium sulfide | 0.026 |
| | DCVP | 0.760 |
| | Potassium Hydroxide | 0.310 |
| | 1,2.4 Triazole | 0.245 |
| | pot carbonate | 0.045 |
| | DMF | 0.025 |
| **13** | **Prothiconazole** | |
| | 2-(1-chloro-cycloprop-1-yl)-1-(2-chloro-phenyl)-2-hydroxy-3-(1,2,4-triazolidine-5-thiono-1-yl)-propane | 1.000 |
| | Toluene | 0.050 |
| | Iron chloride solution | 1.100 |
| **14** | **Metconazole** | |
| | Methyl-33,-Dimethyl-2-Oxo-Cyclopentane Carboxylate | 0.361 |
| | 4-Chloro Benzyl Chloride | 0.535 |
| | Catalyst | 0.025 |
| | Toluene | 0.058 |
| | 1, 2,4-Triazole | 0.218 |
| **15** | **Tebuconazole** | |
| | 1,2,4-triazole | 0.300 |
| | Oxirane,2[2,-(4-chlorophenylEthyl)-2-(1,1-dimethyl)] | 0.800 |
| | DMF | 0.020 |
| | Caustic | 0.100 |
| | Toluene | 0.018 |
| **16** | **Tricyclazole** | |
| | HMBT | 0.960 |
| | Formic acid | 0.290 |
| | Caustic lye | 0.040 |
| **17** | **Cyproconazole** | |
| | Dimethyl Sulfate | 0.564 |
| | Dimethyl Sulfide | 0.124 |
| | PCPCPP | 0.840 |
| | Potassium Hydroxide | 0.520 |
| | 1,2,4-Triazole | 0.332 |
| | Potassium Carbonate | 0.126 |
| | DMF | 0.020 |
| | EDC | 0.014 |
| | HCl | 0.360 |
| | NaOH 100% | 0.123 |
| **18** | **Epoxyconazole** | |
| | 1,2,4 Triazole | 0.960 |
| | NaH | 0.210 |

| | | |
|---|---|---|
| | 2,Bromommethy-2-Phynyl-3-(2-chlorophenyl)-oxirane | 1.330 |
| | N, Ndimethyl Formamide (DMS) | 0.020 |
| | Ethyl Acetate | 0.025 |
| | Disopropyl Ether(DE) | 0.120 |
| **19** | **Flutriafol** | |
| | Dimethyl Sulfate | 0.567 |
| | Dimethyl Sulfide | 0.117 |
| | DFBP | 0.844 |
| | Potassium Hydroxide | 0.320 |
| | 1,2,4 Triazole | 0.288 |
| | Potassium carbonate | 0.053 |
| | DMF | 0.024 |
| **20** | **Glyphosate** | |
| | PMIDA | 0.800 |
| | Hydrogen Peroxide | 0.400 |
| | SMBS | 0.005 |
| **21** | **Pendimethalin Technical** | |
| | DEK | 0.342 |
| | 4 NOX | 0.301 |
| | Hydrogen | 0.036 |
| | Caustic lye | 1.004 |
| | Promoter | 0.012 |
| | EDC | 0.008 |
| | Hexane | 0.016 |
| | Nitric acid | 0.792 |
| | Sulfuric acid | 0.373 |
| | HCl | 0.052 |
| **22** | **Diuron** | |
| | Dichloro Phenyl Isocyanta | 0.807 |
| | Xylene | 0.050 |
| | Dimethyl aniline | 0.193 |
| **23** | **Thiophanate Methyl** | |
| | EDC | 0.040 |
| | Sodium Thiocyanate | 0.425 |
| | Methyl chloro Formate | 0.400 |
| | OPDA | 0.350 |
| **24** | **Chlorothionil** | |
| | Isophthalic Acid | 0.664 |
| | Ammonia Gas | 0.426 |
| | Activated Carbon | 0.080 |
| | Chlorine Gas | 1.160 |
| | Trichlorobenzene | 0.120 |
| **Pesticide Intermediates** | | |
| **1** | **Azoxystrobin** | |
| | 2,6 Dichloro Pyrimidine | 0.410 |
| | DMF | 0.050 |
| | MHPMP | 0.580 |
| | Potassium Carbonate | 0.620 |
| | Cyano Phenol | 0.330 |
| | Cuprous Chloride | 0.010 |
| | Caustic soda | 0.025 |
| | Hexane | 0.025 |
| | Dichoro Methane | 0.040 |

| | | |
|---|---|---|
| **2** | **Benalaxyl** | |
| | Phenyl Acetyl Chloride | 0.251 |
| | Methyl-2-[(2,6 dimethyl phenyl) amino] propionate) | 0.654 |
| | Hexane | 0.020 |
| | Caustic soda | 0.025 |
| **3** | **Bis Pyribac Sodium** | |
| | 2,6 hydroxy Benzoilc Acid | 0.340 |
| | 4,6 Diethoxy 2, Methyl Solfonyl Pyrimidine | 0.515 |
| | TBAB | 0.300 |
| | Caustic Soda | 0.280 |
| | Toluene | 0.025 |
| | n-Butanol | 0.030 |
| | Ethyl Acetate | 0.050 |
| **4** | **Clodinafop Propargyl** | |
| | DMF | 0.085 |
| | DHPPA | 0.600 |
| | $K_2CO_3$ | 0.400 |
| | DFCP | 0.630 |
| | Propargyl chloride | 0.290 |
| | HCl | 0.010 |
| | Methanol | 1.150 |
| **5** | **DICMBA** | |
| | 3,6 Dichloro Methoxy Benzoate | 1.200 |
| | NaOH | 0.300 |
| | TBAB | 0.030 |
| | HCl | 0.820 |
| **6** | **Fenaxoprop P Methyl** | |
| | DMF | 0.080 |
| | 2,6 Dichloro Benzoxazole | 0.550 |
| | $K_2CO_3$ | 0.500 |
| | Ethyl 2-(4-hydroxyphenoxy) propanoate | 0.615 |
| | HCl | 0.009 |
| | Methanol | 1.070 |
| **7** | **Sulfentrazone** | |
| | NaOH | 0.100 |
| | Acetaldehyde | 0.125 |
| | Acetic Acid | 0.165 |
| | Chloride | 0.300 |
| | Phenyl Hydrazine | 0.300 |
| | Sodium Cyanate | 0.170 |
| | Methanol | 0.025 |
| | Chlorine Gas | 0.200 |
| | Potassium Carbonate | 0.400 |
| | Dimethyl Formamide | 0.015 |
| | Dichlorodifluoromethane | 0.240 |
| | Sulphuric Acid | 0.275 |
| | Dichloroethane | 0.015 |
| | Nitric Acid | 0.175 |
| | Iso Propyl Alcohol | 0.030 |
| | Catalyst Pd/C | 0.060 |
| | Methane Sulfonyl Chloride | 0.320 |
| | Pyridine | 0.050 |
| | Toluene | 0.010 |

| | | |
|---|---|---|
| | Dichloromethane | 0.030 |
| **8** | **Kerosoxim Methyl** | |
| | MPMPglyoxylic acid Methyl ester | 0.825 |
| | o-Methyl hydroxyl amine Hydrochloride | 0.200 |
| | soda ash | 0.067 |
| | Toluene | 0.040 |
| **9** | **Metalaxyl** | |
| | Methoxy acetyl chloride | 0.300 |
| | MDMPA | 0.745 |
| | Hexane | 0.020 |
| | Caustic soda | 0.030 |
| **10** | **Oxyfluorfen** | |
| | Isopropanol | 0.025 |
| | KOH | 0.180 |
| | Ethanol | 0.100 |
| | 1,3-bis(2-chloro-α,α,α-trifluoro-p-tolyloxy)-4-nitrobenzene | 0.720 |
| | Dioxane | 0.025 |
| | Hexane | 0.010 |
| **11** | **Pethoxamid** | |
| | Iso Butyro Phenone | 0.832 |
| | Ethoxy Ethyl Amine | 0.315 |
| | PTSA | 0.021 |
| | Chloro acetyl chloride | 0.395 |
| | Toluene | 0.040 |
| **12** | **Miclobutanil** | |
| | Potassium 1,2,4 Triazole | 0.699 |
| | 1-Bromo-2-Cyno-2 (4-Chlorophynyle) Hexane | 0.800 |
| | DMSPO | 0.020 |
| | Ether | 0.010 |
| | KOH | 0.171 |
| | Hexane | 0.005 |
| **13** | **Pretiachlor** | |
| | Chloro Acetyl chloride | 0.146 |
| | PEDA | 0.757 |
| | Hexane | 0.030 |
| | Soda bicarbonate | 0.035 |
| **14** | **Quizalofop Ethyl** | |
| | DMF | 0.030 |
| | Dichloro Quinoxaline | 0.580 |
| | $K_2CO_3$ | 0.500 |
| | Ethyl 2-(4-hydroxyphenoxy) propionate | 0.620 |
| | HCl | 0.010 |
| | Methanol | 0.050 |
| **15** | **Diclofop P Methyl** | |
| | DMF | 0.075 |
| | 2,4 Dichloro Phenol | 0.480 |
| | $K_2CO_3$ | 0.500 |
| | Methyl -2-(4-hydroxyphenoxy) Propane | 0.575 |
| | Methanol | 0.050 |
| **16** | **Diclosulam** | |
| | 3,5 -Lutidien | 0.865 |
| | 2,6 Dichloro aniline | 0.650 |
| | Acetonitrile | 0.055 |

| | | |
|---|---|---|
| | 2-chlorosulfonyl-7-fluoro-5-ethoxy | 0.750 |
| **17** | **1,2 Pentane Diol** | |
| | Di Methyl Sulfate | 0.080 |
| | Di Methyl Sulfide | 0.044 |
| | n Butyraldehyde | 1.240 |
| | Potassium Hydroxide | 1.133 |
| | Sulfuric Acid 98% | 0.033 |
| **18** | **DCAP** | |
| | MDCB | 0.210 |
| | Aluminium Chloride | 1.040 |
| | Acetyl Chloride | 0.600 |
| | HCl 30% | 0.150 |
| **19** | **1,2,4 Triazinone** | |
| | Sulphuric Acid | 1.008 |
| | Acetic Anhydride | 0.530 |
| | Pivaloyl Nitrile | 0.570 |
| | Thio Carbohydrazide | 0.542 |
| | HCl | 1.500 |
| **20** | **1,2,4 Triazole** | |
| | Formic Acid | 1.360 |
| | Ammonia Gas | 0.253 |
| | Hydrazine hydrate | 0.473 |
| | Xylene | 0.080 |
| **21** | **OPDA** | |
| | ONCB | 1.575 |
| | Ammonia | 0.310 |
| | Caustic lye | 1.356 |
| | Sulfur | 0.960 |
| **22** | **Bromoketal** | |
| | 2,4 DCAP | 0.525 |
| | 1,2 Pantane Diol | 0.315 |
| | Cyclohexane | 0.125 |
| | PTSA | 0.015 |
| | Bromine | 0.313 |
| | Caustic Lye 32% | 0.210 |
| **23** | **2,4 Dichloro Valerophe** | |
| | MDCB | 0.700 |
| | Aluminium Chloride | 0.950 |
| | Valeroyl Chloride | 0.610 |

## Annexure-II

## Manufacturing Process

### 1. Atrazine

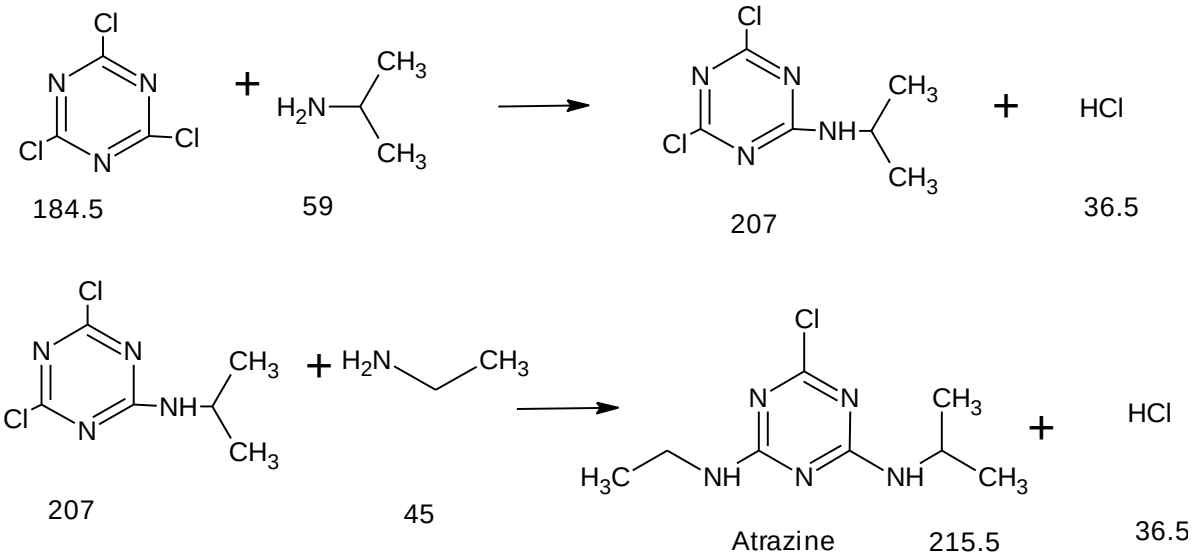
**Manufacturing Process:**

Required quantity of Toluene is taken in to reactor; Cyanuric chloride is charged and stirred so that Cynuric chloride dissolved in the solvent completely.

Isopropyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated in reaction. Ethyl amine is charged slowly and add Sodium hydroxide to neutralize Hydrochloric acid.

Aqueous phase is separated out, fresh water is charged and Toluene is distilled out azeotropically in presence of live steam. Product is filtered off. Centrifuged, dried and pulverized and pack as per requirement.

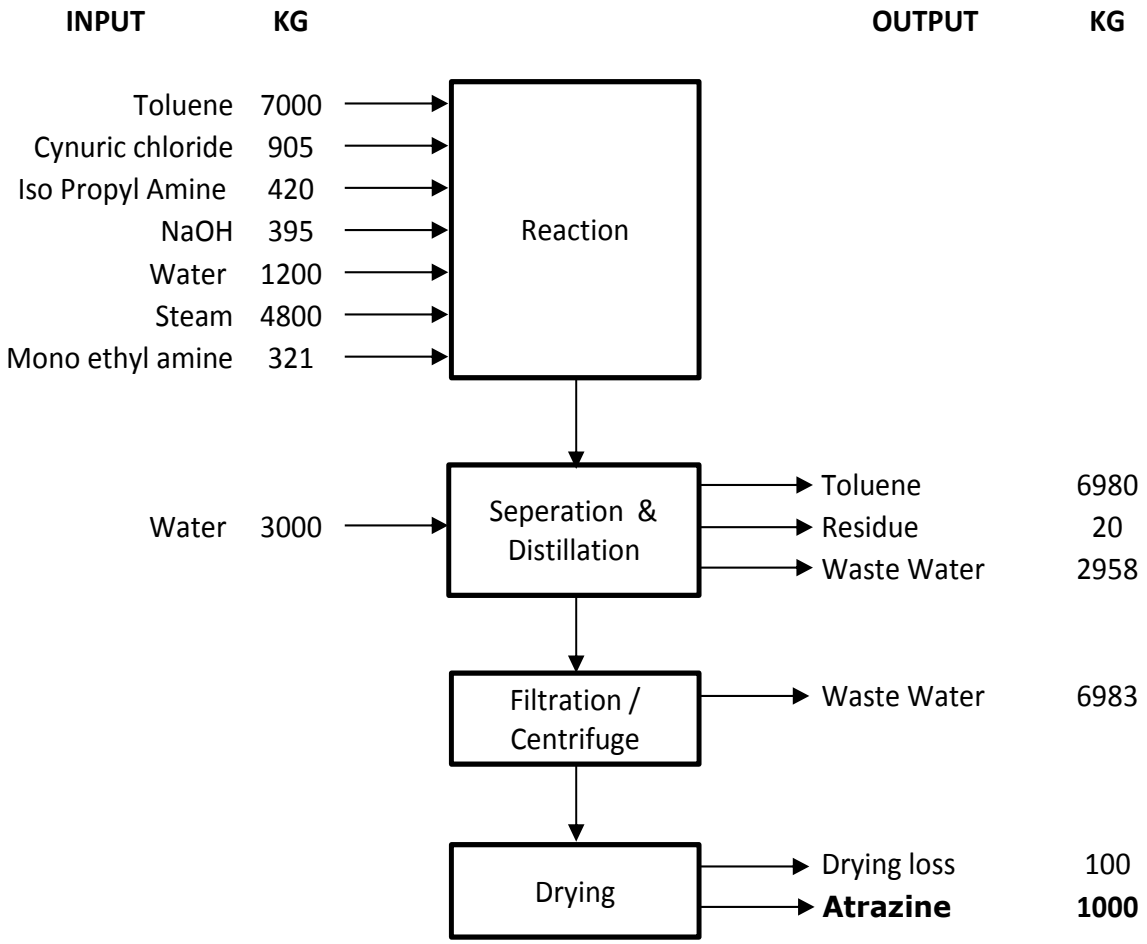
**Chemical Reaction:**




2 HCl + 2 Na-OH ⟶ 2 Na·Cl + 2 $H_2O$

**Mass Balance:**

**MASS BALANCE OF ATRAZINE**

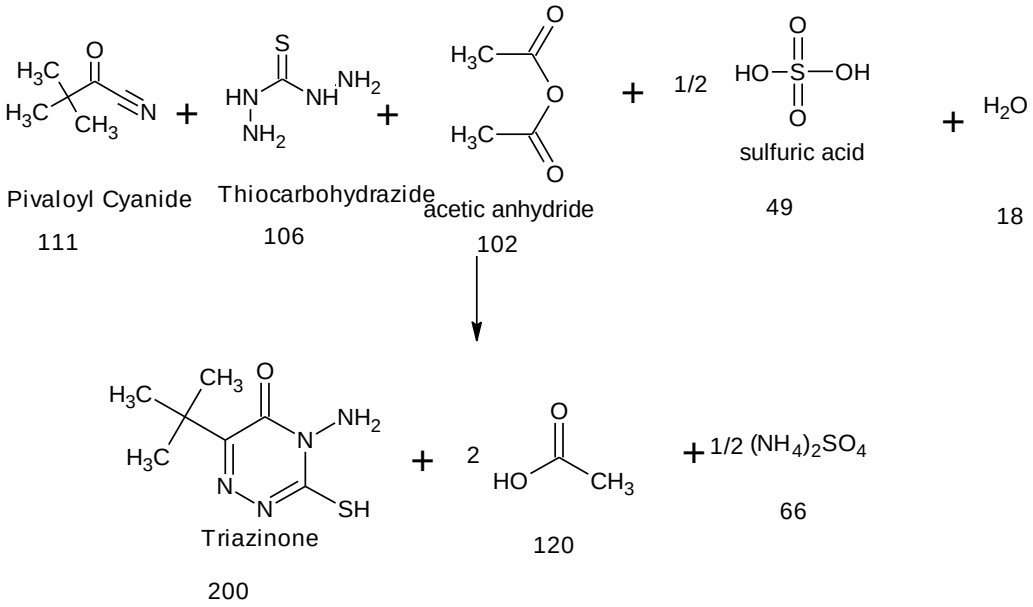


## 2. Metribuzine

### Manufacturing Process:

Triazinone is charged slowly in Sulfuric acid in 4 hours. Temperature is raised to $45^0$C and Di Methyl sulfate is charged. Maintain temperature for 10 hour time. When reaction shows completion of methylation, quench in 50% Soda ash solution. Finally adjust pH 10 with NaOH lye. Filter, centrifuged and dry the wet cake. Pulverize and pack suitably.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF METRIBUZINE**

| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| sulfuric acid | 1246 | → Reaction | | |
| Triazinone | 1000 | → Reaction | | |
| Dimethyl sulfate | 636 | → Reaction | | |
| Soda ash | 1882 | → Quenching and neutralization | | |
| Water | 2000 | → Quenching and neutralization | | |
| Water | 1636 | → Fltration & Washing | → Waterwater | 7218 |
| | | → Drying | → Drying loss | 182 |
| | | → Drying | → Metribuzine | 1000 |
| **TOTAL** | **8400** | | | **8400** |

## 3. Terbuthylazine

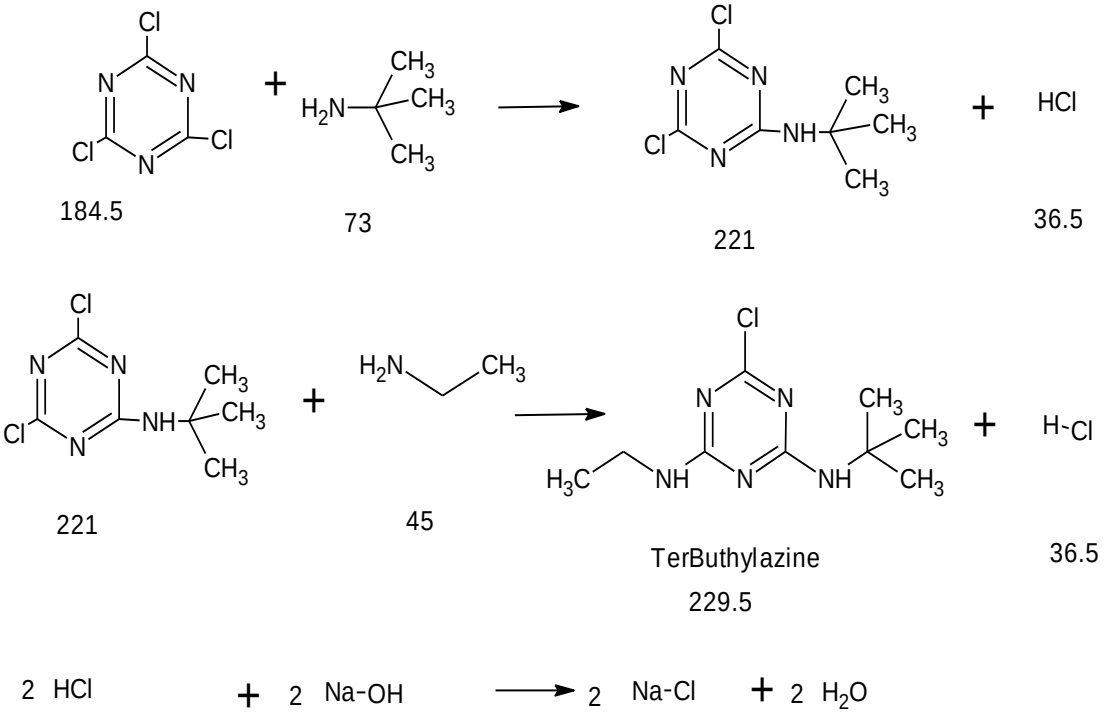
**Manufacturing Process:**

Required quantity of Toluene is taken into reactor; Cyanuric chloride is charged and stirred so that Cyanuric chloride dissolved in the solvent completely. Tertiary Butyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated in reaction.

Ethyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated in reaction.

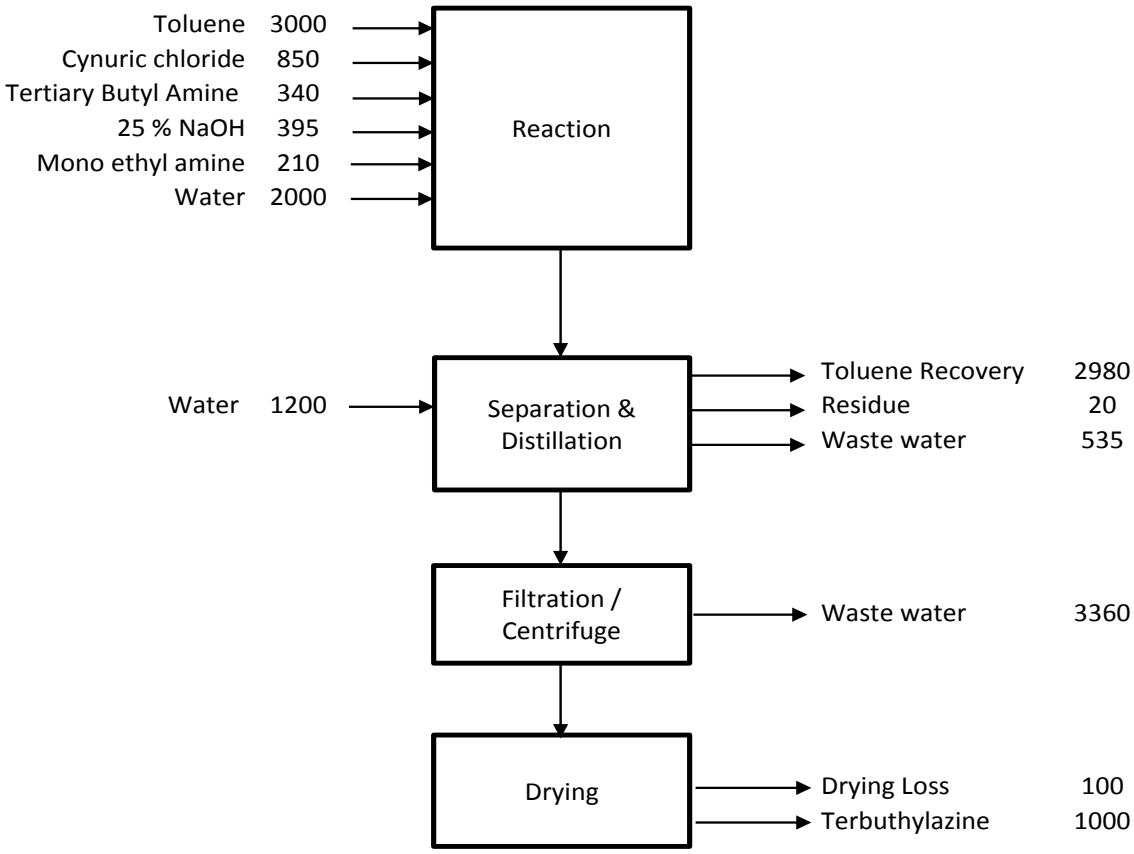
Aqueous phase is separated out, fresh water is charged and Toluene is distilled out azeotropically in presence of live steam. Product is filtered off. Centrifuged, dried and pulverized and pack as per requirement.

**Chemical Reaction:**



## Mass Balance:

**MASS BALANCE OF TERBUTHYLAZINE**



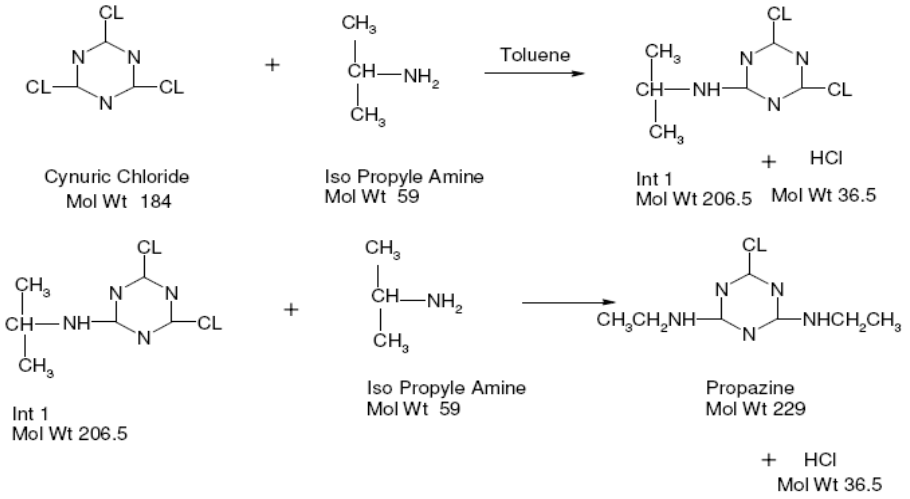

| | | | |
|---|---|---|---|
| **TOTAL** | **7995** | | **7995** |

## 4. Propazine

### Manufacturing Process:

First toluene is taken in to reactor then cynuric chloride is charge into solvent and is dissolved completely. Then Iso Propyl Amine is charged slowly. Sodium Hydroxide is added to neutralize the liberated Hydrochloric Acid. Then again IPA add slowly. NaOH or soda Ash is added to neutralize the mixture. Solvent is recovered by steam distillation. Propazine is filtered off. Centrifuged, dried and pulverized. Pulverize Propazine is then packed according to requirement.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF PROPAZINE**

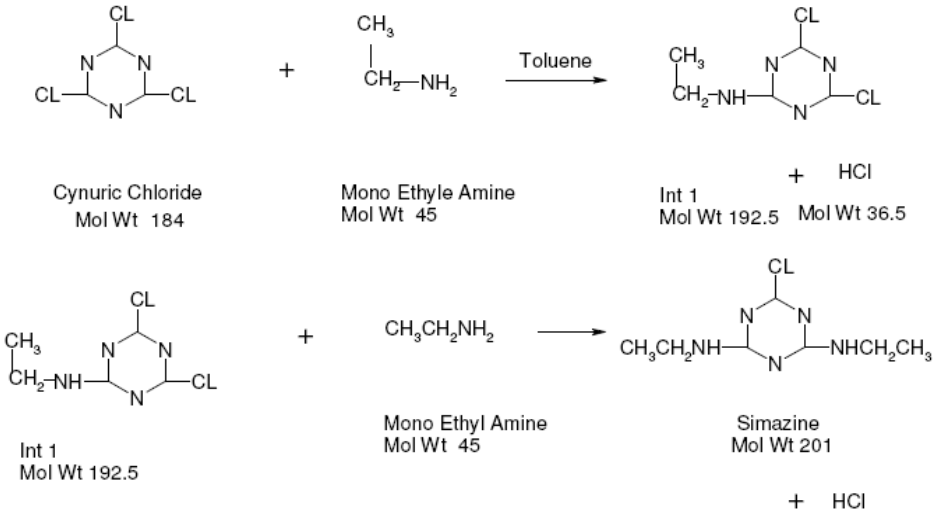
| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| Toluene | 2600 | | |
| Cynuric chloride | 905 | | |
| NaOH | 395 | | |
| Water | 1100 | | |
| Iso Propyle Amine | 420 | | |
| | | Toluene Recovery | 2580 |
| Water | 2100 | Residue | 40 |
| | | Water | 1525 |
| | | Water | 2275 |
| | | Drying Loss | 100 |
| | | Propazine | 1000 |
| **TOTAL** | **7520** | | **7520** |

## 5. Simazine

### Manufacturing Process:

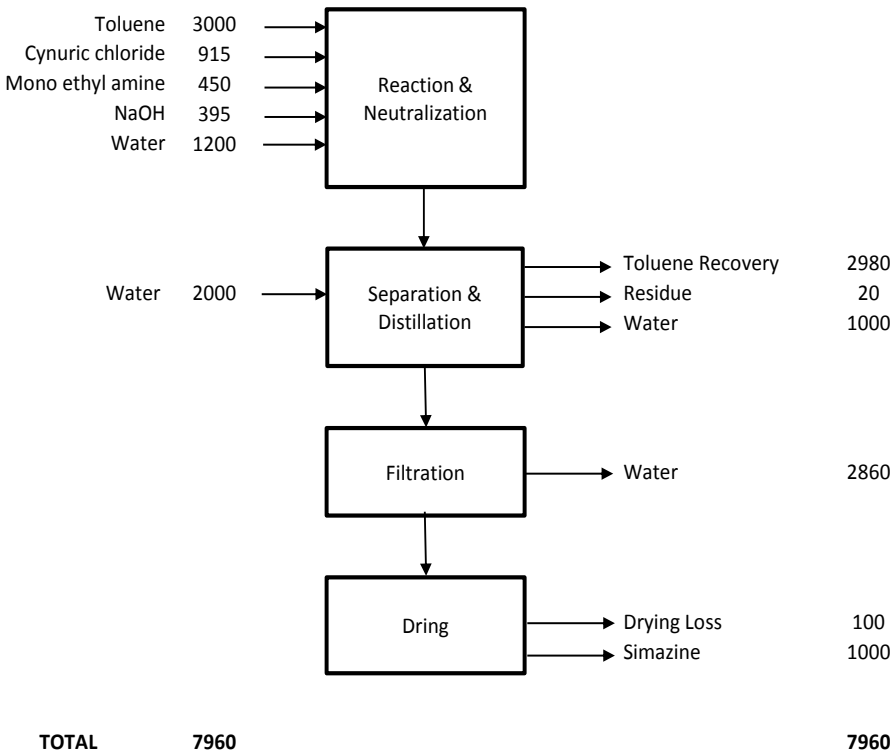
First toluene is taken in to reactor then cynuric chloride is charge into solvent and is dissolved completely. Then mono Ethyl Amine is charged slowly. Sodium Hydroxide is added to neutralize the liberated Hydrochloric Acid. Then again MEA add slowly. NaOH or soda Ash is added to neutralize the mixture. Solvent is recovered by steam distillation. Simazine is filtered off. Centrifuged, dried and pulverized. Pulverized Simazine is then packed according to the requirement.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF SIMAZINE**

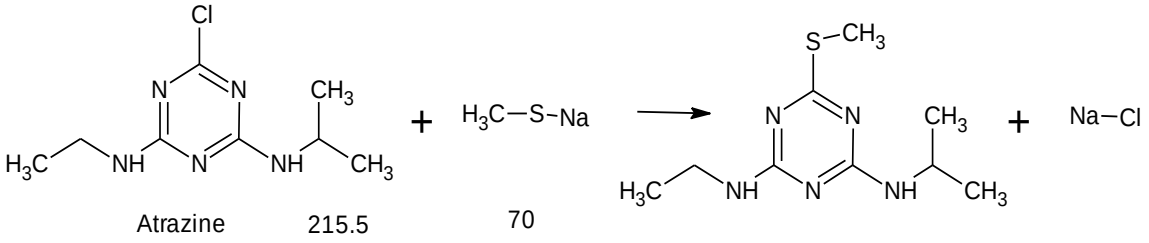


## 6. Ametryne

### Manufacturing Process:

Atrazine is reacted with dilute sodium methyl mercaptant solution under pressure at $100^0$C. Ametryne thus formed is filtered off, centrifuged, dried and pulverized and packed. The mother liquor is then treated with acid to recover SMM.

### Chemical Reaction:




Atrazine 215.5 | 70 | 227 | 58.5

### Mass Balance:

**MASS BALANCE OF AMETRYNE**

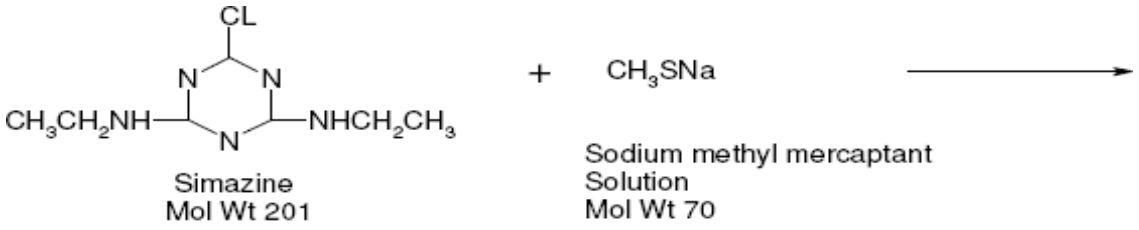
| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| Atrazine | 985 | → Reaction | | |
| Water | 4528 | → Reaction | | |
| SMM 20% Sol | 2000 | → Reaction | | |
| Caustic Solution | 100 | → Reaction | | |
| HCl | 125 | → Reaction | | |
| | | Filteration | Waste Water | 6338 |
| | | Drying | Drying loss | 400 |
| | | Pulverising and Packing | Ametryne | 1000 |
| **TOTAL** | **7738** | | | **7738** |

## 7. Simetryne

**Manufacturing Process:**

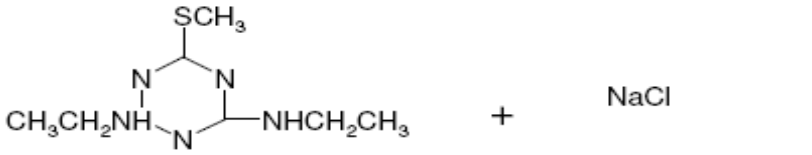
Simazine is reacted with dilute sodium methyl mercaptant solution under pressure at $100^0$C. Simetryne thus formed is filtered off, centrifuged, dried and pulverised and packed. The mother liquor is then treated with acid to recover SMM.

**Chemical Reaction:**




Simazine
Mol Wt 201

Sodium methyl mercaptant
Solution
Mol Wt 70




Simetryne
Mol Wt 212.5

Sodium Chloride
Mol Wt 58.5

**Mass Balance:**

**MASS BALANCE OF SIMETRYNE**

| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| Simazine | 995 | | |
| Water | 2528 | | |
| SMM 20% Sol | 2000 | | |
| Caustic Solution | 100 | | |
| HCL | 125 | | |
| | | Waste Water | 4398 |
| | | Drying Loss | 350 |
| | | Simetryne | 1000 |
| **TOTAL** | **5748** | | **5748** |

## 8. Terbutryne

### Manufacturing Process:

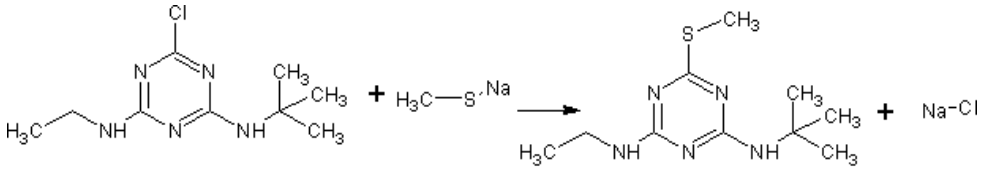
Tertiary Butyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated in reaction.

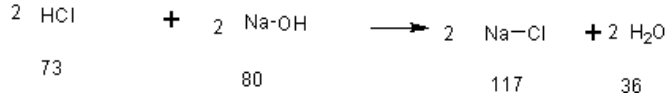
Ethyl amine is charged slowly. Sodium hydroxide is charged to neutralize Hydrochloric acid which is generated in reaction.

Aqueous phase is separated out, fresh water is charged and Toluene is distilled out azeotropically in presence of live steam. Product is filtered off & centrifuged.

Wet cake is charged in Sodium Methyl Mercaptan solution in Vessel and temperature is raised to replace Chlorine in Terbuthylazine. Product is washed, centrifuged. Dried and packed suitably.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF TERBUTRYNE**

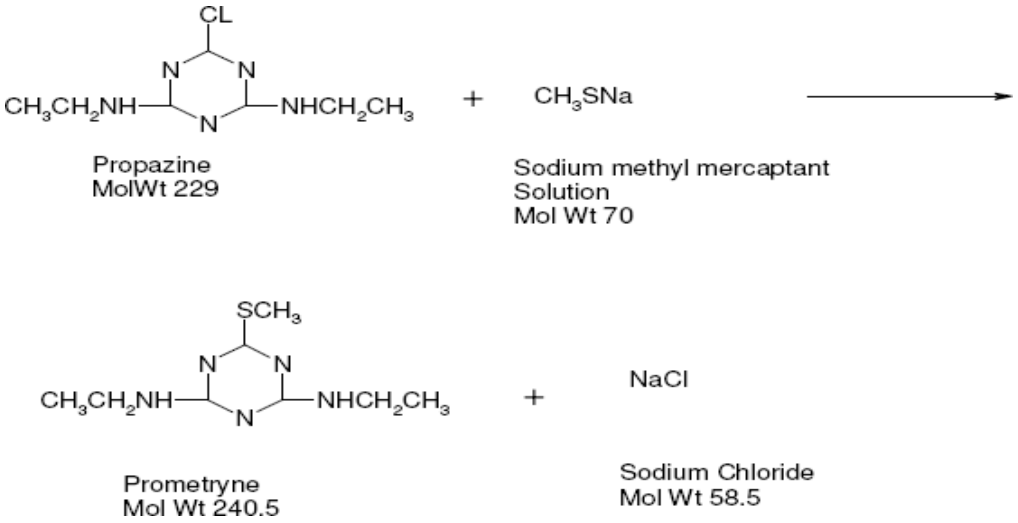
| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| Terbutylazine | 988 | | |
| Water | 2528 | | |
| SMM 20% Sol | 1921 | | |
| Caustic Solution | 13 | | |
| HCl | 16 | | |
| | | waste water | 4364 |
| | | Drying loss | 102 |
| | | Terbutryne | 1000 |
| **TOTAL** | **5466** | | **5466** |

## 9. Promethryn

### Manufacturing Process:

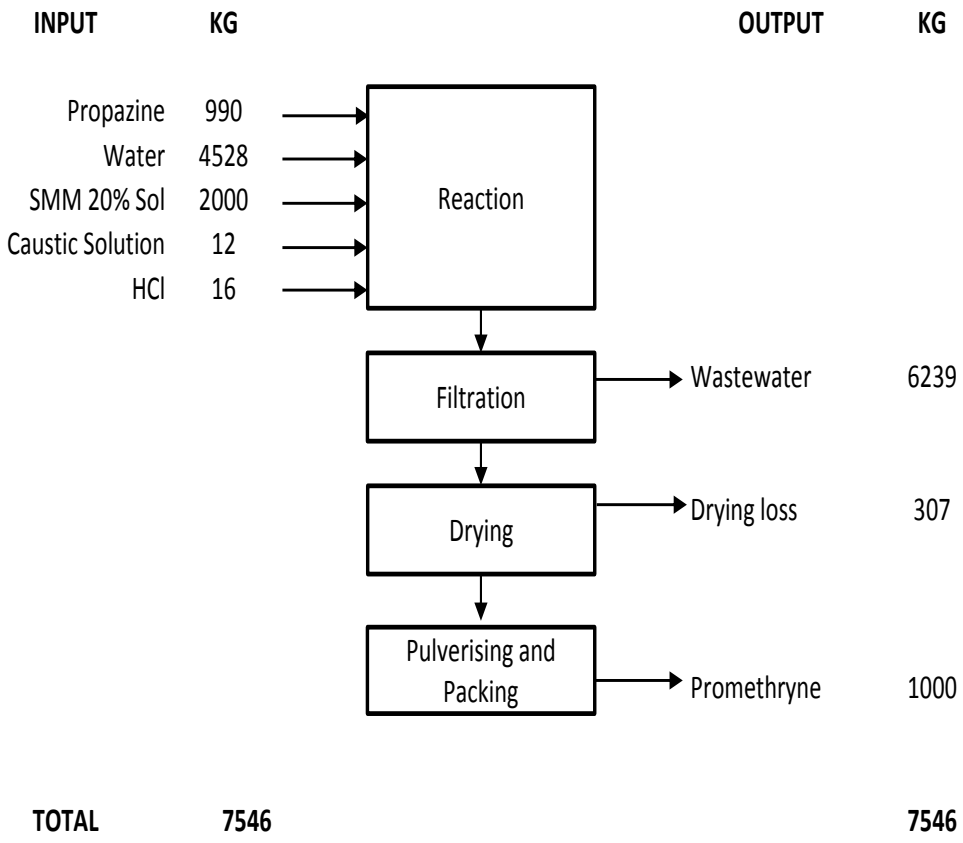
Propazine is reacted with dilute sodium methyl mercaptant solution under pressure at $100^0$C. Prometryne thus formed is filtered off, centrifuged, dried and pulverised and packed. The mother liquor is then treated with acid to recover SMM.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF PROMETHRYN**

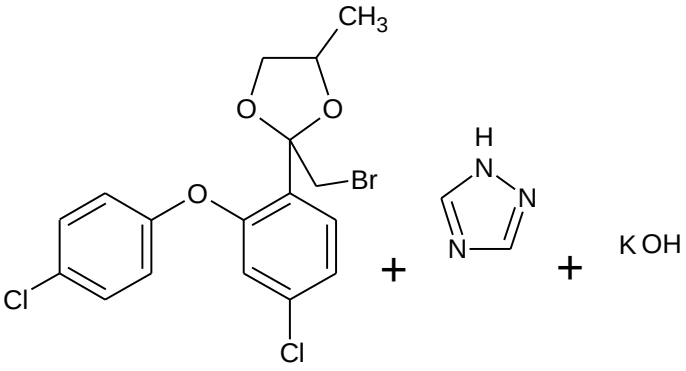


## 10. Difenoconazole

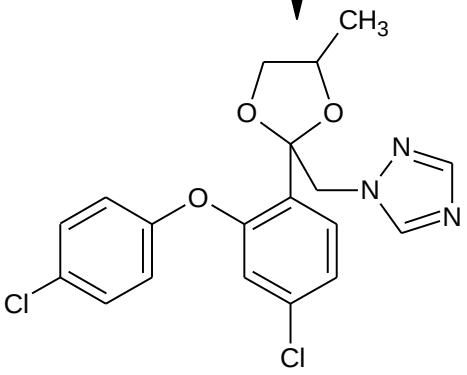
**Manufacturing Process:**

1,2,4 Triazole, Toluene, DMSO, water, potassium hydroxide is charged and water is removed azeotropically. Toluene is also removed partially and then bromoketal is charged and temperature is increased. Reaction mass is maintained at elevated temperature for few hours. Toluene and DMSO is distilled out. Charged Toluene and washed with water. Aqueous phase is discarded and Toluene is distilled out to get crude material. Difenoconazole is distilled out and from distilled material; Difenoconazole is crystallized to get crystalline powder.

**Chemical Reaction:**




418 69 56



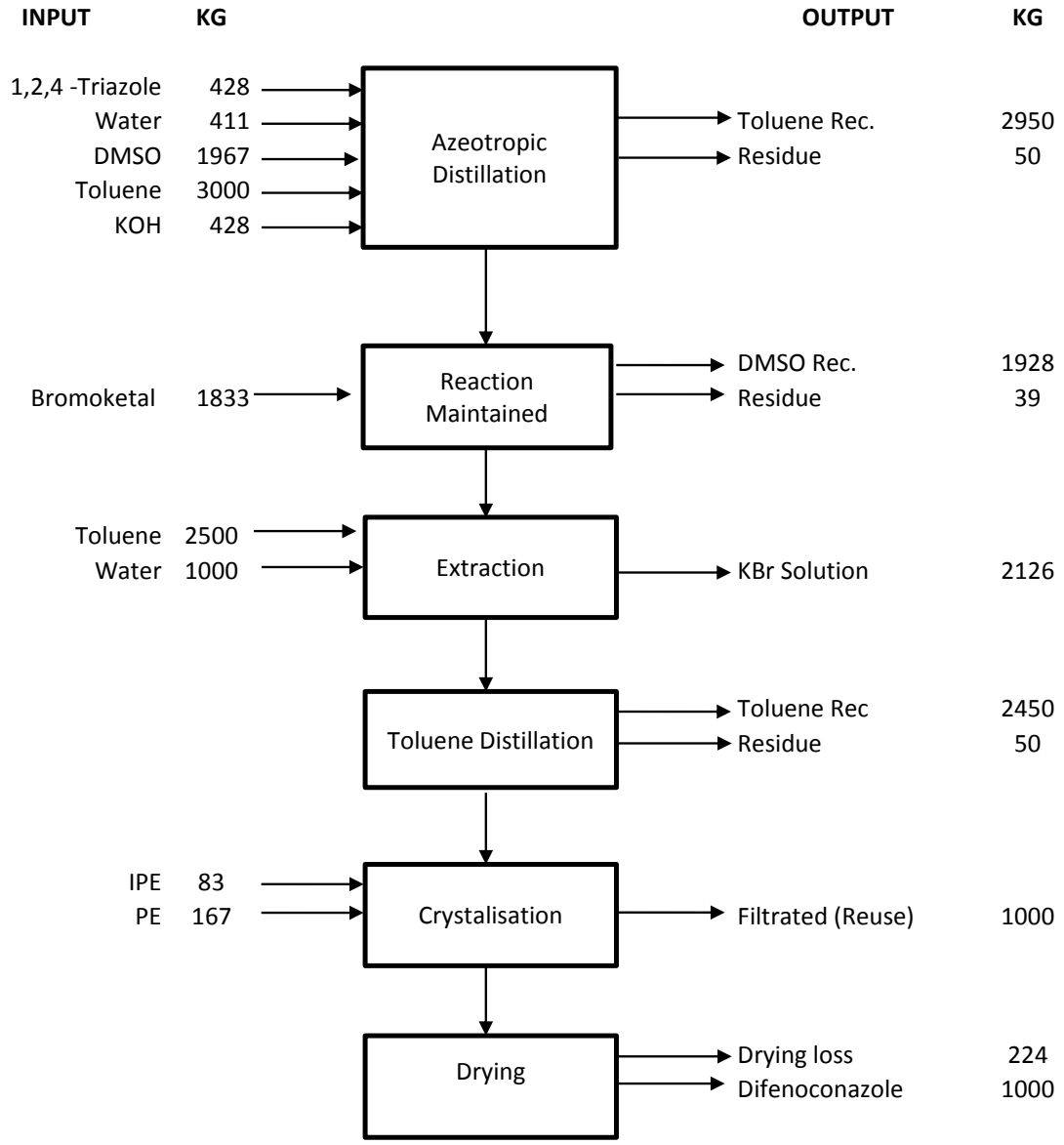

406

\+ K-Br + $H_2O$

119 18

## Mass Balance:

**MASS BALANCE OF DIFENACONAZOLE**




| | | | |
|---|---|---|---|
| **TOTAL** | **11817** | | **11817** |

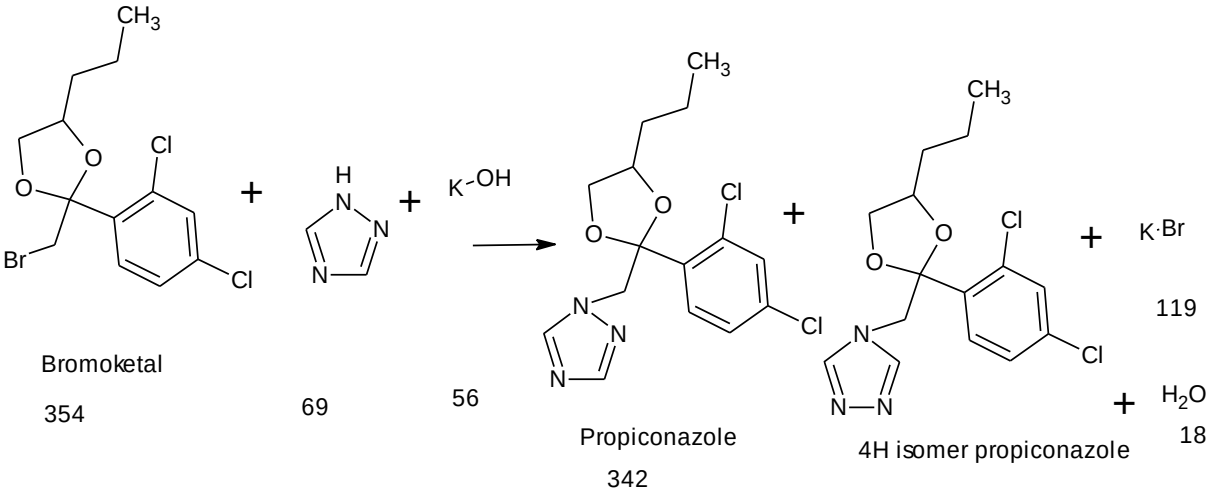
## 11. Propiconazole

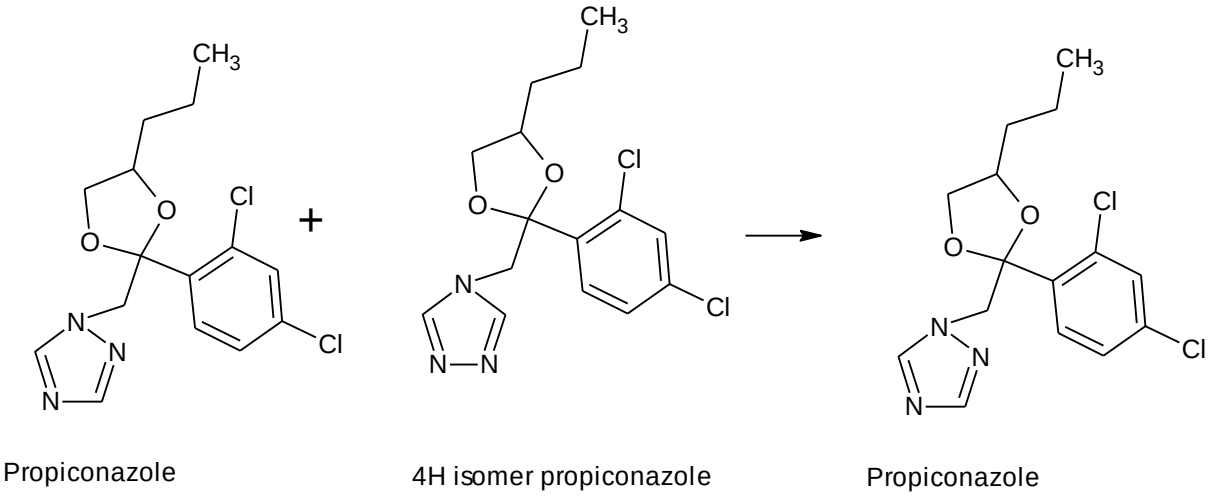
### Manufacturing Process:

1,2,4 1H Triazole and Potassium Hydroxide is charged in DMSO solvent to form Potassium Salt of 1,2 4 1H Triazole. 2 Bromo Methyl-2-[(2,4 dichlorophenyl)-4-propyl]-1,3 Dioxolan (Bromoketal) is gradually added to DMSO containing Potassium Salt of Triazole. Temperature is raised and maintained for few hours to complete the reaction.

After completion of reaction solvent is removed by distillation. Residue is washed with water and then crude Propiconazole is distilled to get technical grade Propiconazole. Residue is transferred to ETP.

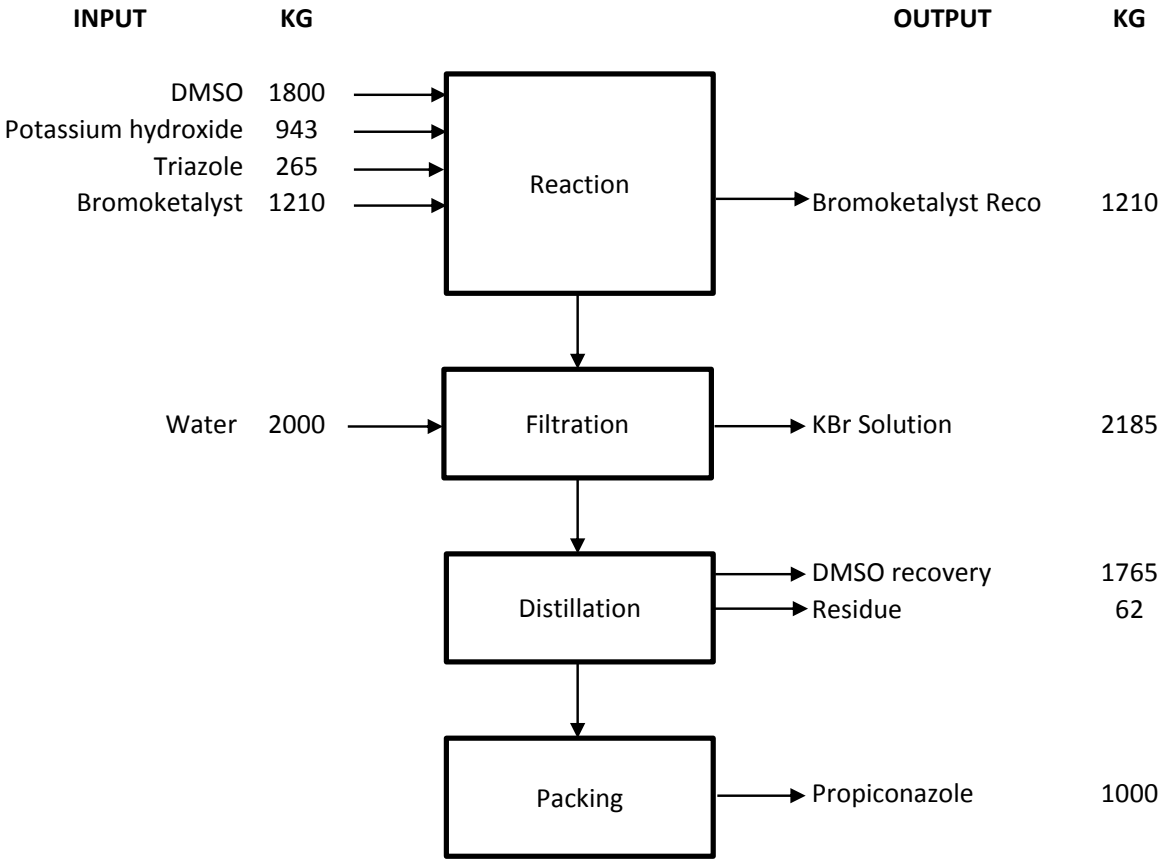
### Chemical Reaction:



## Mass Balance:

**MASS BALANCE OF PROPICONAZOLE**



## 12. Hexaconazole

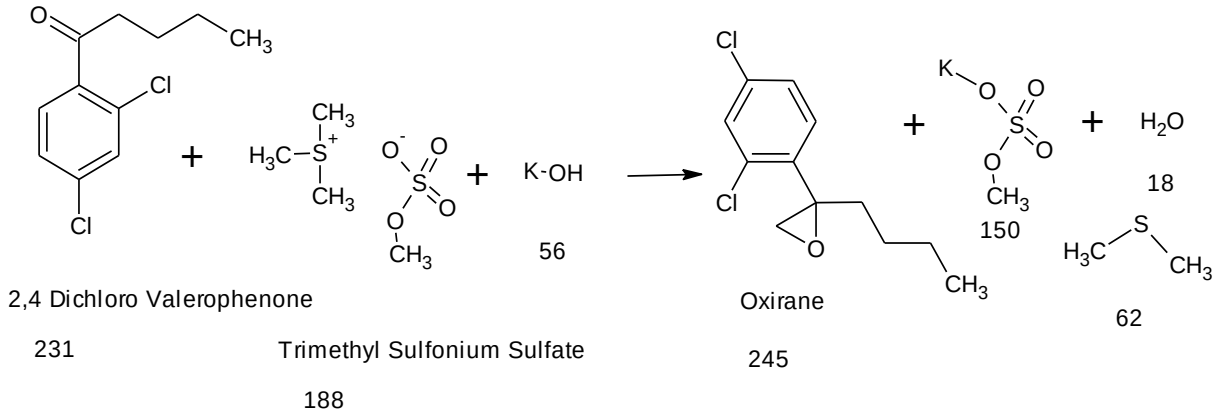
### Manufacturing Process:

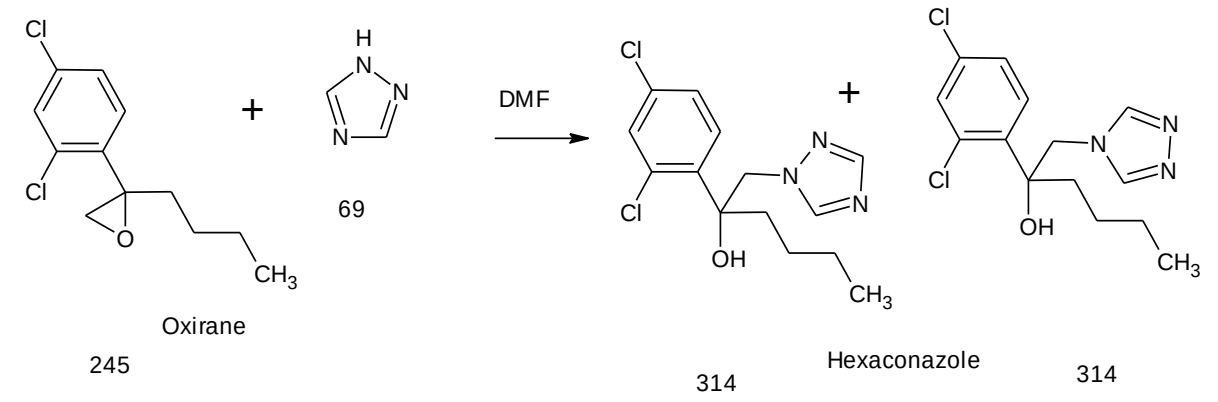
Trimethyl sulfonium sulfate preparation: Di Methyl sulfate is charged in Di Methyl Sulfide at 33°C to form Trimethyl sulfonium sulfate.

2,4 Di Chloro Valerophenone is reacted with Trimethyl sulfonium sulfate in presence of potassium Hydroxide to form Oxirane. Solvent Di Methyl sulfide is recovered by distillation and product (Oxirane) is separated from Potassium Hydrogen sulfate water is added to dissolve salt and back extracted with Methylene dichloride and then Aqueous is transferred to ETP. 1,2,4 1H Triazole and Potassium Carbonate is charged in Di Methyl formamide solvent and Previously prepared Oxirane is added at elevated temperature to form Hexaconazole. After completion of reaction, organic phase is separated by filtration. Carbonate sludge is washed with DMF and collected with organic filtrate. Sludge is transferred to solid waste DMF is distilled out from reaction mass first at atmospheric distillation and then by vacuum distillation.

Hexaconazole is isolated from molten mass with help of water. Slurry is filtered, centrifuged and dried.

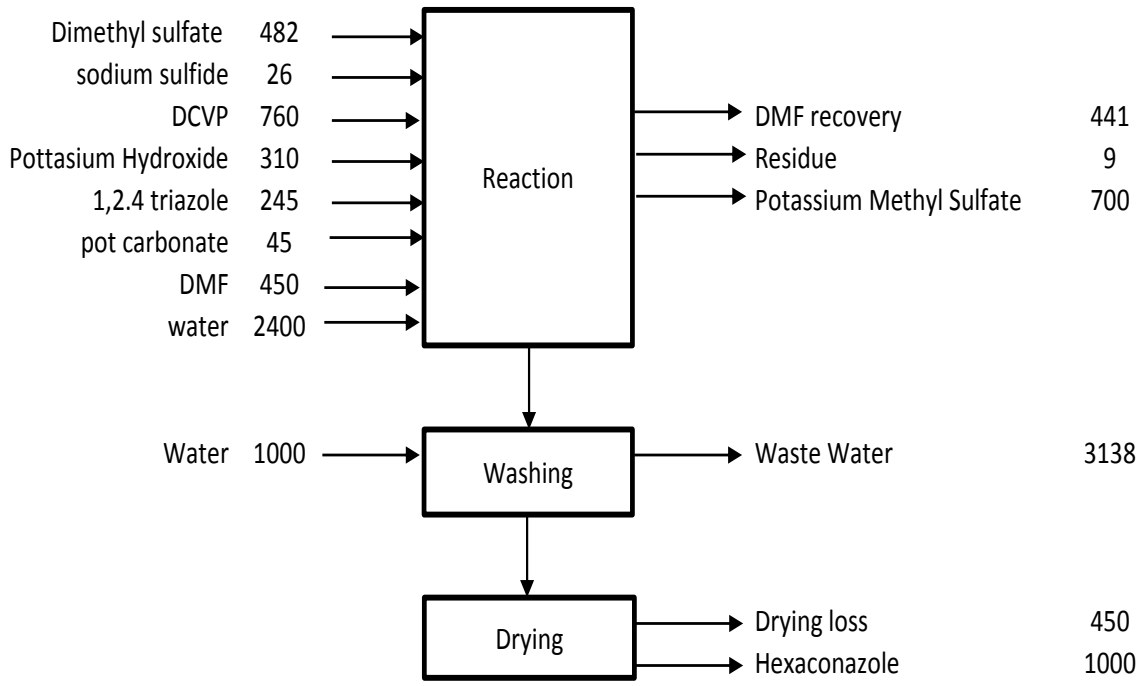
### Chemical Reaction:



## Mass Balance:

**MASS BALANCE OF HEXACONAZOLE**



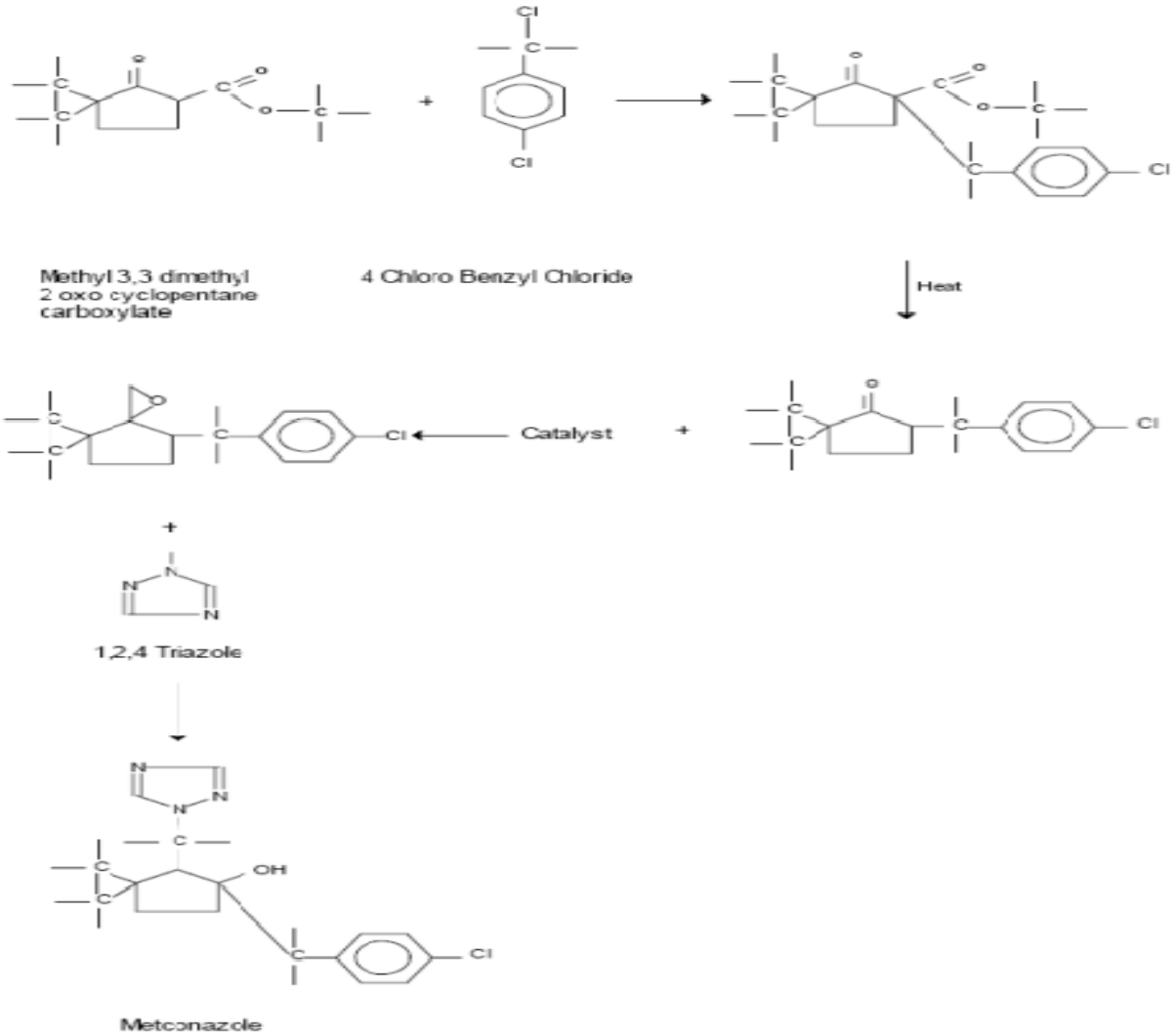
## 13. Metconazole

**Manufacturing Process:**

Methyl-33,-Dimethyl-2-Oxo-Cyclopentane Carboxylate reacts with 4-Chloro Benzyl Chloride in presence of Solvent and catalyst to give 1-(4-Chloro Benzyl) Methyl-3,3-Methyl-2-Oxo Cyclopentane Carboxylate, which undergoes rearrangement reaction on heating with catalyst gives the intermediate.

Intermediate finally reacts with 1,2,4-Triazole in presence of solvent as well as catalyst to give the final product Metconazole.

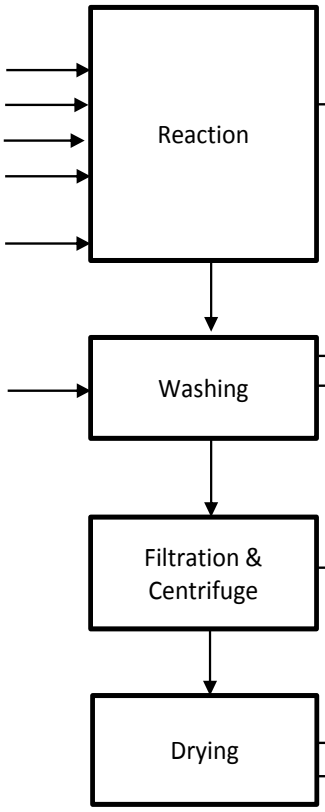
**Chemical Reaction:**



## Mass Balance:

**MASS BALANCE OF METCONAZOLE**

| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| Methyl-33,-Dimethyl-2-Oxo-Cyclopentane Carboxylate | 361 | | |
| 4-Chloro Benzyl Chloride | 535 | HCl Gas | 94 |
| Catalyst | 25 | | |
| Toluene | 2178 | | |
| 1, 2,4-Triazole | 218 | | |
| Water | 595 | | |
| Watre for Scrubber | 282 | | |
| Water | 395 | Toluene Recvoey | 2134 |
| | | Residue | 165 |
| | | Effluent | 714 |
| | | Drying loss | 482 |
| | | Metconazole | 1000 |
| **TOTAL** | **4589** | | **4589** |

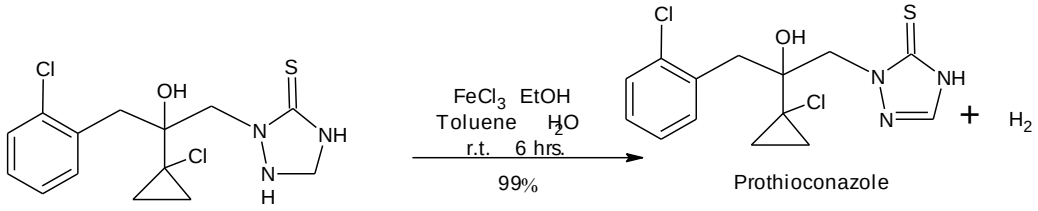


## 14. Prothioconazole

### Manufacturing Process:

At room temperature, a mixture of 2-(1-chloro-cycloprop-1-yl)-1-(2-chloro-phenyl)-2-hydroxy-3-(1,2,4-triazolidine-5-thiono-1-yl)-propane, toluene and ethanol is admixed with stirring with 0.5 molar aqueous iron (III) chloride solution which has been acidify slightly with hydrochloric acid. The reaction mixture is stirred at room temperature for 6 hrs, and the phases are then separate. The organic phase is washed twice with water and saturated aqueous sodium chloride solution, dried over sodium sulphate and concentrated under reduced pressure. This gives solid product 2-(1-chloro-cycloprop-1- yl)-1-(2-chloro-phenyl)-3-(4,5-dihydro-1,2,4-triazole-5-thiono-1-yl)-propan-2-ol.

### Chemical Reaction:

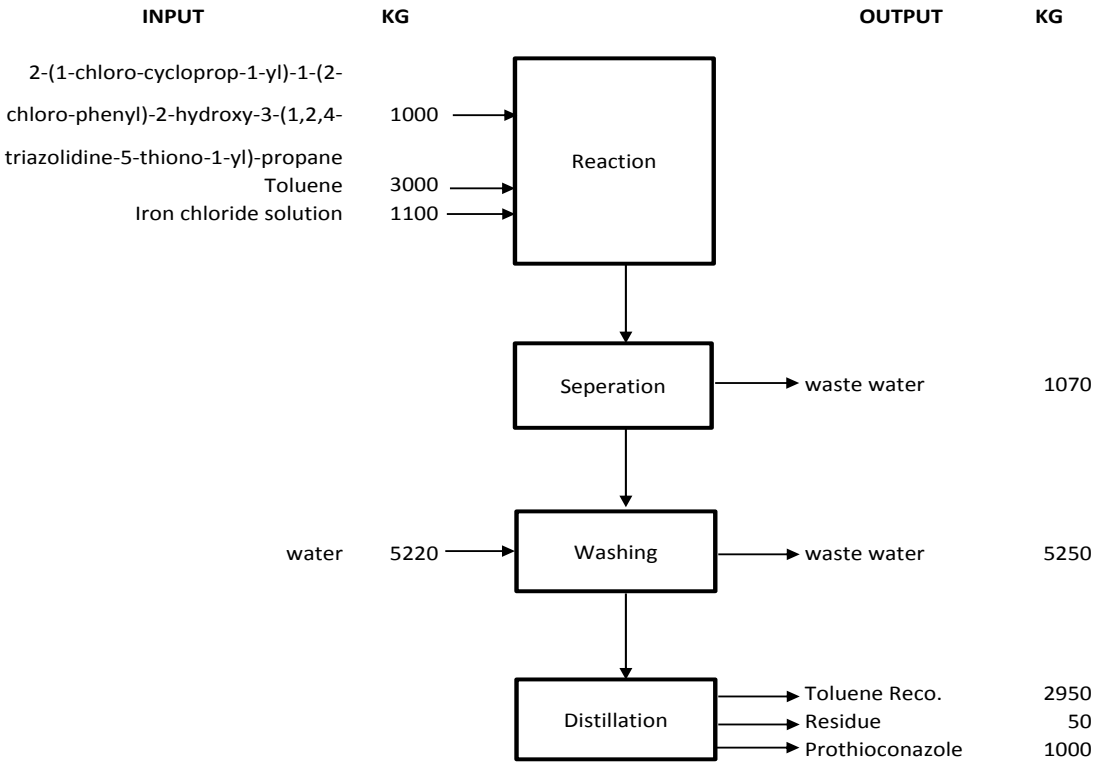



2-[2-(1-chlorocyclopropyl)-3-(2-chlorophenyl)-2-hydroxypropyl]-1,2,4-triazolidine-3-thione

346 344 2

### Mass Balance:

**MASS BALANCE OF PROTHICONAZOLE**

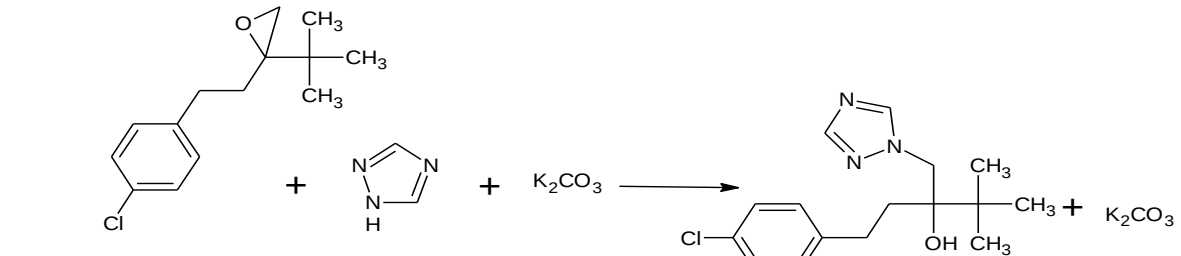


## 15. Tebuconazole:

### Manufacturing Process:

In a reaction vessel, charged DMF, Oxirane, potassium Carbonate and 1,2,4 Triazole and slowly temperature increased to elevated temperature and maintained for 8 hours to complete reaction. Caustic soda flakes is charged slowly to isomerise 4 H isomer when test is ok. DMF is distilled out and reaction mass drowned in to water. Toluene is charged and organic mass is extracted and aqueous is discarded. Toluene is cooled to precipitate Tebuconazole. Filter and dry the Tebuconazole.

### Chemical Reaction:




2-*tert*-butyl-2-[2-(4-chlorophenyl)ethyl]oxirane

Tebuconazole

238.5 69 138 307.5 138

### Mass Balance:

**MASS BALANCE OF TEBUCONAZOLE**

| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| 1,2,4-triazole | 300 | → Reaction | | |
| Oxirane,2[2,-(4-chlorophenylEthyl)-2-(1,1-dimethyl)] | 800 | → Reaction | | |
| DMF | 1000 | → Reaction | | |
| | | Reaction → Seperation | | |
| Caustic | 100 | → Seperation | DMF Reco | 980 |
| | | | Residue | 20 |
| | | Seperation → Extraction | | |
| Water | 2000 | → Extraction | Waste water | 2200 |
| Toluene | 936 | → Extraction | | |
| | | Extraction → Distillation | | |
| | | | Toluene | 918 |
| | | | Reside | 18 |
| | | | Tebuconazole | 1000 |
| **TOTAL** | **5136** | | | **5136** |

## 16. Tricyclazole

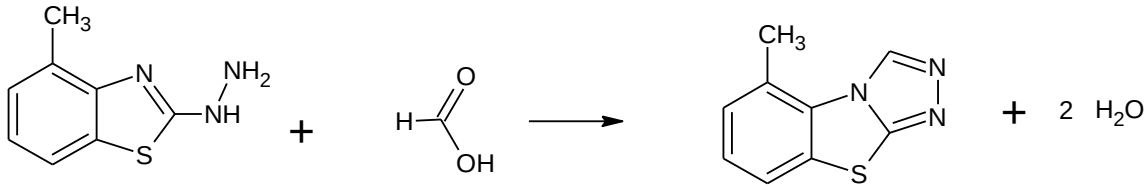
### Manufacturing Process:

2- Hydrazino -4-Methyl Benzo Thiazol is charged in formic acid at 90-100° C in four hour time. Temperature is raised to complete the reaction. After completion of reaction formic acid is distilled out along with some water.

After most of formic acid is distilled out water is charged in to the reactor and residual acid is neutralized with Caustic soda lye.

Slurry is filtered out, centrifuged and dried. Filtrate is sent to ETP.

### Chemical Reaction:




| HMBT | | Tricyclazole | |
|---|---|---|---|
| 179 | 46 | 189 | 36 |

### Mass Balance:

**MASS BALANCE OF TRICYCLAZOLE**

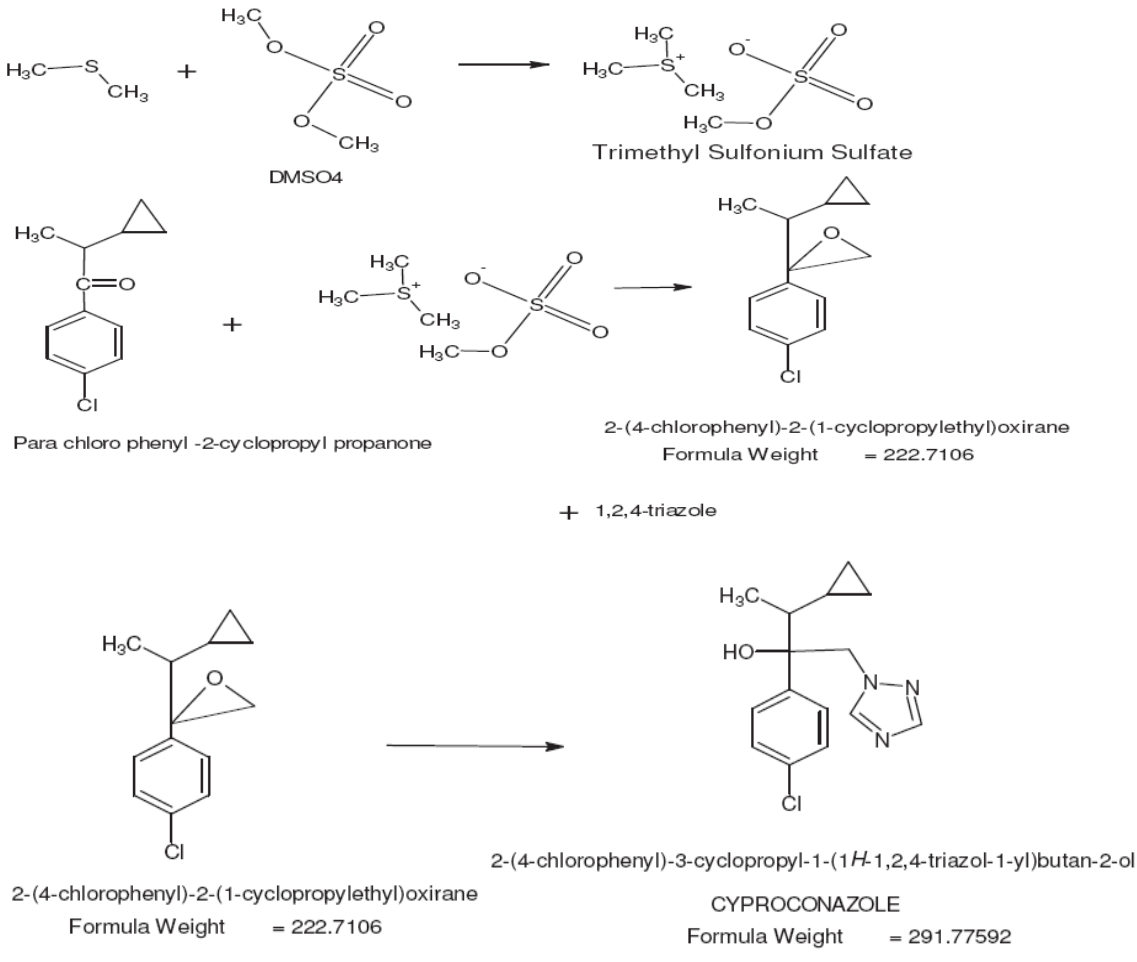
| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| HMBT | 960 | Formic acid recovery | 240 |
| Formic acid | 530 | | |
| Caustic lye | 40 | | |
| Water | 4400 | | |
| | | Waste water | 4645 |
| | | Drying loss | 45 |
| | | Tricyclazole | 1000 |
| **TOTAL** | **5930** | | **5930** |

## 17. Cyproconazole

**Manufacturing Process:**

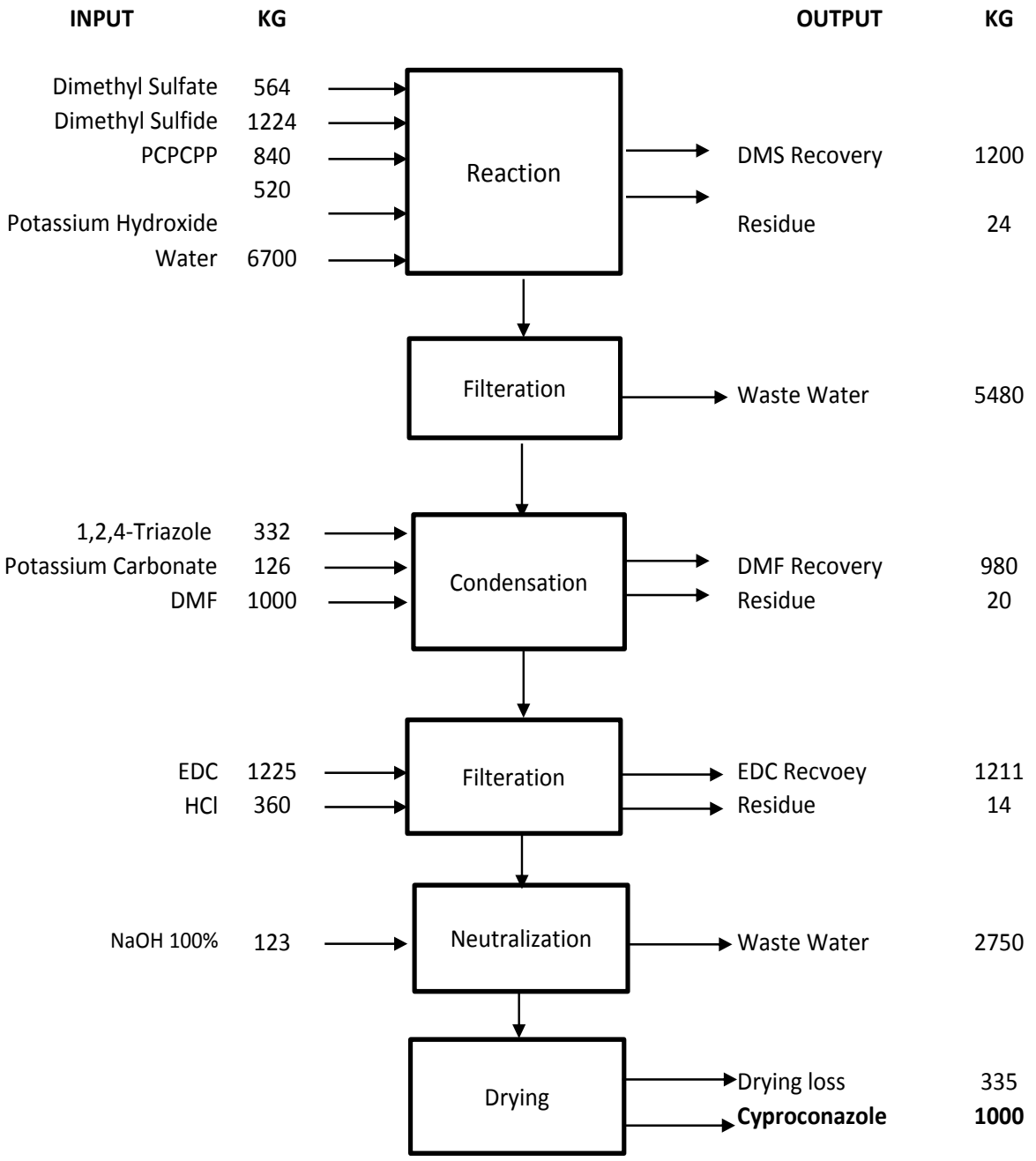
Trimethyl sulfonium sulfate preparation. Di methyl Sulfate is charged in Di methyl sulfide at 33°C to form trimethyl sulfonium sulfate. Para chloro Phenyl 2 cyclopropyl 1 propanone is reacted with trimethyl sulfonium sulfate in presence of potassium hydroxide to form oxirane. Solvent di methyl sulfide is recovered by distillation and product (oxirane) is separated from potassium methyl sulfate. Water is added to dissolve salt and then aqueous is transferred to ETP. 1,2,4 1H triazole and Patassium carbonate is charged in dimethyl formamide solvent and previously prepared Oxirane is added at elevated temperature to form cyproconazole. After completion of reaction, organic phase is separated by filtration. Sludge is transferred to solid waste. DMF is distilled out from reaction mass first at atmospheric distillation and then by vaccum distillation. Organics will be dissolved in EDC and heat to dissolve organics. Hydrochloric acid is charged and cooled to room temperature to isolate product. Cyproconazole hydrochloride is neutralized with caustic lye in EDC and cooled to room temperature to isolate the product. Slurry is filtered, centrifuged and dried.

**Chemical Reaction:**



## Mass Balance:

**MASS BALANCE OF CYPROCONAZOLE**

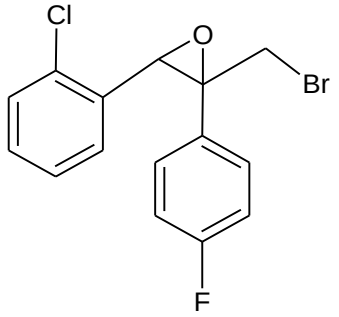


## 18. Epoxyconazole

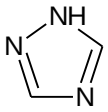
**Manufacturing Process:**

Charge in reaction vessel 1,2,4-triazole and sodium hydride (80% strength dispersion in mineral oil) are suspended in N,N-dimethyl formamide and a solution of 2-bromomethyl-2-fluorophenyl-3-(2-chlorophenylij)-oxirane in N,N-dimethyl formamide is to be added at room temperature. After 8 hours, the reaction solution poured onto water and extracted with ethyl acetate. The organic phase is washed with water and dried over sodium sulphate and the solvent is evaporated off under reduce pressure. Recrystallization from di isopropyl ether will give Z-2-(1,2,4-triazole-1-ylmethyl)-2-phenyl-3-(2-chlorophenyl) oxirane.

**Chemical Reaction:**




+




69

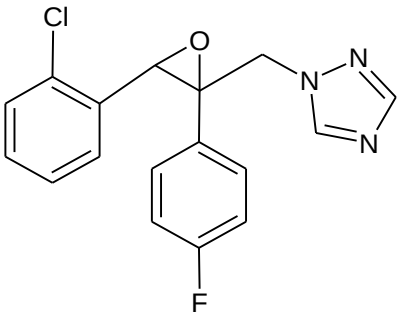
+ K–OH

56

2-(bromomethyl)-3-(2-chloromethyl)-2-(4-fluorophenyl)oxirane

341.5

Molecular Formula: $C_{15}H_{11}BrClFO$




+ K·Br + $H_2O$

Molecular Formula: $C_{17}H_{13}ClFN_3O$

Epoxiconazole

329.5

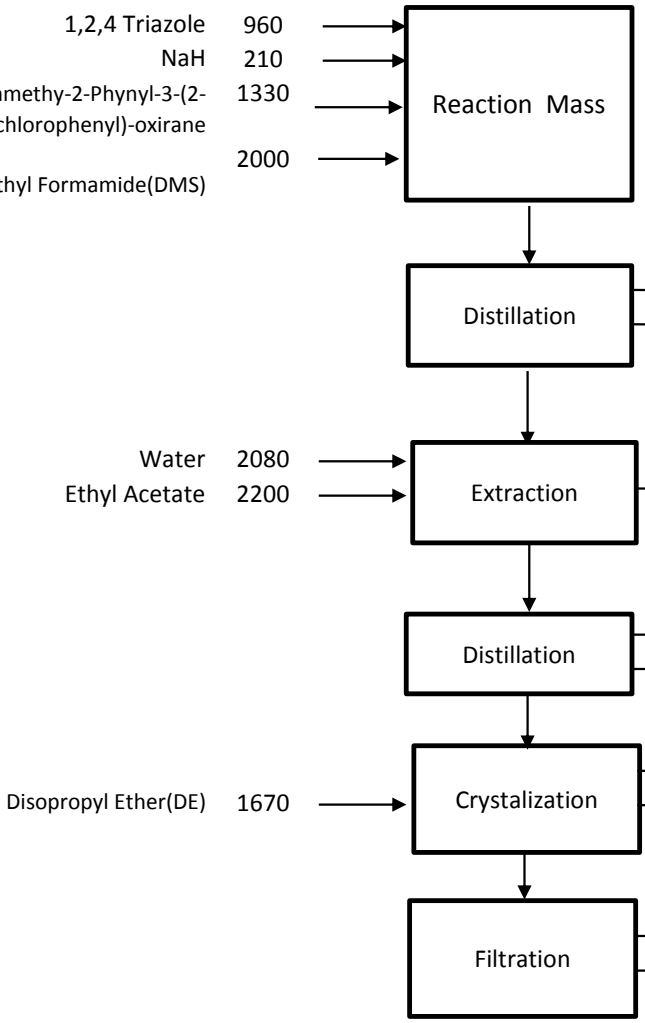
119

18

## Mass Balance:

**MASS BALANCE OF EPOXYCONAZOLE**

| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| 1,2,4 Triazole | 960 | | |
| NaH | 210 | | |
| 2,Bromommethy-2-Phynyl-3-(2-chlorophenyl)-oxirane | 1330 | | |
| N,Ndimethyl Formamide(DMS) | 2000 | | |
| | | DMS Recovery | 1980 |
| | | Residue | 20 |
| Water | 2080 | | |
| Ethyl Acetate | 2200 | Waste water | 3530 |
| | | Ethyl Acetate Rec. | 2175 |
| | | Residue | 25 |
| Disopropyl Ether(DE) | 1670 | DE Recovered | 1637 |
| | | Residue | 33 |
| | | **Epoxyconazole** | **1000** |
| | | Residue | 50 |
| **TOTAL** | **10450** | | **10450** |



## 19. Flutriafol

**Manufacturing Process:**

Oxirane preparation:

Trimethylsulfonium sulfate preparation:

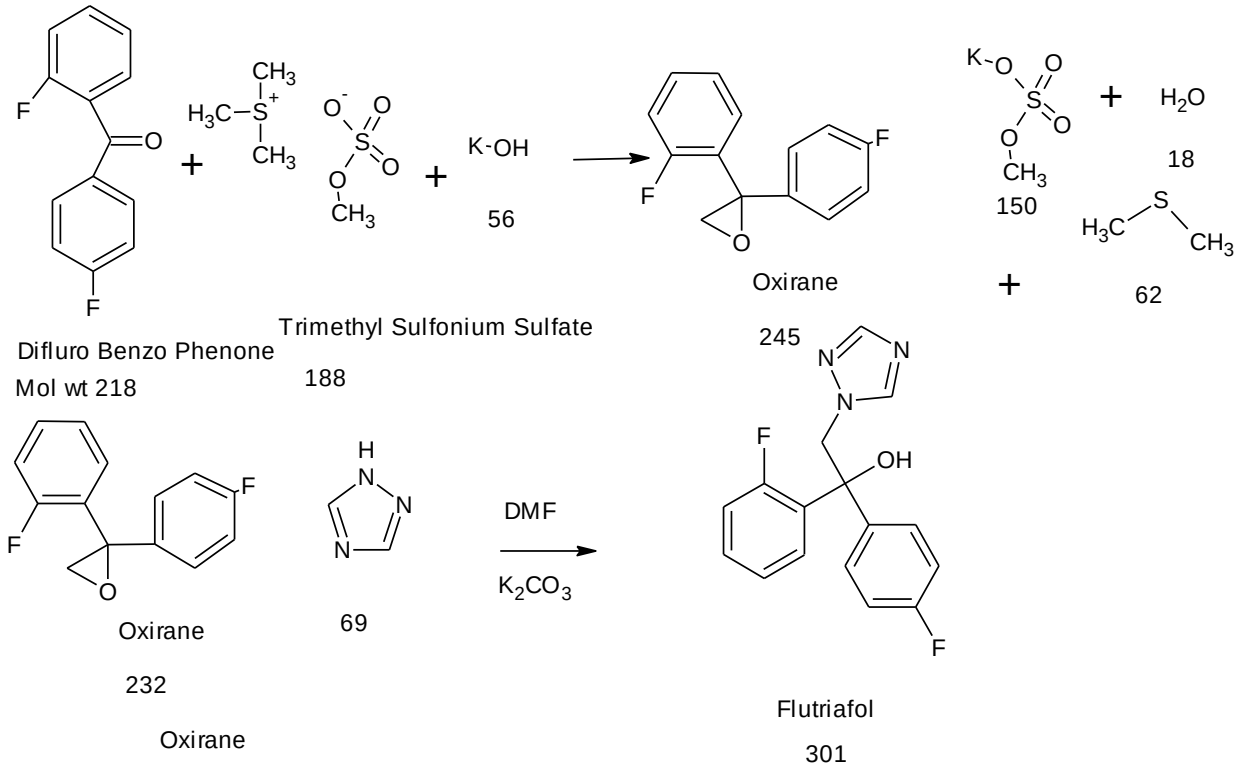
Di Methyl sulfate is charged in Di Methyl Sulfide at 33°C to form Trimethylsulfonium sulfate.

2,4 Di fluorobenzophenone is reacted with Trimethylsulfonium sulfate in presence of potassium Hydroxide to form Oxirane. Solvent Di Methyl sulfide is recovered by distillation and product (Oxirane) is separated from Potassium methyl sulfate, water is added to dissolve salt and then Aqueous is transferred to ETP.

1,2,4 1H Triazole and Potassium Carbonate is charged in Di Methyl formamide solvent and Previously prepared Oxirane is added at elevated temperature to form Flutriafol. After completion of reaction, organic phase is separated by filtration. Sludge is transferred to solid waste. DMF is distilled out from reaction mass first at atmospheric distillation and then by vacuum distillation.

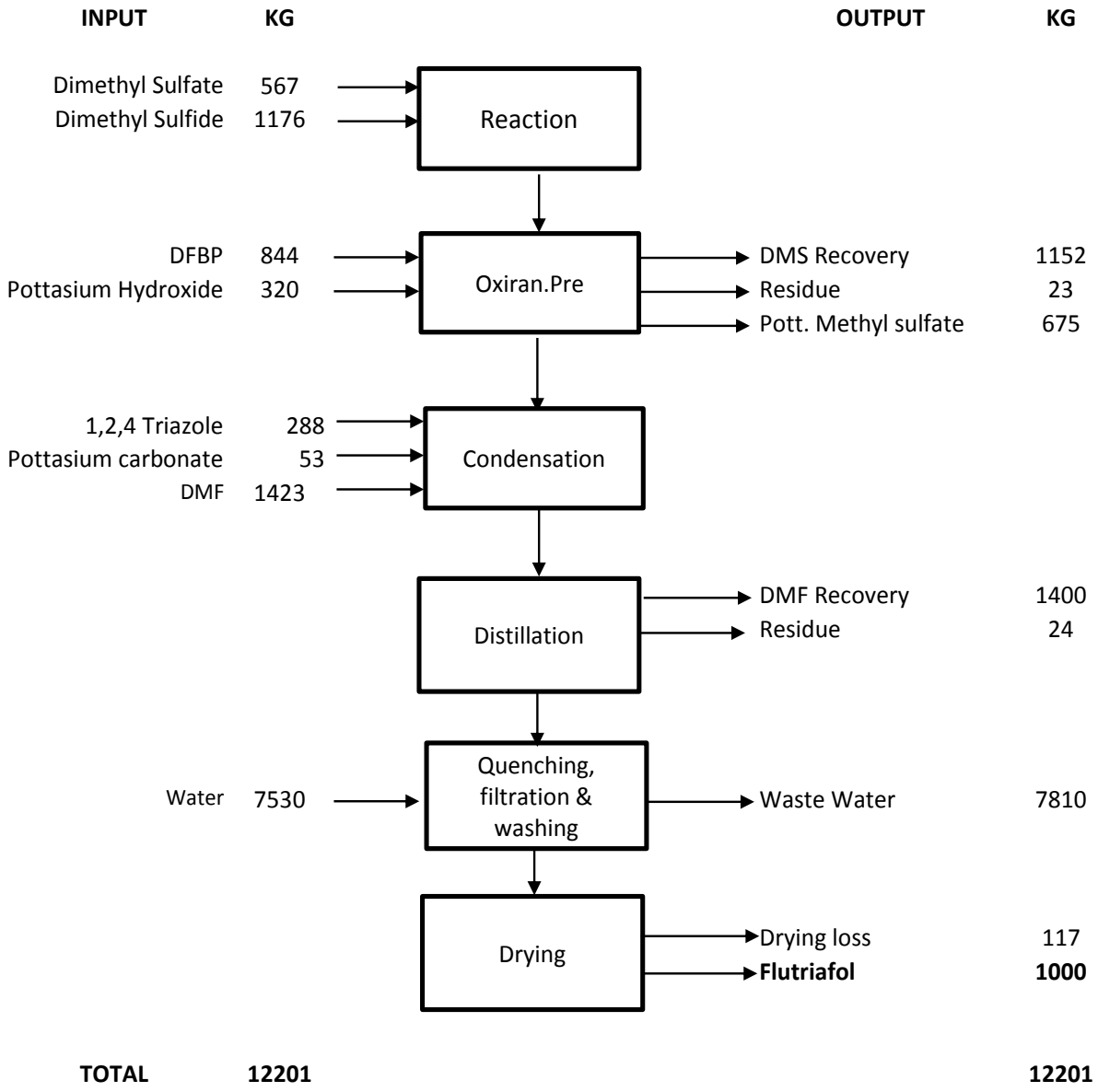
Flutriafol is isolated from molten mass with help of water. Slurry is filtered, centrifuged and dried.

**Chemical Reaction:**



## Mass Balance:

**MASS BALANCE OF FLUTRIAFOL**

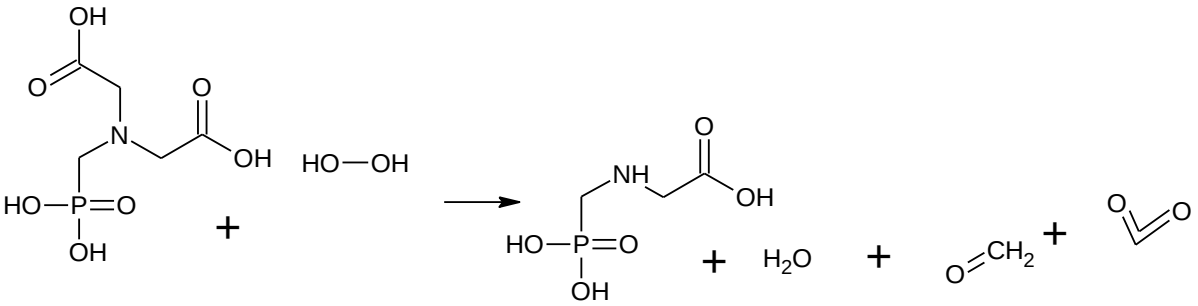


## 20. Glyphosate

### Manufacturing Process:

Phosphono Methyl Imino Diacetic Acid (PMIDA) is charged in water, catalyst sodium Tungstate is charged and temperature is raised. Hydrogen peroxide is added. Clear solution is formed. After addition of catalyst oxidation is carried out to form Glyphosate. Product is cooled and filtered out. Centrifuged and dried.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF GLYPHOSATE**

| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| PMIDA | 800 | | | |
| Carbon catalyst | 3 | | | |
| Hydrogen Peroxide | 400 | | | |
| SMBS | 5 | | | |
| | | Reaction | | |
| | | Filtration | | |
| Water | 6240 | Washing | waste water | 6248 |
| | | Drying | Drying loss | 200 |
| | | | Glyphosate | 1000 |
| **TOTAL** | **7448** | | | **7448** |

## 21. Pendimethalin

### Manufacturing Process:

Mixture of 4 NOX (4 Nitro Ortho Xylene), Di Ethyl Ketone and Platinum on carbon as catalyst is charged in autoclave. Hydrogen Gas is purged. Hydrogenation will be completed in 8-10 hours of time. Reaction mass is filtered to recover the platinum on carbon catalyst, which is used in next batches. Excess Di ethyl Ketone is recovered by distillation.

### Nitration

Mixed acid is prepared by adding nitric acid to Sulfuric acid and water in reactor at below room temperature. NAX and EDC is mixed in reactor. Add slowly EDC and NAX mixture to mixed acid prepared above at room temperature. Maintain temperature for few hours to complete the reaction. When reaction is completed allow to settle the reaction mass. Separate spent acid as bottom layer. Apply water wash to organic layer and separate organic layer. Aqueous layer containing acid which is back extracted with EDC and then neutralized and transferred to ETP.

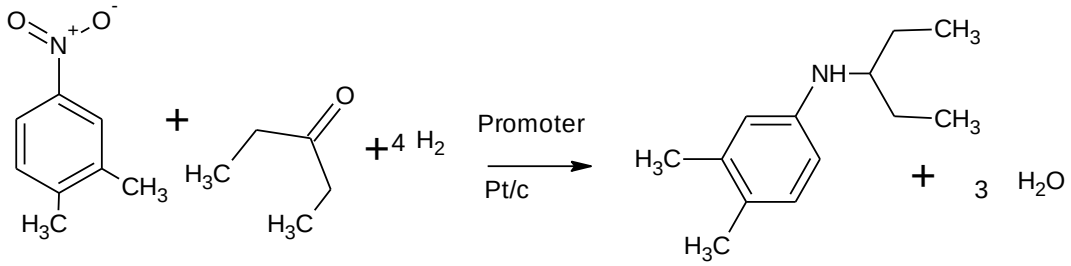
### Denitrososation

To remove N Nitroso impurity, reaction mass is treated with acetone and Hydrochloric acid at elevated temperature in Glass lined vessel. After completion of reaction neutralize excess hydrochloric acid with caustic lye and then washed with water. Aqueous phase was separated Distilled out EDC from organic mass first at atmospheric and then under vacuum to remove EDC. This will generate crude Molten Pendimethalin.

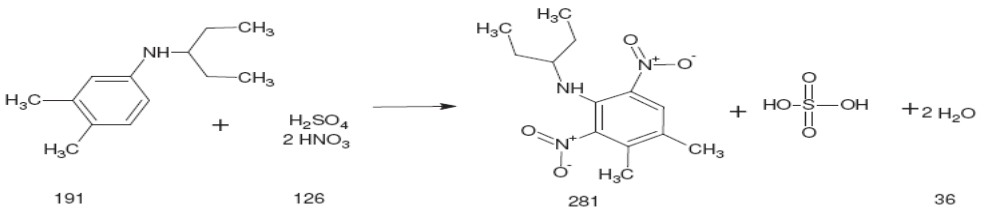
### Purification

During distillation and earlier reactions tar is formed in crude molten Pendimethalin. Molten Pendimethalin is dissolved in n Hexane, clarified to remove tarry mass and from clear solution Hexane is removed by distillation to get Pendimethalin, which is packed as per requirement.

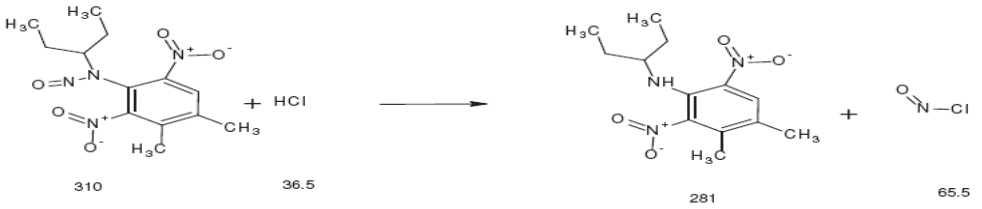
### Chemical Reaction




151 86 8 191 54




Denitrososolation




## Mass Balance:

**Mass Balance of Pendimethalin**

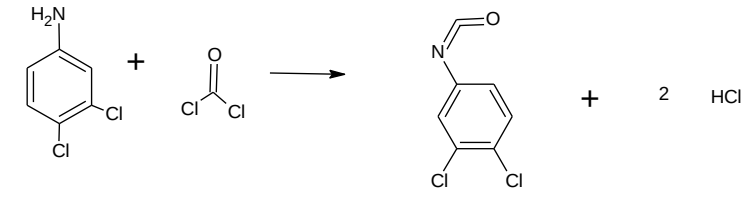
| Input | Kgs | | Out put | Kgs |
|---|---|---|---|---|
| DEK | 1200 | → **Nax Preparation** | | |
| 4 NOx | 600 | → | | |
| Hydrogen | 35 | → | | |
| Water | 500 | → **Washing** | Wastewater | 472 |
| | | | Recovered DEK | 700 |
| EDC | 1500 | → **Nax Nitration** | NOx Gas | 35 |
| Nitric Acid | 1000 | → | | |
| Sulphuric A | 690 | → | | |
| Water | 152 | → | | |
| Caustic Soc | 48 | → | | |
| | | **Separation** | Spent H2SO4 (48-50%) | 1690 |
| Hydro Chlo | 52 | → **Denitosation & Washing** | Wastewater | 1610 |
| Water | 1200 | → | | |
| | | **Distillation** | Recovered EDC | 1470 |
| | | | Pendimethalin | 1000 |
| **Total** | **6977** | | | **6977** |

## 22. Diuron

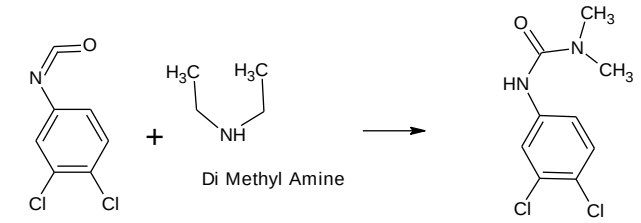
### Manufacturing Process:

3,4 DCPI and DMA being added in the reactor gradually and stir and maintain with specified temperature. After the reaction carried out the whole mass being transferred in filter for the filtration. The mass is flush with water and aqueous goes to ETP, solvent is being recovered. Then the wet cake from the filter dried gets Diuron final product.

### Chemical Reaction:



3,4 Dichloro Aniline 162 + 99 → 3,4 Dichloro Phenyl Isocyanate 188 + 2 HCl 73



3,4 Dichloro Phenyl Isocyanate 188 + Di Methyl Amine 45 → Diuron 233

### Mass Balance:

**MASS BALANCE OF DIURON**

| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| Dichloro Phenyl Isocyanta | 807 | Reaction | | |
| Xylene | 1500 | | | |
| Dimethyl aniline | 193 | | | |
| | | Filtration | Wet Cake | 1000 |
| | | Distillation | Xylene | 1470 |
| | | | Residue | 30 |
| Wash Water | 1500 | Washing | Wash water | 1450 |
| Wet Cake | 1000 | | | |
| | | Drying | Drying loss | 50 |
| | | | Diuron | 1000 |
| **TOTAL** | **5000** | | | **5000** |

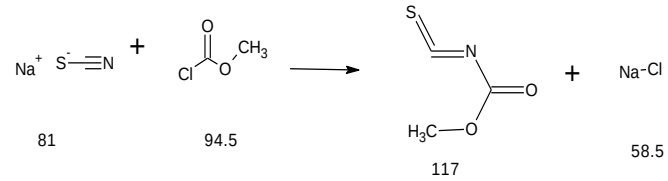
## 23. Thiophanate Methyle

### Manufacturing Process:

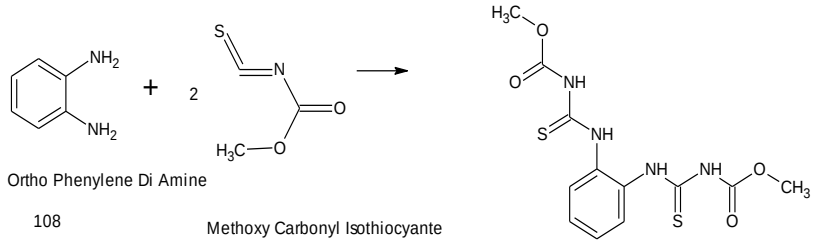
Sodium Thiocyanate is charged in to Di Chloro ethane and reacted with Methyl chloroformate to form Methoxy carbonyl iso Thiocyanate.

Ortho Pheneylene Diamine is charged to Methoxy carbonyl Iso Thioocyante in Di Chloro Ethane and temperature is raised to reflux temperature. Reaction is completed in 3 to 4 hour time. Reaction mass is cooled to $50^0$C and then filtered. Hot water washing is applied to remove solvent. Product is dried, pulverized and packed as per requirement. Mother liquor and washing is to be collected and solvent Dichloro Ethane is to be recovered first by atmospheric distillation and then by vacuum distillation.

### Chemical Reaction:




81 94.5 117 58.5




Ortho Phenylene Di Amine 108

Methoxy Carbonyl Isothiocyante 117

Thiophanate Methyl 342

### Mass Balance:

**MASS BALANCE OF THIOPHANATE METHYLE**

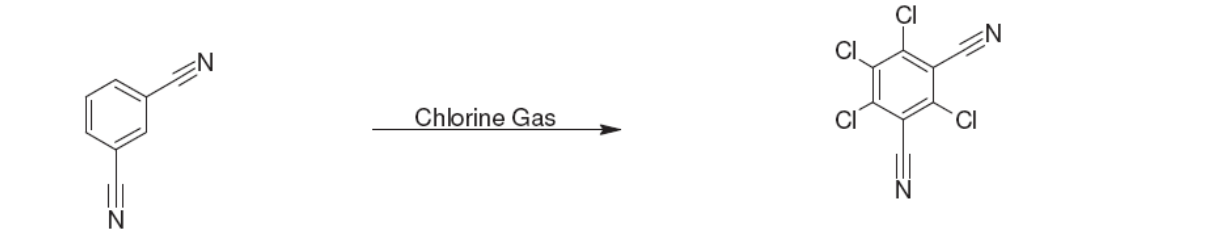
| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| EDC | 2000 | Reaction | EDC Recovery | 1960 |
| Sodium Thiocyanate | 425 | | Residue | 40 |
| Methyl chloro Formate | 400 | | | |
| OPDA | 350 | | | |
| Water | 3100 | | | |
| | | Filtreation | Wastewater | 3075 |
| Water | 1000 | Washing | Wastewater | 1000 |
| | | Drying | Drying loss | 200 |
| | | | Thiophanate Methyl | 1000 |
| TOTAL | 7275 | | | 7275 |

## 24. Chlorothionil

### Manufacturing Process:

Into a glass lined reactor charge EDC, catalyst and isophthalo nitrite. Purge chlorine gas at elevated temperature until the completion of reaction. After completion of reaction, cool the reaction mass and filter. Recover solvent from mother liquor under vaccum. Wet cake is dried to get Chlorothalonil.

### Chemical Reaction:




benzene-1,3-dicarbonitrile

2,4,5,6-tetrachlorobenzene-1,3-dicarbonitrile

### Mass Balance:

**MASS BALANCE OF CHLOROTHIONIL**

| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| Isophthalic Acid | 664 | Reactor | Water | 648 |
| Alumina Catalyst | 90 | | | |
| Ammonia Gas | 426 | | | |
| | | Filteration | Alumina Catalyst Reco | 90 |
| Activated Carbon | 80 | Reactor | HCl | 145 |
| Chlorine Gas | 1160 | | | |
| | | Filteration | Trichlorobenzene Rec | 1765 |
| Trichlorobenzene | 1800 | | Residue | 35 |
| | | Drying | Drying loss | 537 |
| | | | **Chlorothionil** | **1000** |
| **TOTAL** | **4220** | | | **4220** |

## Pesticide Intermediates

### 1. Azoxystrobin

**Manufacturing Process:**

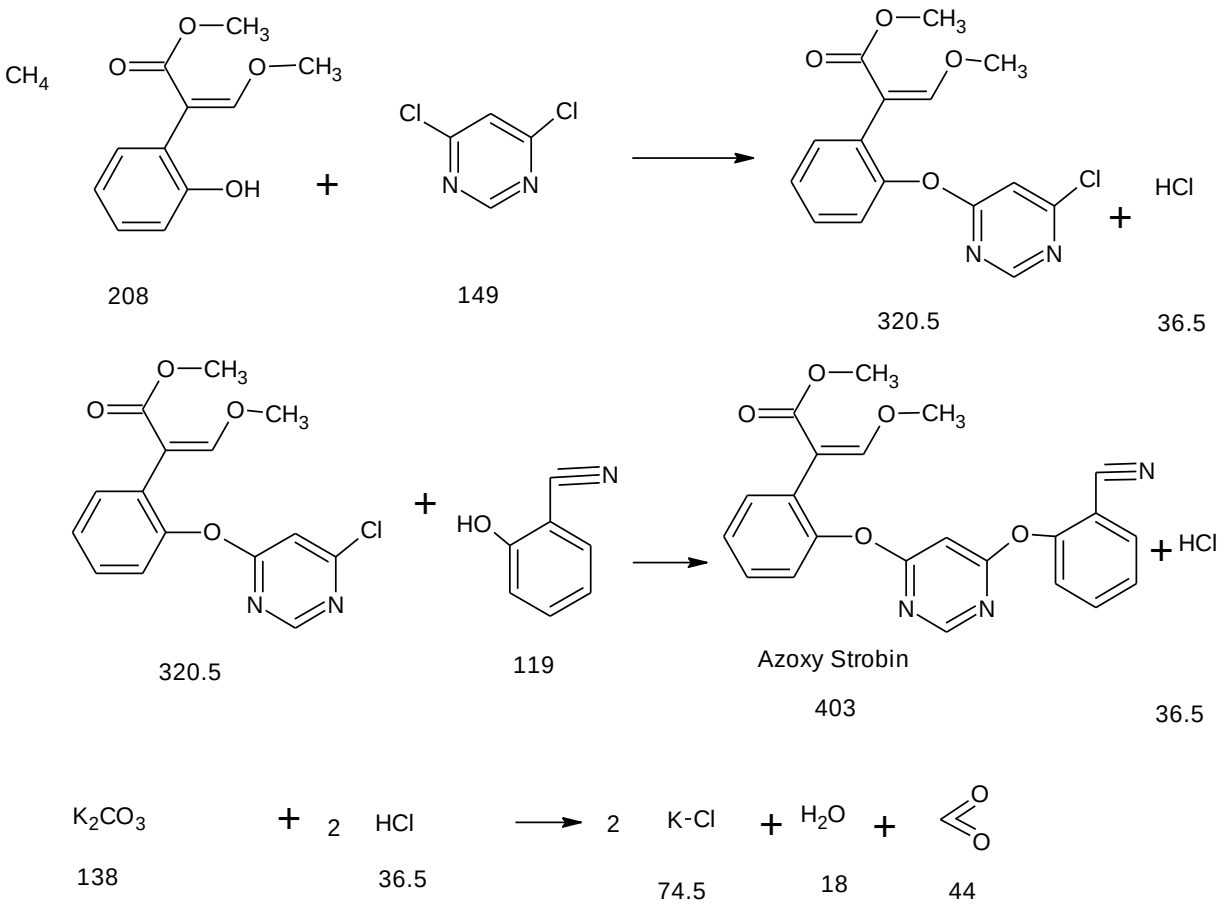
2,6 Dichloro Pyrimidine and anhydrous Potassium carbonate is charged in DMF. Solution of Methyl- 2-(2 Hydroxy phenyl)-3 methoxy Propenoate in DMF is charged to above solution. When addition is over, warm the reaction mass to complete the reaction.

Charge 2 cyano Phenol to the reaction mass and add catalytic amount of Cuprous Chloride and heat the reaction mass to $100^0$C for few hours.

Filter the reaction mass to remove inorganics and distilled out DMF from reaction mass. Add hexane and wash the reaction mass with dilute caustic to remove unreacted cyano phenol from the reaction mass.

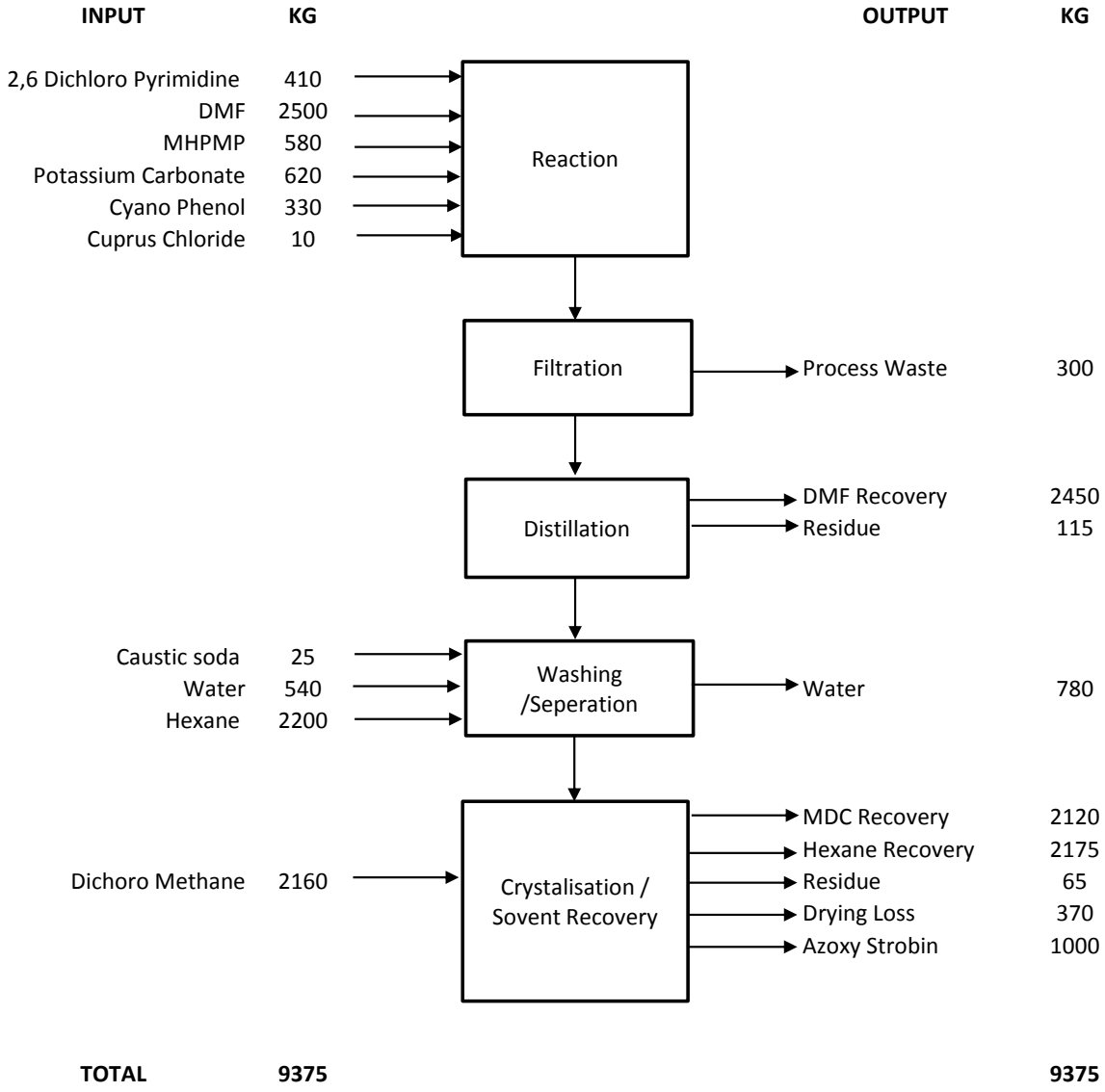
Crystallize the crude with ether/dichloromethane and n Hexane, precipitate is filtered, centrifuged and dried to get technical grade white crystalline solid

**Chemical Reaction:**



## Mass Balance:

**MASS BALANCE OF AZOXYSTROBIN**



## 2. Benalaxyl

**Manufacturing Process:**

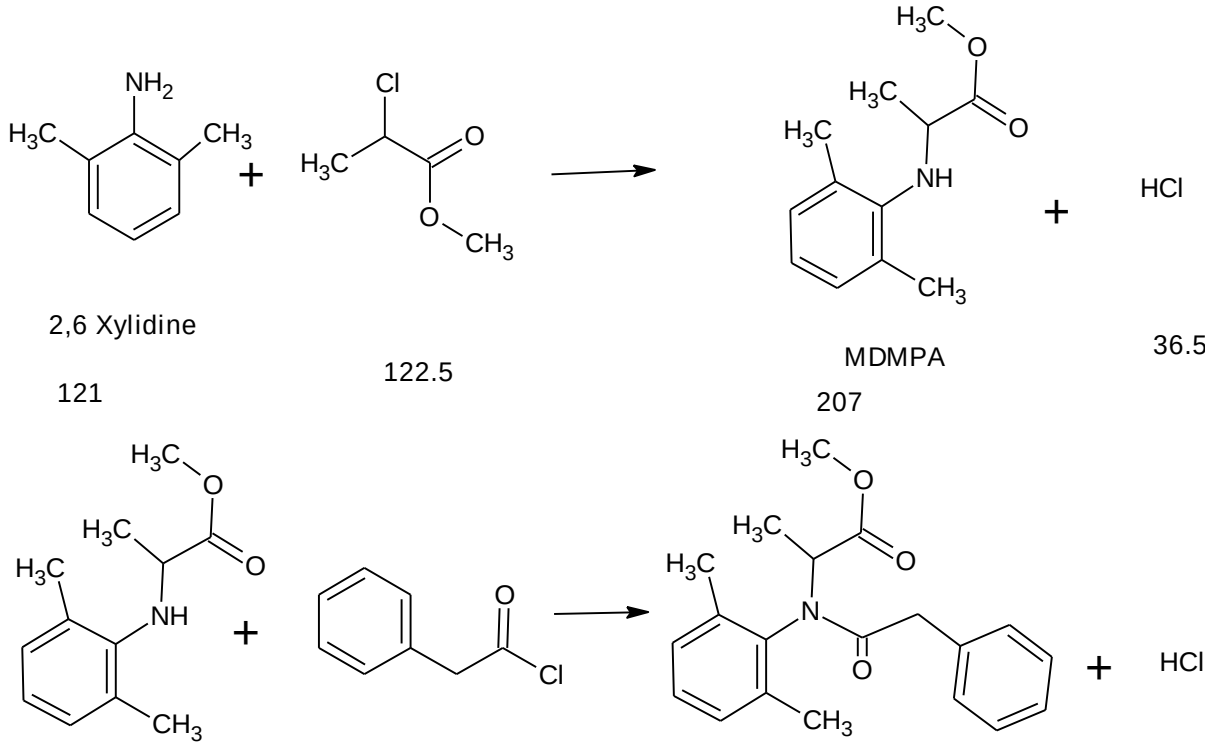
2,6 Xylidine is reacted with 2-chloro Methyl Propionate in presence of Sodium Iodide as catalyst. When reaction is completed, reaction mass is neutralized with soda ash and aqueous phase is sent to ETP.

Organic mass is taken for distillation. First unreacted 2,6 Xylidine is distilled out which is recycled in next batch. Vacuum is applied and MDMPA (Methyl-2-[(2,6 dimethyl phenyl) amino] propionate) is distilled out, which is used for next reaction. Residue is taken out and sent for incineration.

MDMPA (Methyl-2-[(2,6 dimethyl phenyl) amino] propionate) is charged in n Hexane and Phenyl acetyl chloride is charged slowly at reflux temperature. HCl formed is taken out by applying mild vacuum and scrubbed by water and Caustic soda lye. Residual acid is neutralized by alkali and aqueous phase is separated out.

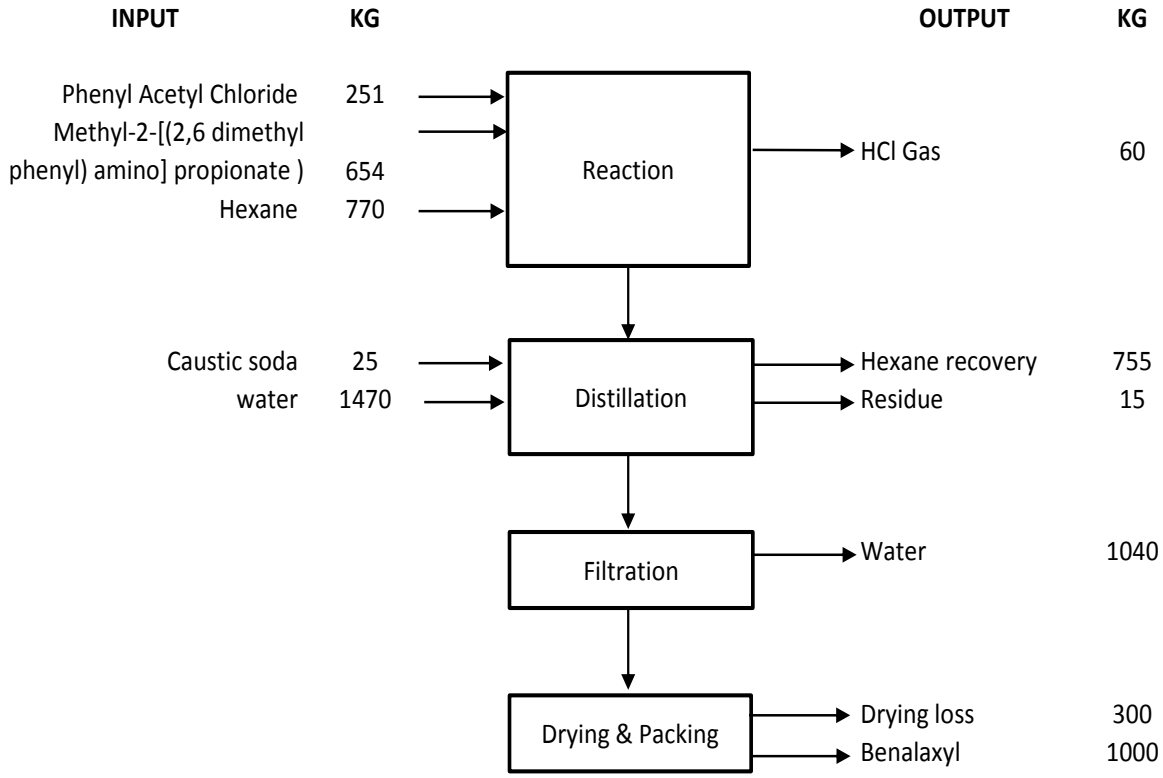
Product is filtered out, centrifuged and dried. Hexane is recovered from Mother Liquor.

**Chemical Reaction:**



## Mass Balance:

**MASS BALANCE OF BENALAXYL**

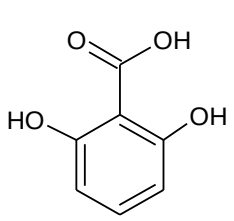


## 3. Bis Pyribac sodium

### Manufacturing Process:

Toluene, TBAB Caustic soda and 2,6 Dihydroxy Benzoic acid is charged in reactor and followed by addition of 4,6 Dimethoxy 2 Methoxy Sulfonyl Pyrimidine. The reaction mass is heated for several hours to complete the reaction. After completion of reaction mass is cooled and filtered. Crude is crystallized using n Butanol, ethyl acetate and water. After filtration wet cake is dried to get Bis Pyribac Sodium.

### Chemical Reaction:

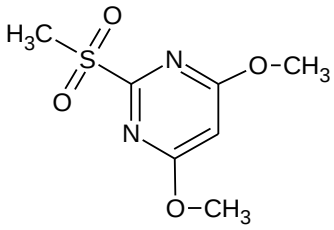


2,6 Dihydroxy Benzoic acid

154

+

2



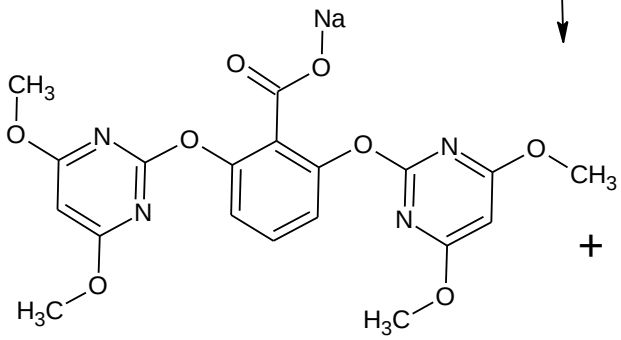
4,6 Dimethoxy 2 methyl Sulfonyl Pyrimidine

218

+

Na·OH

40

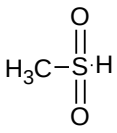


452

Bis Pyribac Sodium

+

2



160

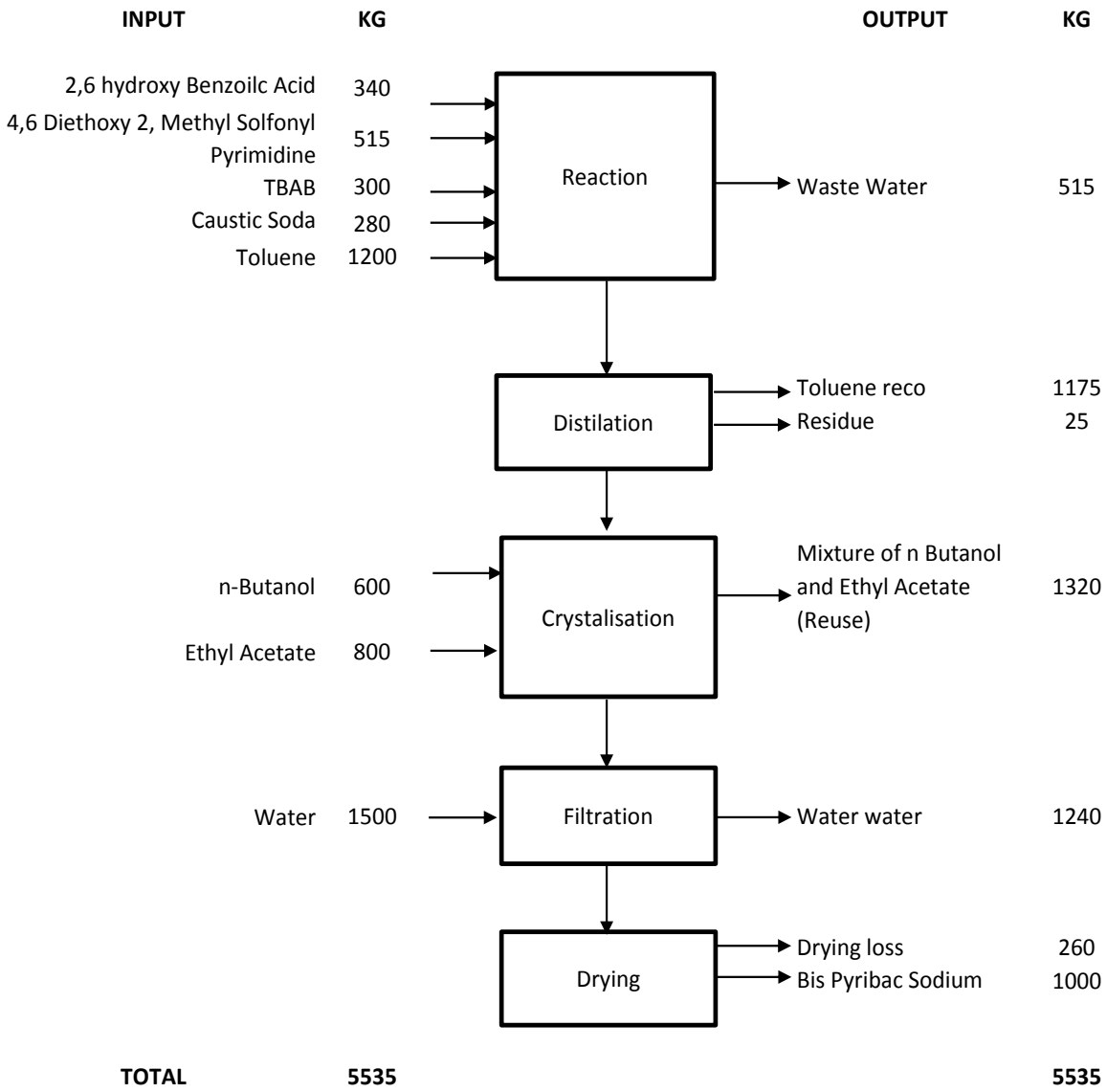
+

$H_2O$

18

## Mass Balance:

**MASS BALANCE OF BIS PYRIBAC SODIUM**



## 4. Clodinafop Propargyl

### Manufacturing Process:

The R-(+)-2-(4-Hydroxy-Phenoxy)-Propionic acid is dissolved in Dimethyl Formamide and then charge potassium carbonate and 2,3-difluoro-5-chloro pyridine (DFCP) . The mass is heated and stirred for several hours to complete the reaction. From the resulting intermediate R-(+)-2-[4-(5-chloro-3-fluoro Pyridin-2-yloxy)-Phenoxy] Propionic acid potassium salt.

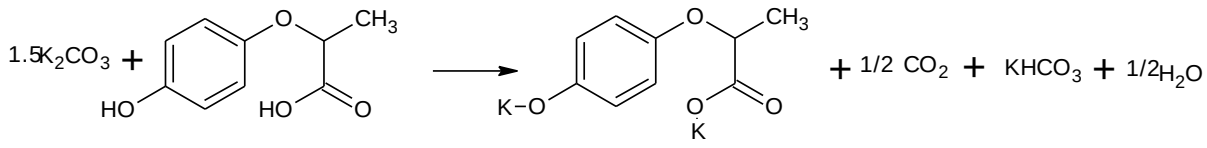
Propargyl chloride in toluene is charged in the reaction mass. Temperature is raised to complete the reaction.

Reaction mass is filtered to remove inorganic salt. DMF and toluene is distilled off from organic mass to get crude Clodinafop Propargyl.

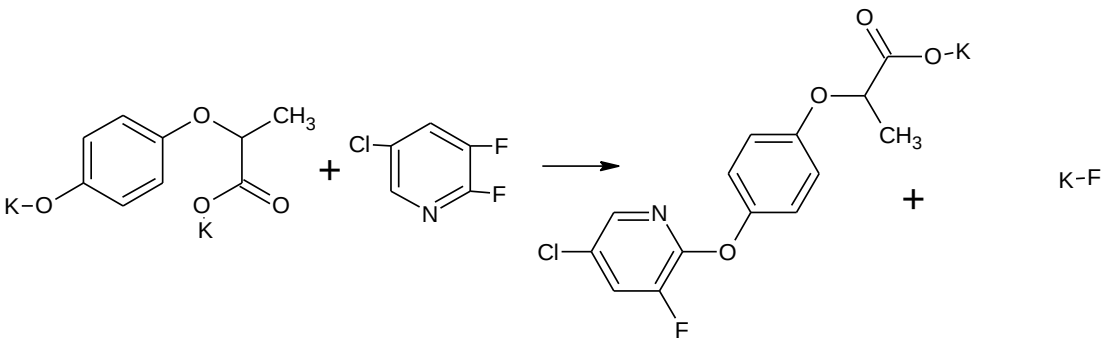
Further purification is done to get technical grade Clodinafop Propargyl.

Solvent is recovered from mother liquor.

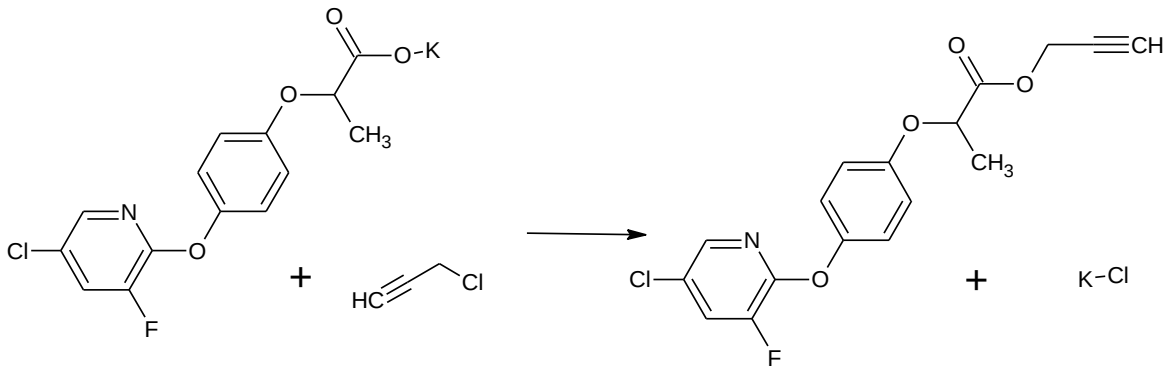
### Chemical Reaction:




207 182 258 22 100 9



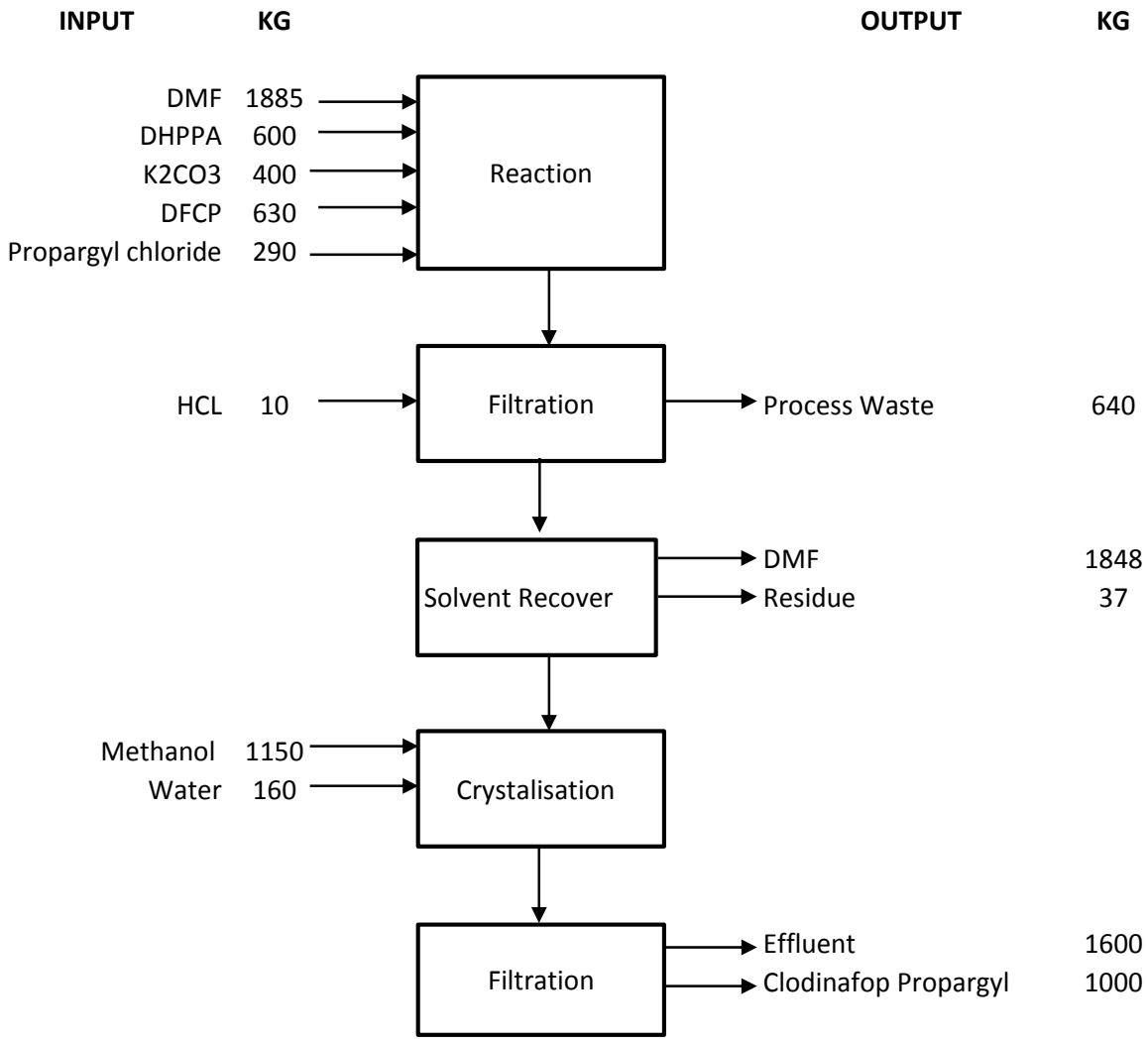

258 149.5 349.5 58




349.5 74.5 349.5 74.5

## Mass Balance:

**MASS BALANCE OF CLODINAFOP PROPARGYL**

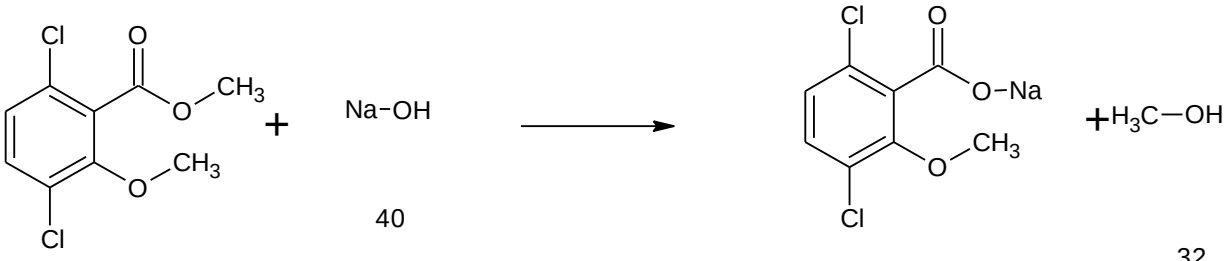


## 5. DICMBA

### Manufacturing Process:

3,6 Dichloro Methoxy Benzoate is charged in water. TBAB and sodium hydroxide is charged and temperature is raised to carry out hydrolysis. Methanol is recovered and aqueous phase is separated out. Steam is applied to remove organic impurity and then finally molten mass is charged into water and acidification is carried out to get DICMBA.

### Chemical Reaction:

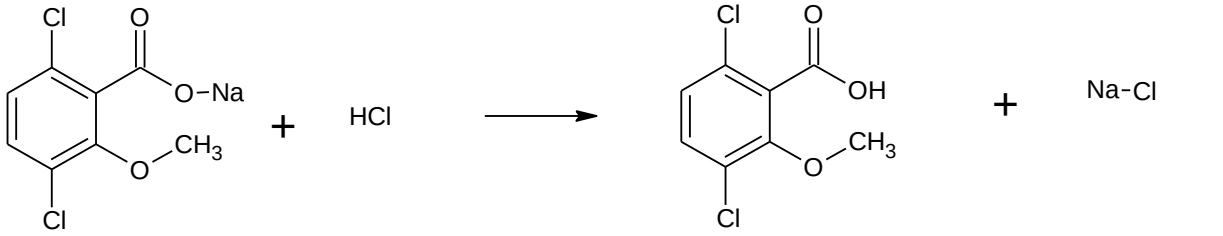



methyl 3,6-dichloro-2-methoxybenzoate

Molecular Formula = $C_9H_8Cl_2O_3$

Formula Weight = 235.06402

243




243

36.5

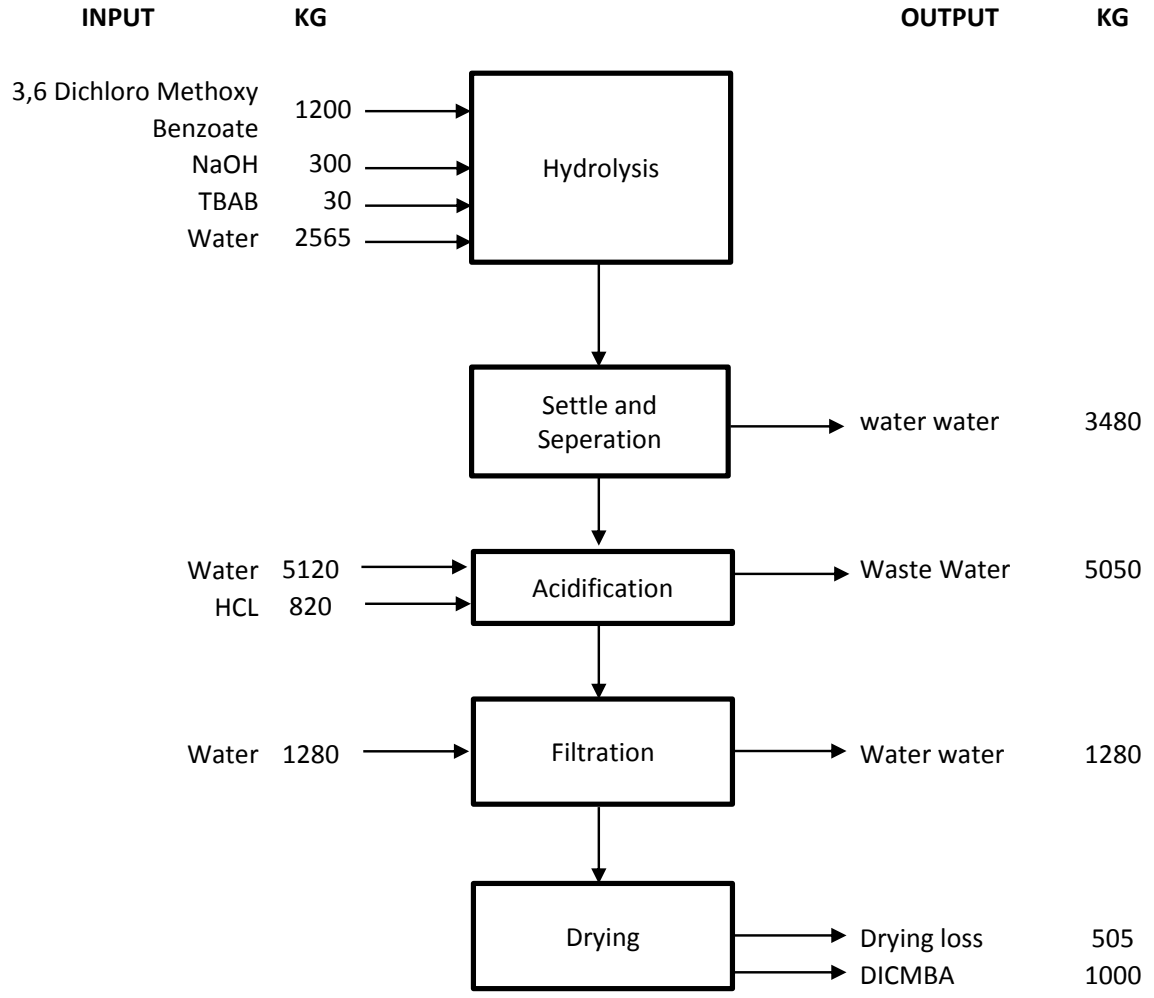
3,6-dichloro-2-methoxybenzoic acid

Molecular Formula = $C_8H_6Cl_2O_3$

Formula Weight = 221.03744

## Mass Balance:

**MASS BALANCE OF DICMBA**

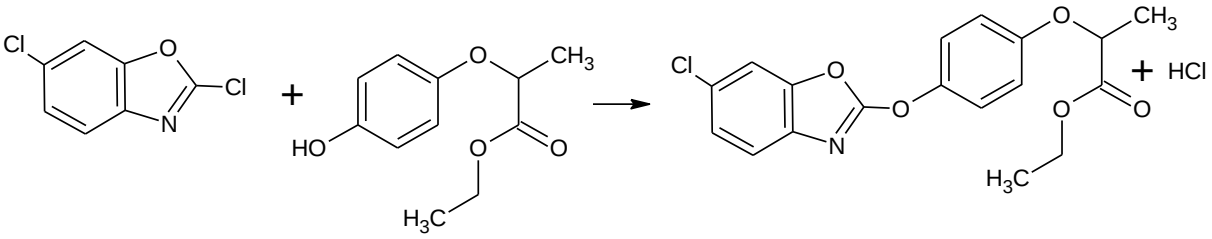


## 6. Fenaxoprop P Methyl

### Manufacturing Process:

Charge 2,6 Dichloro Benzoxazole and Potassium carbonate in Dimethyl formamide and charge Ethyl (Hydroxy Phenoxy) propionate. Raise the temperature to complete the reaction. When reaction is completed filter the inorganic salt. Adjust pH 4.0 with the help of Hydrochloric acid to precipitate inorganic salt from filtrate. Clarify to remove salt. Distill solvent from organic phase. Crystallize crude using Methanol and water filter, centrifuge and dry the product.

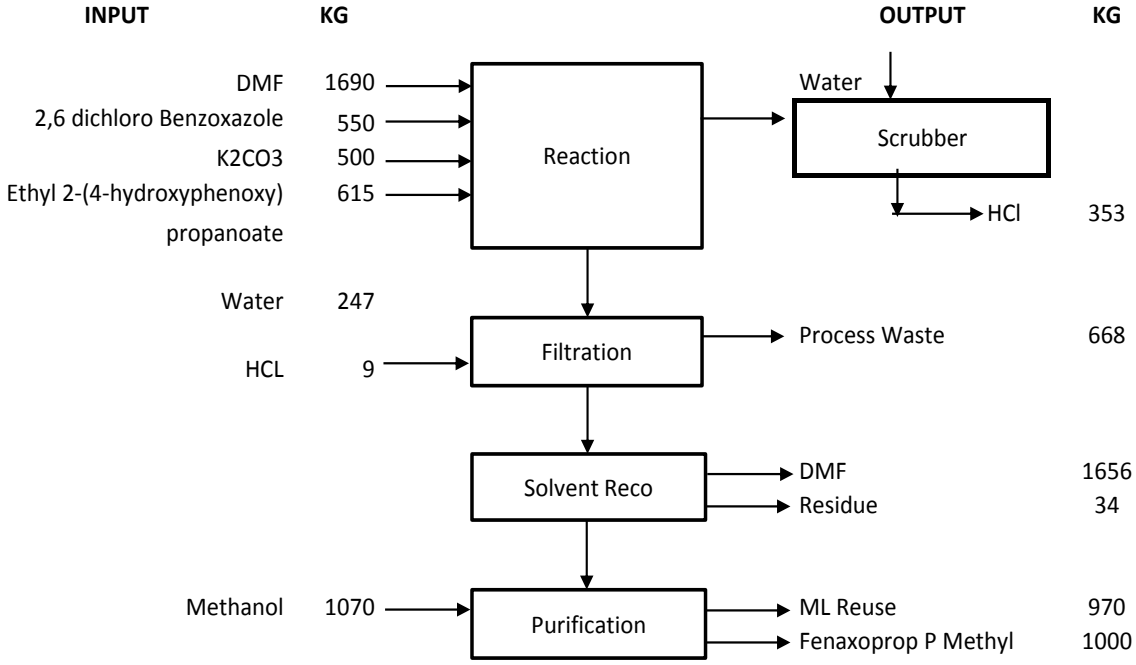
### Chemical Reaction



| 2,6 Dichloro Benzoxazole | Ethyl (Hydroxy Phenoxy) Propionate | Fenaxoprop P Ethyl | |
|---|---|---|---|
| 188 | 210 | 361.5 | 36.5 |

### Mass Balance:

**MASS BALANCE OF FENAXOPROP P METHYL**

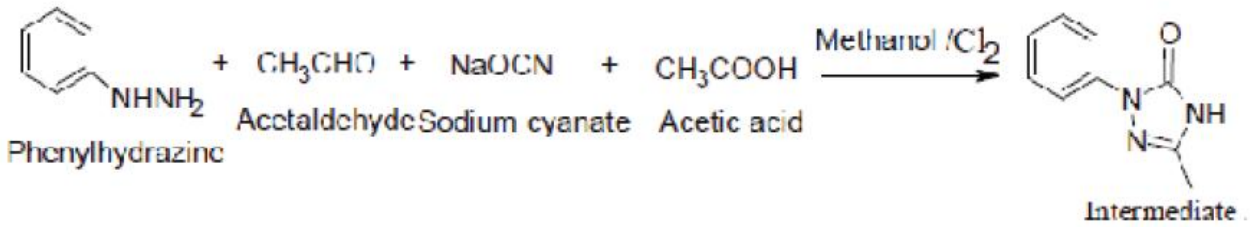


## 7. Sulfentrazone

### Manufacturing Process:

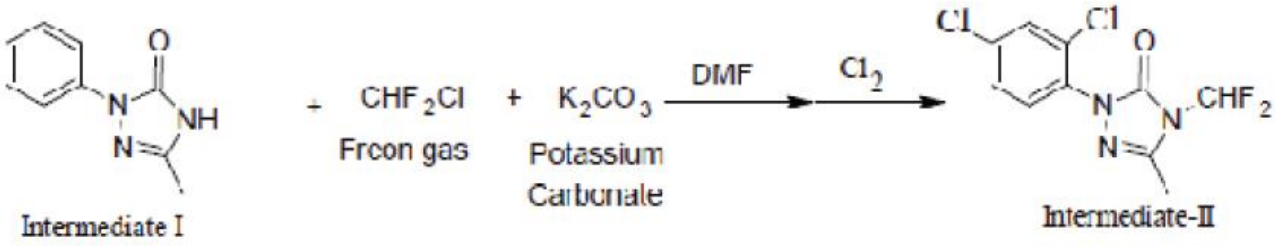
### Step-1:

A mixture of phenyl hydrazine, acetaldehyde, sodium cyanate and acetic acid in solvent methanol was chlorinated using chlorine gas over a period of 6-8 hours at 50-55°C. Product of this step (Intermediate I) was filtered after recovery of methanol under reduced pressure.



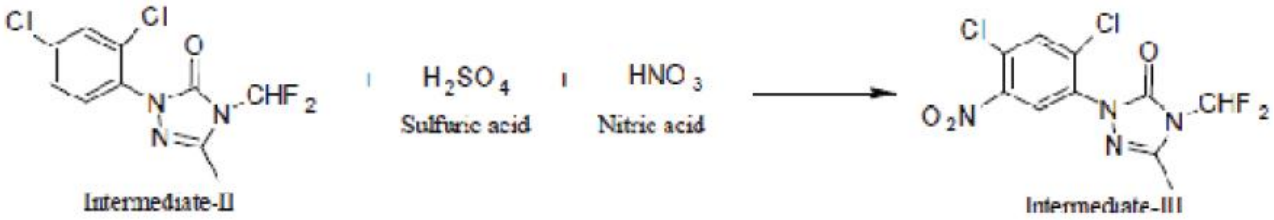

### Step-2:

A mixture of Intermediate II in solvent dimethyl formaldehyde and potassium carbonate was heated to 175-180°C. Freon 22 gas was purged for 3-4 hours. The mass was cooled to 50-60°C and the resultant solid was filtered. Chlorine gas was purged to the filtrate over a period of 4-5 hours maintaining the temperature of the mass at 65-75°C. Solvent dimethyl formamide was distilled off under reduced pressure, residue quenched in water and filtered to give Intermediate-II.



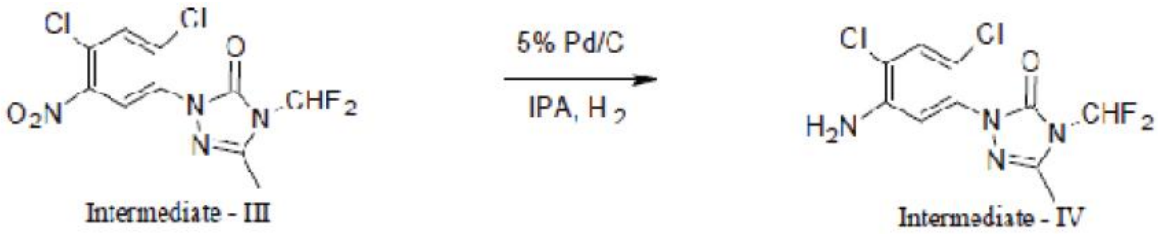

### Step-3:

Nitric Acid was charged to a mixture containing Intermediate II in solvent Dichloroethane and Oleum at ambient temperature. The mass was quenched in water & the resultant product (intermediate III) was obtained by filtration. Solvent dichloroethane recovered during the process was recycled.



**Step-4:**

A solution containing Intermediate III in solvent isopropyl alcohol (IPA) and Pd/C catalyst was pressurized using hydrogen at 70-80°C for a period of 10-11 hours. The mass was cooled to 50-60°C Pd/C catalyst was filtered off and recycled. Solvent IPA was distilled, residue was quenched in water and the product (Intermediate IV) was obtained by filtration.

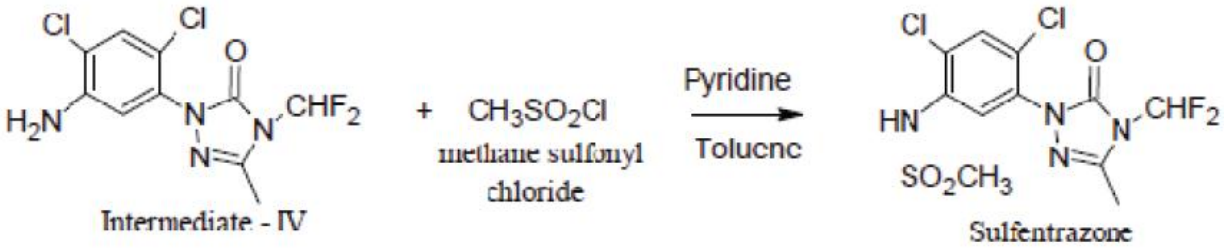



Intermediate - III

Intermediate - IV

**Step-5:**

A mixture of Intermediated IV, toluene and pyridine was charged to the reactor. Mixture was heated to 50-60°C and methane sulfonyl chloride was charged. Reaction was subjected to a series of extractions. Pyridine was recovered by extraction with dichloromethane. Toluene was distilled and the residue was quenched in water and filtered to yield sulfentrazone technical. Recovered toluene was recycled in subsequent batches.

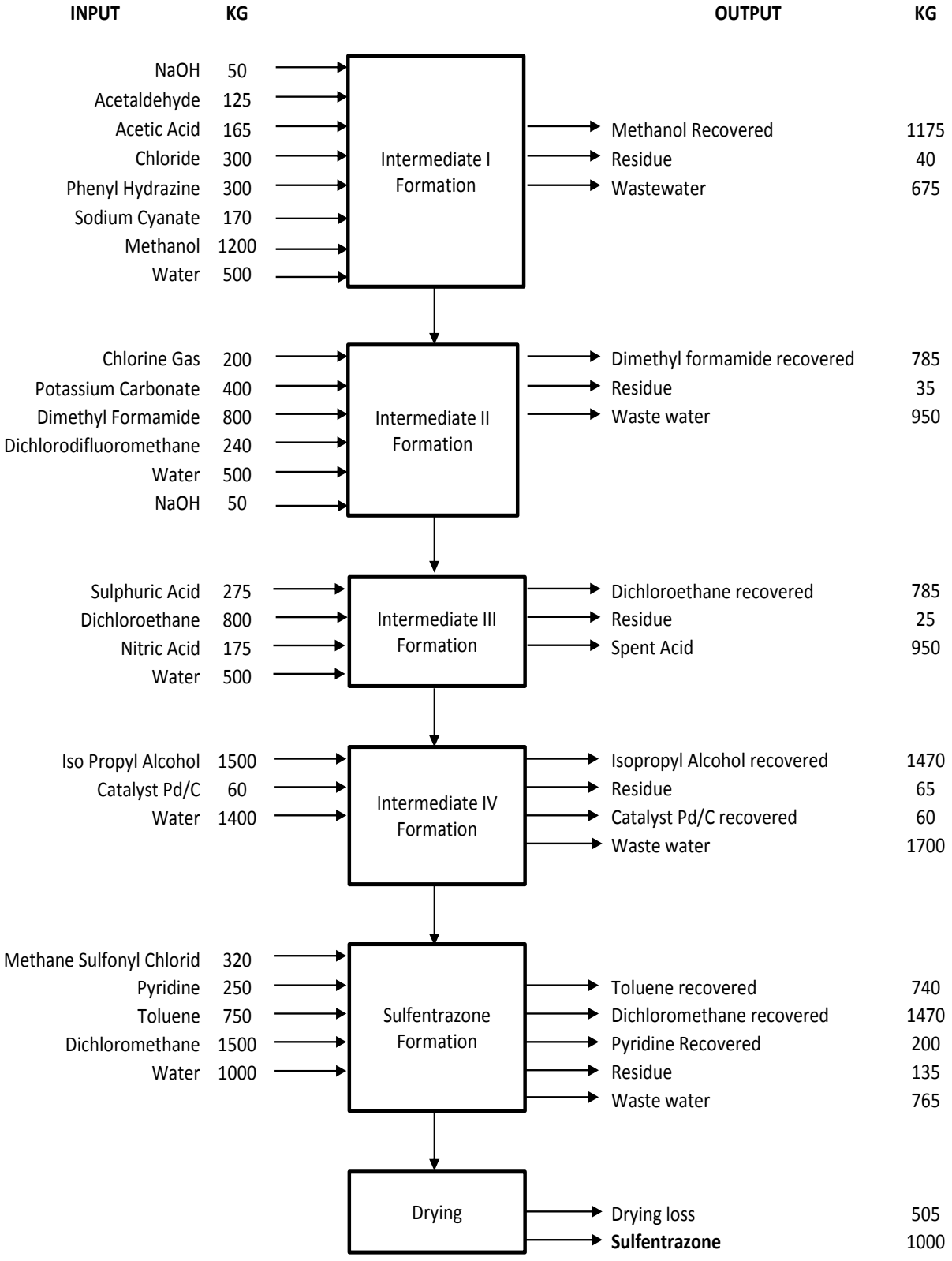



Intermediate - IV

Sulfentrazone

## Mass Balance:

**MASS BALANCE OF SULFENTRAZONE**

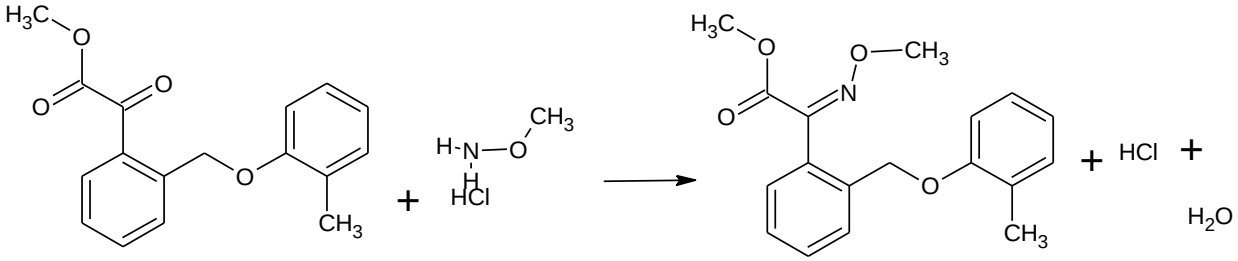


## 8. Kerosoxim Methyl

### Manufacturing Process:

2-[(Methylpheoxy) methyl Phenyl Glyoxylic acid methyl ester and O Methyl Hydroxyl amine Hydrochloride is charged in to Toluene and oxime formation was carried out. Reaction pH is slowly adjusted with the help of Soda ash solution and Toluene is distilled off to precipitate Kerosoxim Methyl Product is filtered, centrifuged and dried.

### Chemical Reaction:



MPMPGlyoxylic acid Methyl ester + o Methyl Hydroxyl amine Hydrochloride → Kresoxim Methyl + HCl + $H_2O$

284 + 83.5 → 313 + 36.5 + 18

### Mass Balance:

**MASS BALANCE OF KEROSOXIM METHYL**

| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| MPMPglyoxylic acid Methyl ester | 825 | | |
| o-Methyl hydroxyl amine Hydrochloride | 200 | | |
| Water | 1027 | | |
| soda ash | 67 | | |
| Tolune | 3000 | | |
| Water for Scrubber | 300 | | |
| | | HCl (Reaction) | 353 |
| Water | 3000 | | |
| | | Toluene (Distillation) | 2960 |
| | | Residue (Distillation) | 59 |
| | | Waste Water (Filtration) | 3512 |
| | | Drying loss | 535 |
| | | Kerosoxim Methyl | 1000 |
| **TOTAL** | **8419** | | **8419** |

## 9. Metalaxyl

**Manufacturing Process:**

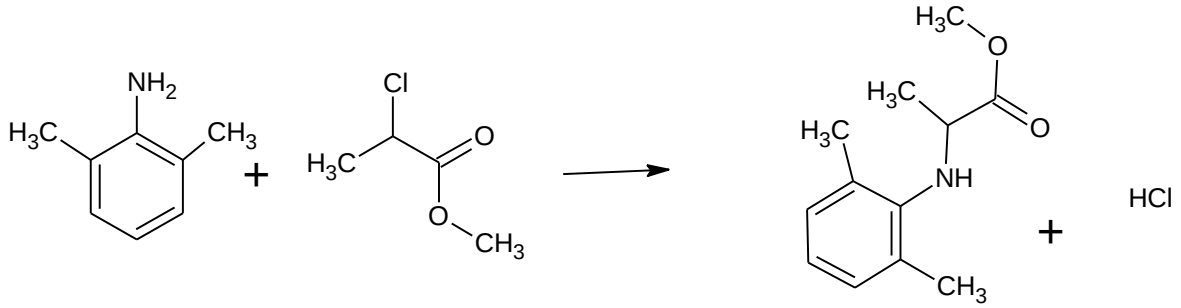
2,6 Xylidine is reacted with 2-chloro Methyl Propionate in presence of Sodium Iodide as catalyst. When reaction is completed, reaction mass is neutralized with soda ash and aqueous phase is sent to ETP.

Organic mass is taken for distillation. First unreacted 2,6 Xylidine is distilled out which is recycled in next batch. Vacuum is applied and MDMPA (Methyl-2-[(2,6 dimethyl phenyl) amino] propionate ) is distilled out, which is used for next reaction Residue is taken out and sent for incineration.

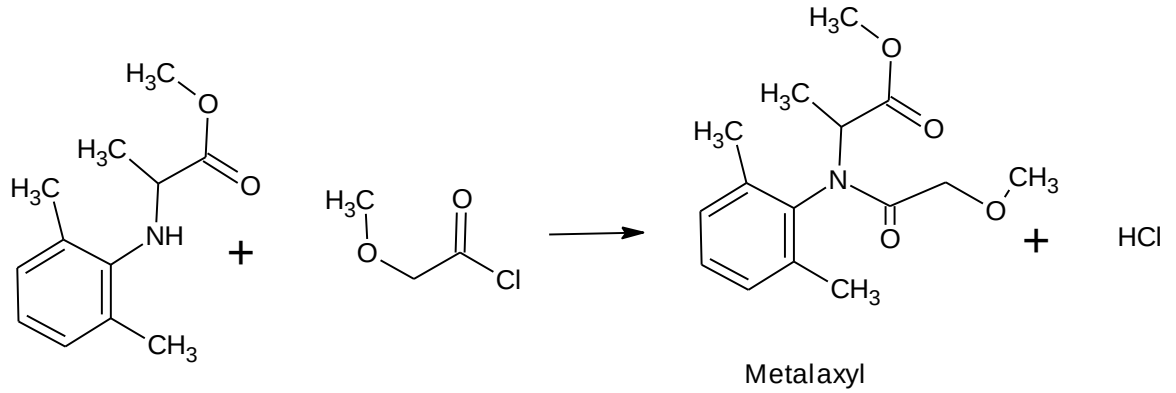
MDMPA (Methyl-2-[(2,6 dimethyl phenyl) amino] propionate) is charged in n-Hexane and Methoxy acetyl chloride is charged slowly at reflux temperature. HCl formed is taken out by applying mild vacuum and scrubbed by water and Caustic soda lye. Residual acid is neutralized by alkali and aqueous phase is separated out.

Product is filtered out, centrifuged and dried. Hexane is recovered from Mother Liquor.

**Chemical Reaction**




2,6 Xylidine 121 | 122.5 | MDMPA 207 | 36.5




207 | 108.5 | Metalaxyl 279 | 36.5

## Mass Balance:

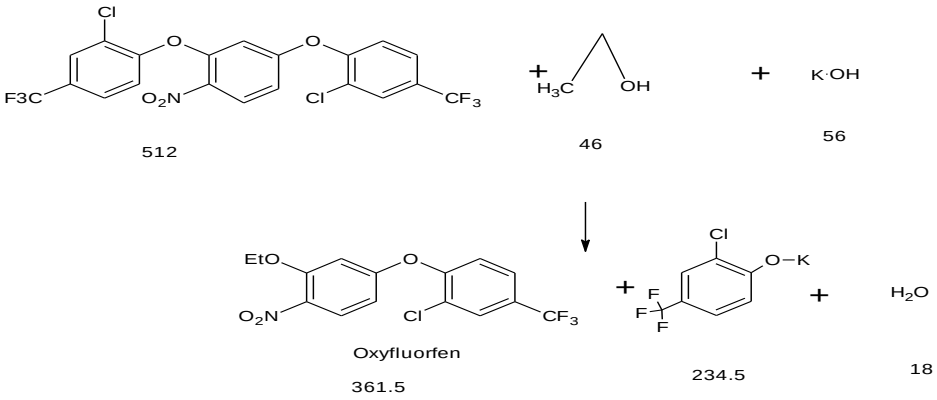
| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| Methoxy acetyl chloride | 300 | Reaction | HCl | 45 |
| MDMPA | 745 | | | |
| Hexane | 820 | | | |
| Water for Scrubber | 60 | | | |
| caustic soda | 30 | Distillation | Hexane recovery | 804 |
| water | 290 | | Residue | 16 |
| | | Filtration | Waste water | 220 |
| | | Drying & Packing | Drying loss | 160 |
| | | | Metalaxyl | 1000 |
| **TOTAL** | **2245** | | | **2245** |

## 10. Oxyfluorfen

### Manufacturing Process:

Charge a 10% solution of potassium hydroxide in ethanol is added to a solution of 1,3- bis (2-chloro-α,α,α-trifluoro-p-tolyloxy)-4-nitrobenzene in dioxane. After 40 minute at room temperature, the solution is heated to 45 C, then cooled, diluted with Hexane and washed with water, dried and the solvent removed. The residue is re-crystallized from isopropanol to give 2-chloro-α,α,α-trifluoro-p-tolyl-3-ethoxy-4-nitrophenyl ether (oxyfluorofen).

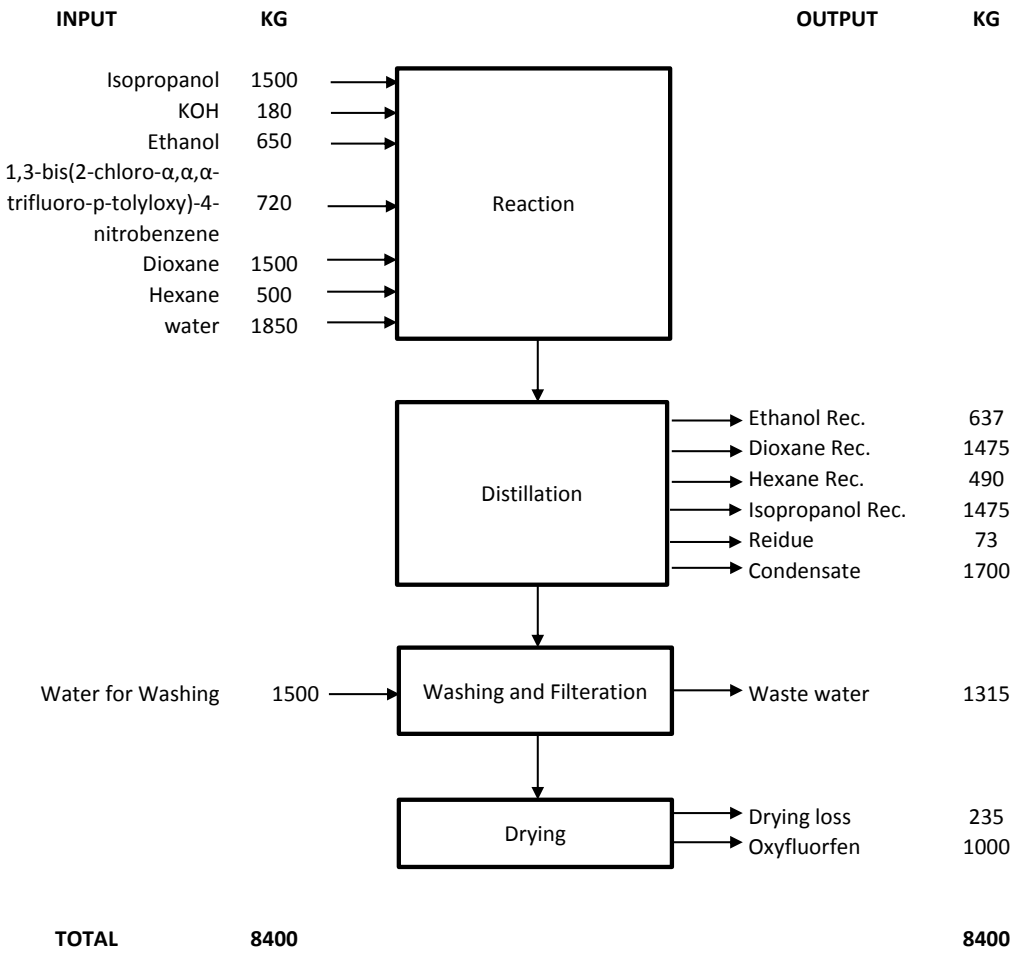
### Chemical Reaction:




2-chloro-1-(3-ethoxy-4-nitrophenoxy)-4-(trifluoromethyl)benzene

## Mass Balance:

**MASS BALANCE OF OXYFLUORFEN**



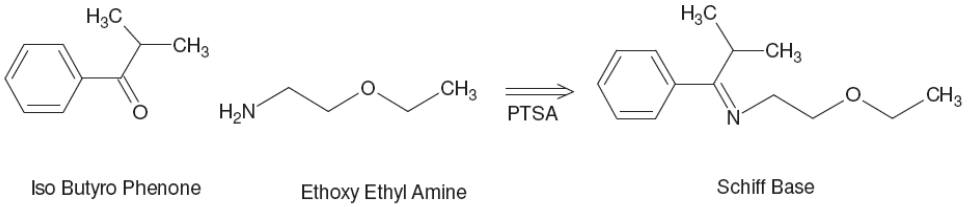
## 11. Pethoxamid

### Manufacturing Process:

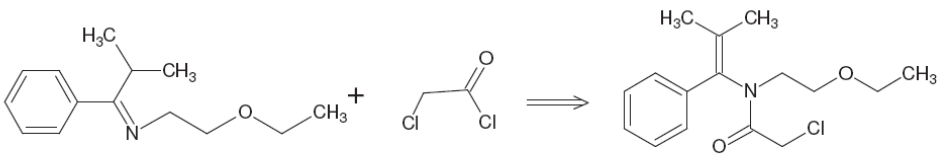
Iso Butyro Phenone and Ethoxy ethyl amine and PTSA is charged in a reactor. Water generated is removed by Azeotropic distillation. Schiff Base is formed. Unreacted isobutyro phenone and Schiff base is distilled at reduced pressure.

Chloro acetyl chloride and toluene solution is added to Schiff base and Toluene solution. HCl gas generated is removed. Applied water wash and filtered. Toluene is distilled out form mother liquor. Product Pethoxamide is dried and packed.

### Chemical Reaction:




Iso Butyro Phenone — Ethoxy Ethyl Amine — Schiff Base



Schiff Base — CAC — Pethoxamide

### Mass Balance:

**MASS BALANCE OF PETHOXAMID**

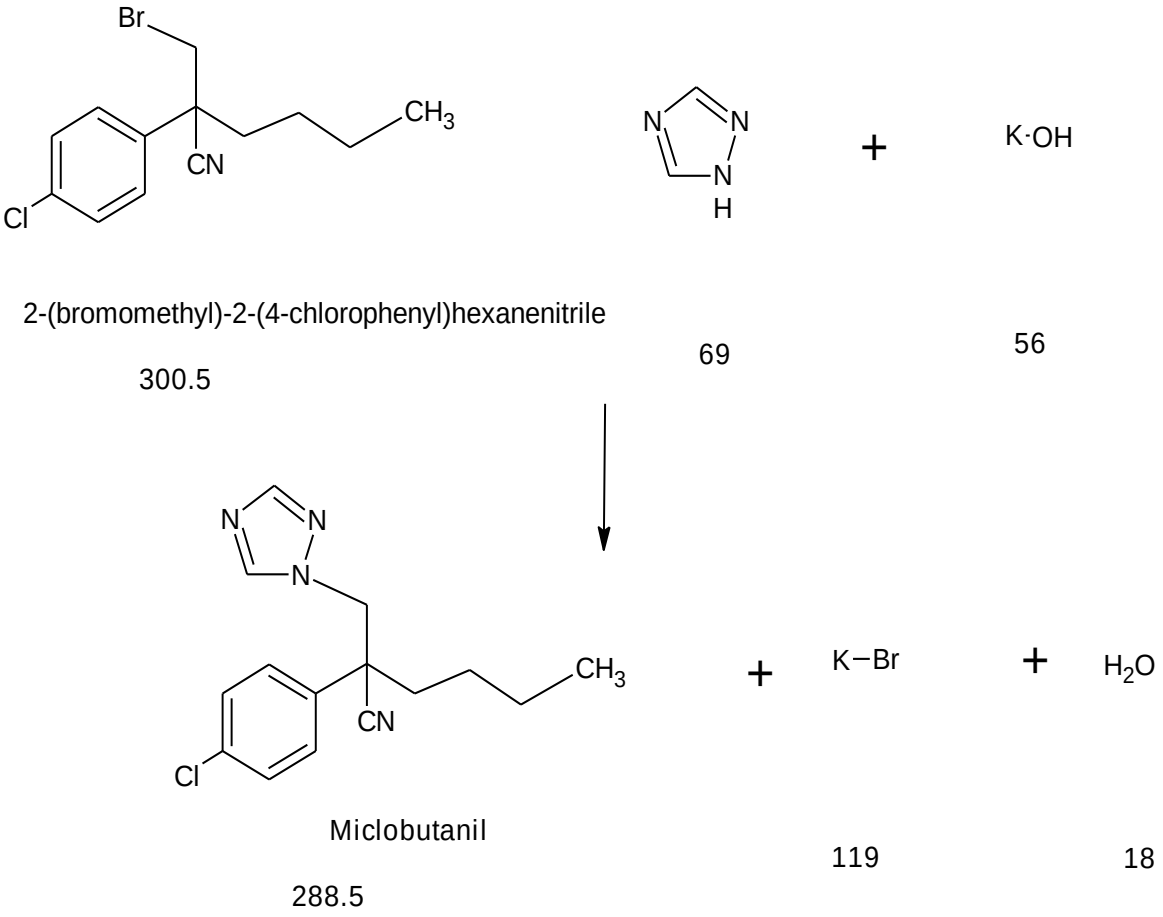
| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| Iso Butyro Phenone | 832 | Reaction | Water | 150 |
| Ethoxy Ethyl Amine | 501 | | Ethoxy ethyl amine | 186 |
| PTSA | 21 | | | |
| Water | 208 | Washing | Waste water | 350 |
| Chloro acetyl chloride | 395 | Addition of CAC in Toluene + SB Solu. HCl is removed | HCl | 46 |
| Toluene | 1040 | | | |
| Water for scrubber | 75 | | | |
| Water | 1232 | Washing | Waste Water | 1117 |
| | | Distillation | Toluene Recovered | 1020 |
| | | | Residue | 20 |
| | | Drying | Drying losss | 415 |
| | | | Pethoxamid | 1000 |
| **TOTAL** | **4304** | | | **4304** |

## 12. Miclobutanil

**Manufacturing Process:**

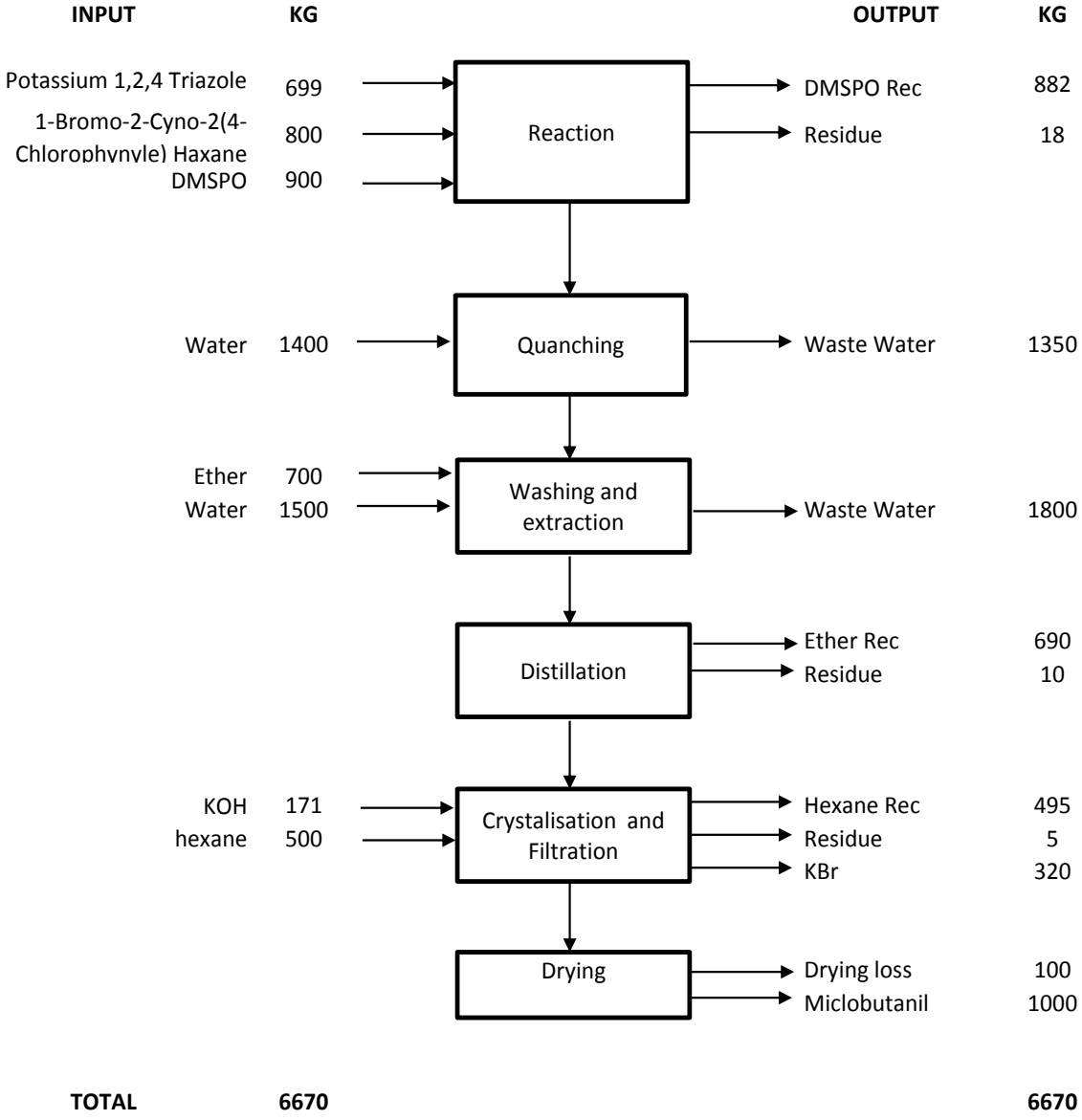
In a reactor charge 1-bromo-2-cyano-2(4-chlorophenyl) hexane, followed by potassium triazole and DMSO. The reaction was stirred for about 48 hours and at room temperature and then was stirred for about 24 hours at 70°C. The reaction was quenched by pouring it into water. The aqueous mixture was extracted four times with ether and the combined ether extracts were washed twice with water and once with brine. The organic phase was dried over sodium sulphate, concentrated and re-dissolved in a minimum amount of ether. Hexane was added until the solution become cloudy and then flask was placed in the freezer. The crystals which form, they filtered and dried. The filtrate was concentrated to obtain additional less pure material which is a Myclobutanil.

**Chemical Reaction:**



## Mass Balance:

**MASS BALANCE OF MICLOBUTANIL**



## 13. Pretiachlor

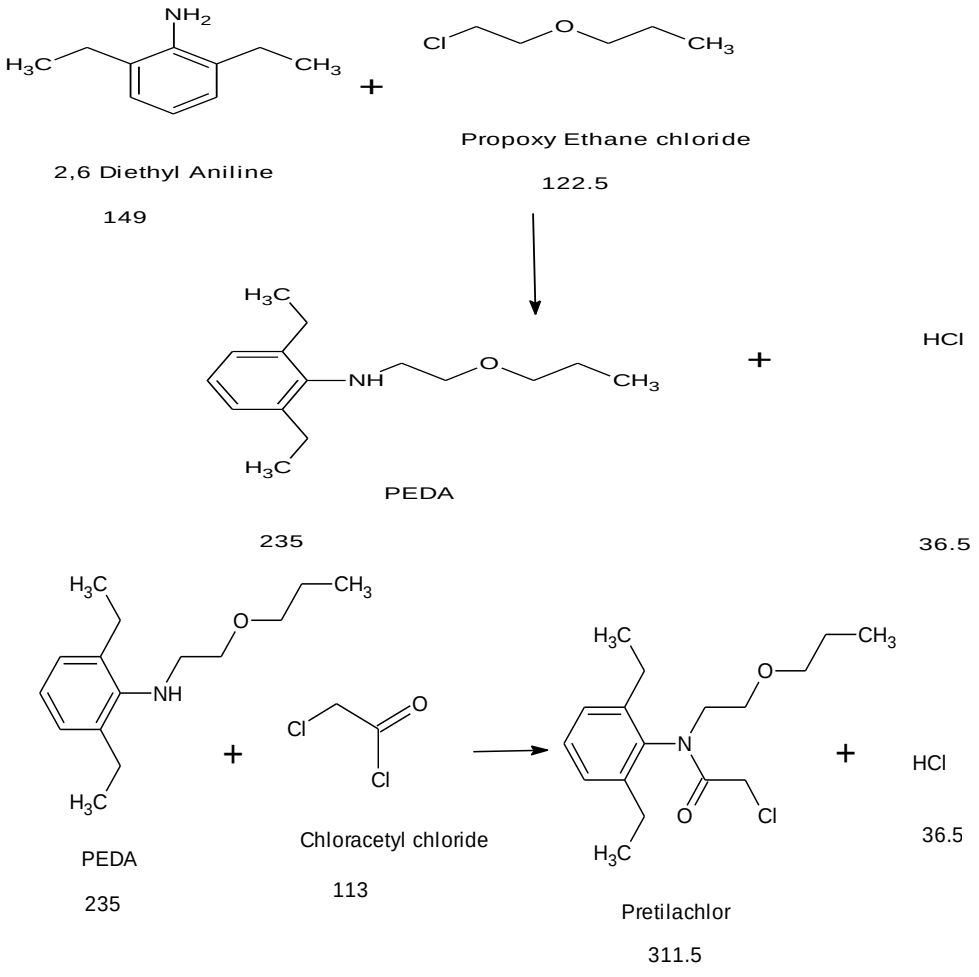
### Manufacturing Process:

2,6 Diethyl Aniline and Propoxy Ethane Chloride is charged in to MSGL reactor. Temperature is raised to complete the reaction. When reaction is completed, reaction mass is neutralized with Dilute Caustic soda lye and aqueous phase is separated out.

Organic phase containing excess 2, 6 Diethyl Aniline and PEDA (Propoxy ethyl 2, 6 Diethyl Aniline) is subjected to distillation. First 2, 6 Diethyl aniline is recovered and used in next batch. Then vacuum is applied and Propoxy Ethyl-2, 6 diethyl aniline is recovered and used in next step. Residue is transferred to incineration.

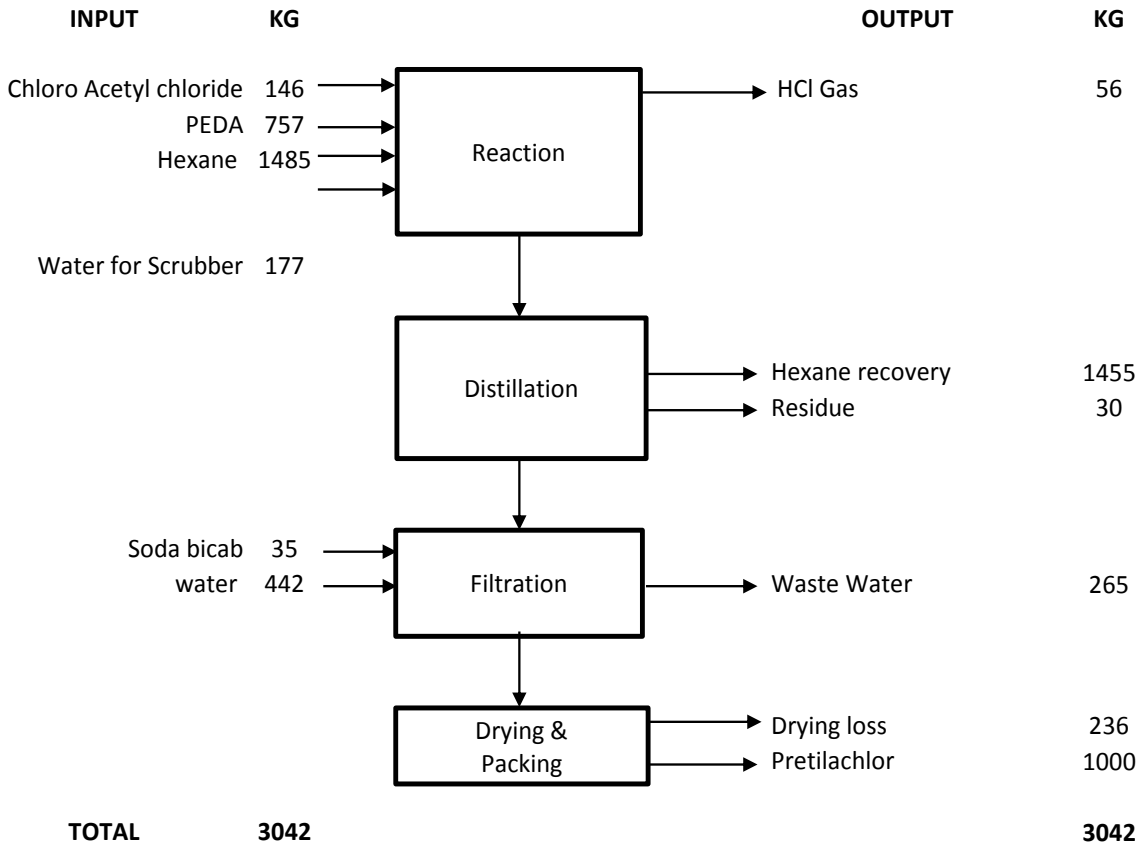
PEDA (Propoxy ethyl 2,6 Di ethyl Aniline) is charged in n Hexane and at reflux temperature Chloro acetyl chloride is added slowly. HCl gas is removed with vacuum and scrubbed in water and caustic soda lye. Residual acid is neutralized with small quantity of sodium bicarbonate in water. Aqueous phase is separated out and sent to ETP. Solvent is distilled out from organic phase containing Pretilachlor, first at atmospheric distillation and then by applying vacuum. Pretilachlor is packed as per requirement.

### Chemical Reaction



## Mass Balance:

**MASS BALANCE OF PRETIACHLOR**

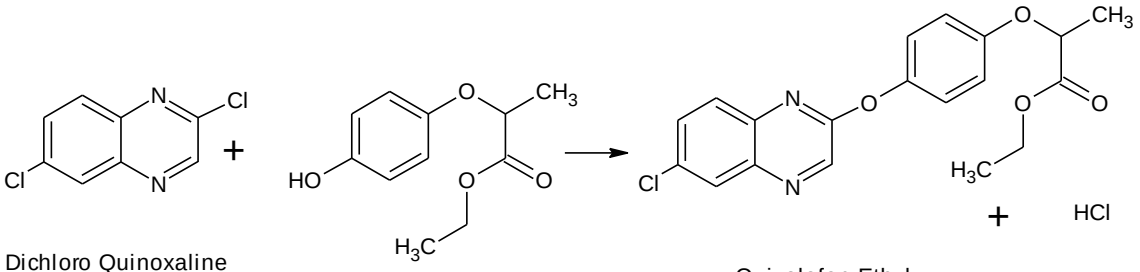


## 14. Quizalofop Ethyl

### Manufacturing Process:

Charge 2, 6 Dichloro Quinaoxaline and Potassium carbonate in Dimethyl formamide and charge Ethyl (Hydroxy Phenoxy) propionate. Raise the temperature to complete the reaction. When reaction is completed filter the inorganic salt. Adjust pH 4.0 with the help of Hydrochloric acid to precipitate inorganic salt from filtrate. Clarify to remove salt. Distill solvent from organic phase. Crystallize crude using Methanol and water filter, centrifuge and dry the product.

### Chemical Reaction:




2,6 Dichloro Quinoxaline

Ethyl (Hydroxy Phenoxy) Propionate

Quizalofop Ethyl

199

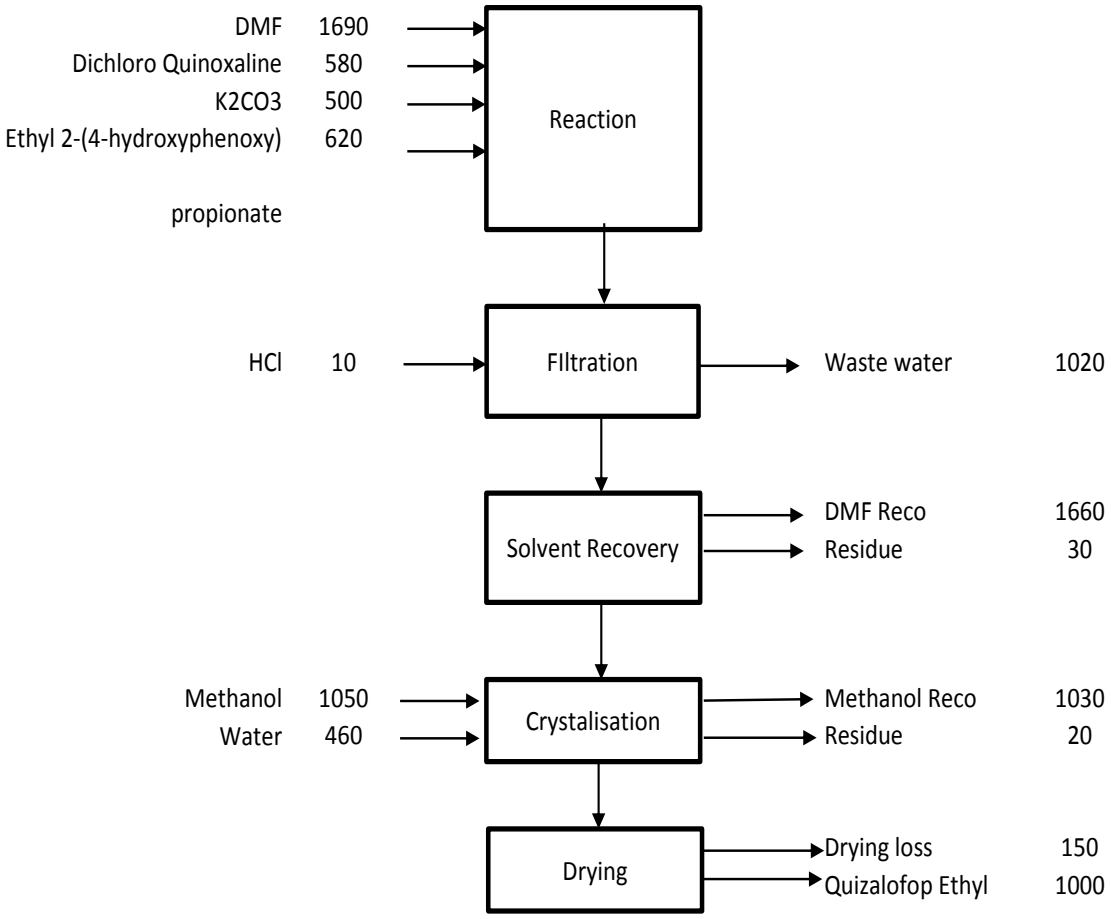
210

372.5

36.5

## Mass Balance:

**MASS BALANCE OF QUIZALOFOP ETHYL**

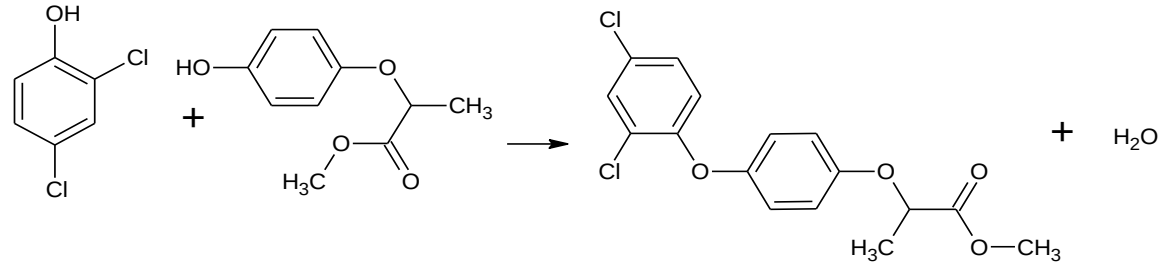


## 15. Diclofop P Methyl

### Manufacturing Process:

Charge 2, 4 Dicloro Phenol and Potassium carbonate in Dimethyl formamide and charge Methyl (Hydroxy Phenoxy) propionate. Raise the temperature to complete the reaction. When reaction is completed filter the inorganic salt. Adjust pH 4.0 with the help of Hydrochloric acid to precipitate inorganic salt from filtrate. Clarify to remove salt. Distill solvent from organic phase. Crystallize crude using Methanol and water filter, centrifuge and dry the product.

### Chemical Reaction:




| 2,4 Dichloro Phenol | Hydroxy Phenoxy Methyl Propionate | Diclofop Methyl | |
|---|---|---|---|
| 163 | 196 | 341 | 18 |

### Mass Balance:

**MASS BALANCE OF DICLOFOP P METHYL**

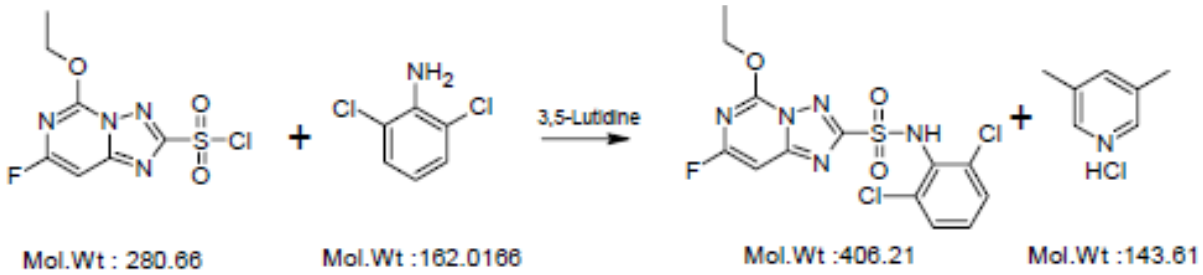
| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| DMF | 1690 | Reaction | | |
| 2,4 Dichloro Phenol | 480 | | | |
| K2CO3 | 500 | | | |
| Methyl -2-(4-hydroxyphenoxy) Propoan | 575 | | | |
| | | FIltration | Waste water | 440 |
| | | Solvent Recovery | DMF Reco | 1656 |
| | | | Residue | 34 |
| Methanol | 1050 | Crystalisation | Methanol Reco | 1030 |
| | | | Residue | 20 |
| | | Drying | Drying loss | 115 |
| | | | Diclofop P Methyl | 1000 |
| **TOTAL** | **4295** | | | **4295** |

## 16. Diclosulam

### Manufacturing Process:

The process involves the condensation of 2-chlorosulfonyl-7-fluoro-5-ethoxy [1, 2, 4] triazolo [1,5-c]-pyrimidine and 2,6-dichloro aniline in presence of base to get pure product.

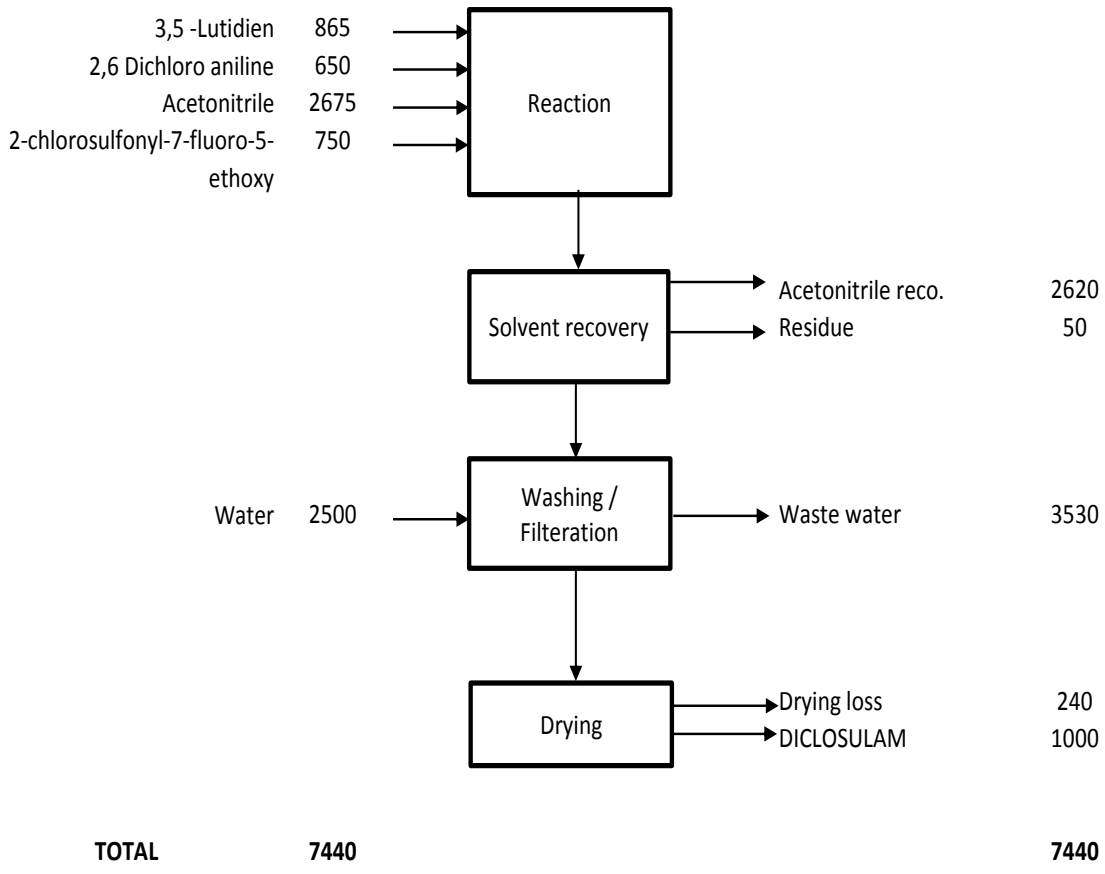
### Chemical Reaction:




Mol.Wt : 280.66 Mol.Wt :162.0166 Mol.Wt :406.21 Mol.Wt :143.61

### Mass Balance:

**MASS BALANCE OF DICLOSULAM**

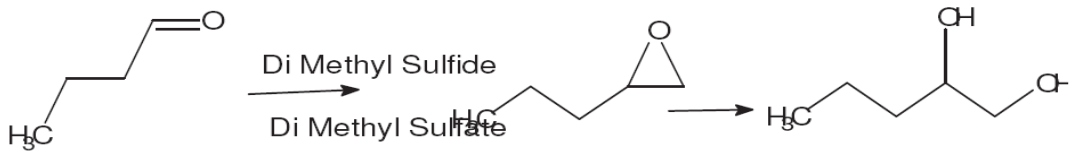


## 17. 1,2 Pentane Diol

### Manufacturing process:

n-Butyraldehyde is reacted with trimethyl sulfonium sulfate in presence of potassium hydroxide as a base to form Oxirane. Oxirane is hydrolyzed with the help of dilute sulfuric acid to form Pentane Diol. Excess of DMS is distilled off. Organic mass is distilled to get pure Pentane diol.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF 1,2 PENTANE DIOL**

| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| Di Methyl Sulfate | 2160 | Tri Methyl Sulfonium Sulfate Salt Prepraration | | |
| Di Methyl Sulfide | 2167 | | | |
| n Butyraldehyde | 1240 | Oxirane Preparation | | |
| Potassium Hydroxide | 1133 | | | |
| | | Distillation out excess Dimethyl Sulfide | Di Methyl Sulfide Reco. | 1123 |
| | | | Residue | 44 |
| Water | 5200 | To dissolve Salt and Separation | Potasium Methyl Sulfate Reco. | 2120 |
| | | | Residue | 40 |
| | | | Waste Water | 5850 |
| Sulfuric Acid 98% | 33 | Hydrolysis | Water | 2856 |
| Water | 3100 | | | |
| | | Distillation Out Excess Dimethyl Sulfide | **1,2 Pentane Diol** | **1000** |
| | | | Residue | 2000 |
| **TOTAL** | **15033** | | | **15033** |

## 18. DCAP

Meta Dichloro Benzene is reacted with Acetyl chloride in presence of Aluminium chloride as catalyst. When reaction is over, reaction mass is quenched in water and hydrochloric Acid. Poly Aluminium chloride is separated off from reaction mass. Reaction mass is distilled off to get crude Di chloro Aceto phenon. Recovered meta dichloro benzene is used in next batch. Crude product is crystallizing out to get pure DCAP.

**Chemical Reaction:**


MDCB DCAP

**Mass Balance:**

**MASS BALANCE OF DCAP**

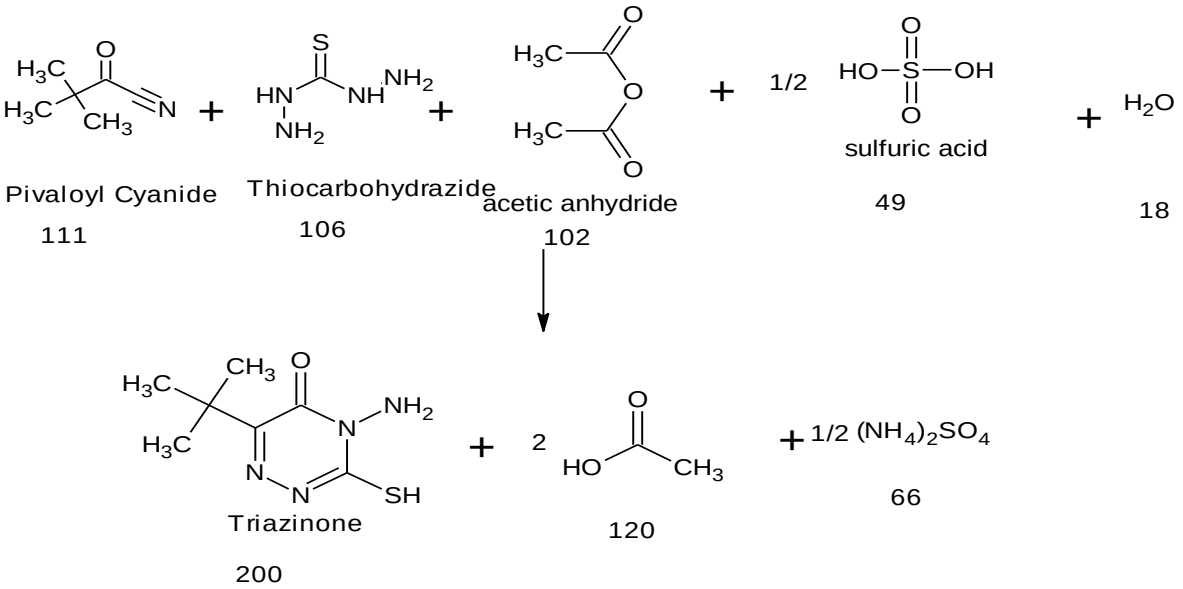
| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| MDCB | 1010 | | |
| Alluminium Chloride | 1040 | | |
| Acetyl Chloride | 600 | | |
| Water for Scrubbing | 400 | | |
| | | Acetylation → HCl Gas | 230 |
| Water | 3600 | | |
| HCl 30% | 150 | | |
| | | Quenching → Aluminium Chloride | 4400 |
| | | Distillation → MDCB Recovered | 990 |
| | | Distillation → Residue | 180 |
| | | Crystallizer → DCAP | 1000 |
| **TOTAL** | **6800** | | **6800** |

## 19. 1,2,4 Triazinone

### Manufacturing Process:

Triazinone is charged slowly in Sulfuric acid in 4 hours. Temperature is raised to $45^0$C and Di Methyl sulfate is charged. Maintain temperature for 10 hours time. When reaction shows completion of methylation, quench in 20% Soda ash solution. Finally adjust pH 10 with NaOH lye. Filter, centrifuged and dry the wet cake. Pulverise and pack suitably.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF 1,2,4 TRIAZINONE**

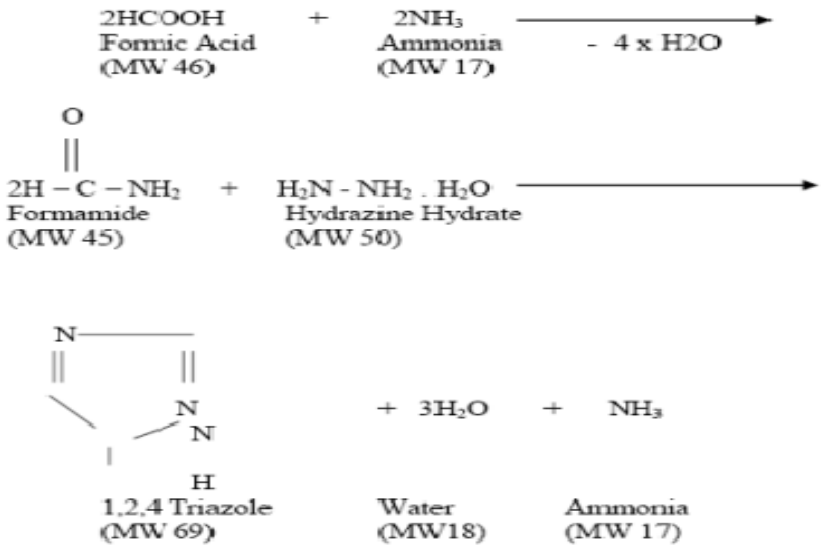
| INPUT | KG | OUTPUT | KG |
|---|---|---|---|
| Sulphuric Acid | 1008 | | |
| Acetic Anhydride | 530 | | |
| Pivaloyl Nitrile | 570 | | |
| ThioCarbohydrazide | 542 | | |
| HCl | 1500 | | |
| | | Waste Water | 3000 |
| Water | 4100 | Waste Water | 3970 |
| | | Drying loss | 280 |
| | | Triazineone | 1000 |
| **TOTAL** | **8250** | | **8250** |

## 20. 1,2,4 Triazole

### Manufacturing Process:

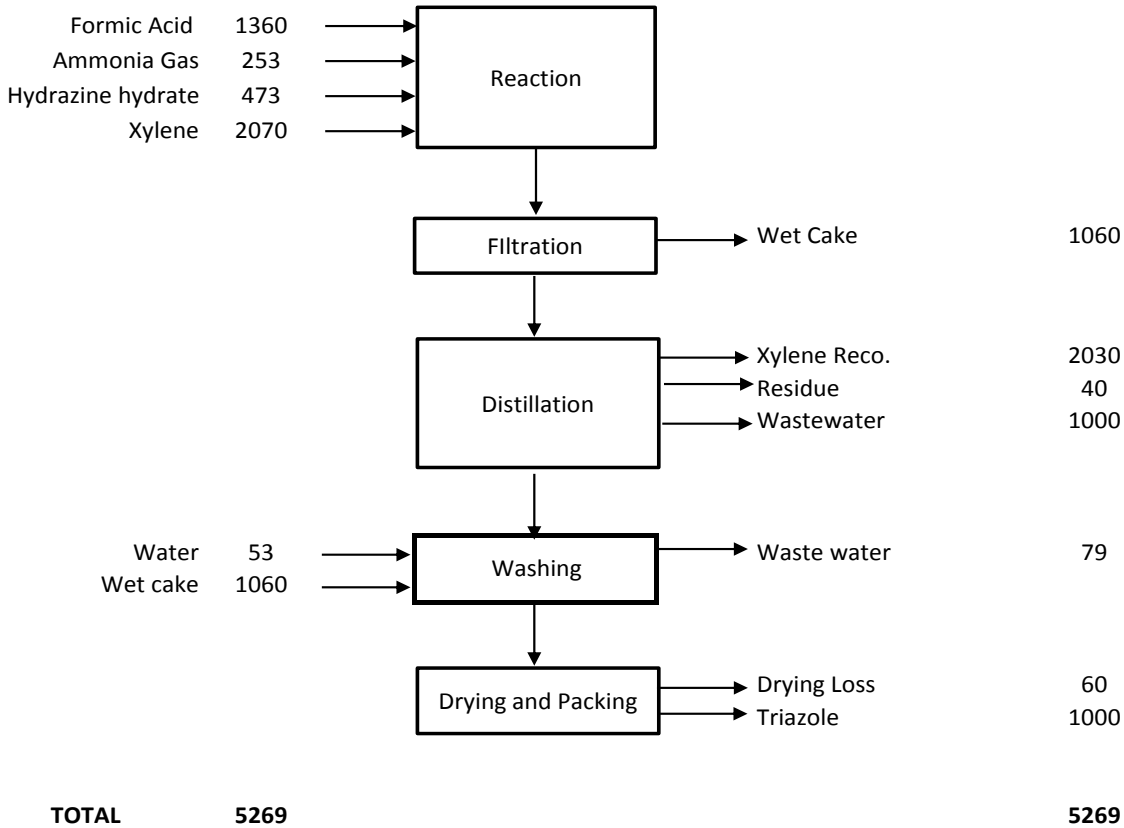
Formic Acid is reacted with dry Ammonia to form Formamide which on reaction with Hydrazine hydrate gives the final Product 1,2,4 Triazole. During the reaction ammonia & water molecules are formed in stoichiometric quantities.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF 1,2,4 TRIAZOLE**



## 21. Ortho Phenylene Diamine (OPDA)

**Manufacturing Process:**

**Step: 1**

First 30% ammonium solution is prepared by passing Anhydrous Ammonia gas in water. Then ONCB (Ortho nitro Benzene) is reacted with excess 30% ammonia under pressure. The product of the reaction is ONA (Ortho Nitro Aniline) and $NH_4Cl$. $NH_4Cl_2$ is the partially decomposed with caustic into ammonia, Sodium chloride and water. Liberated and excess ammonia is then distilled out. Then aqueous layer is separated from organic layer and sent to ETP.

**Step: 2**

Sulfur, caustic lye and water are heated in a reactor to from polysulfide.

**Step: 3**

Reduction of ONA to OPDA. ONA prepared in step 1 is then reacts with polysulfide to OPDA and sodium thiosulfate. The crude OPDA is then filtered and washed with water. The mother liquor is transferred for sodium thiosulfate recovery.

**Step: 4**

Distillation of Crude OPDA wet crude OPDA is then distilled to get pure OPDA which is then flacked. The residue tar is then transferred to ETP.

**Chemical Reaction:**

**Reaction 1 :-**

$$C_6H_4.Cl.NO_2 + 2\ NH_3 = C_6H_4.NO_2.NH_2 + NH_4Cl$$

**Reaction 2:**

$$NH_4Cl + NaOH = NH_3 + NaCl + H_2O$$

**Reaction 3:**

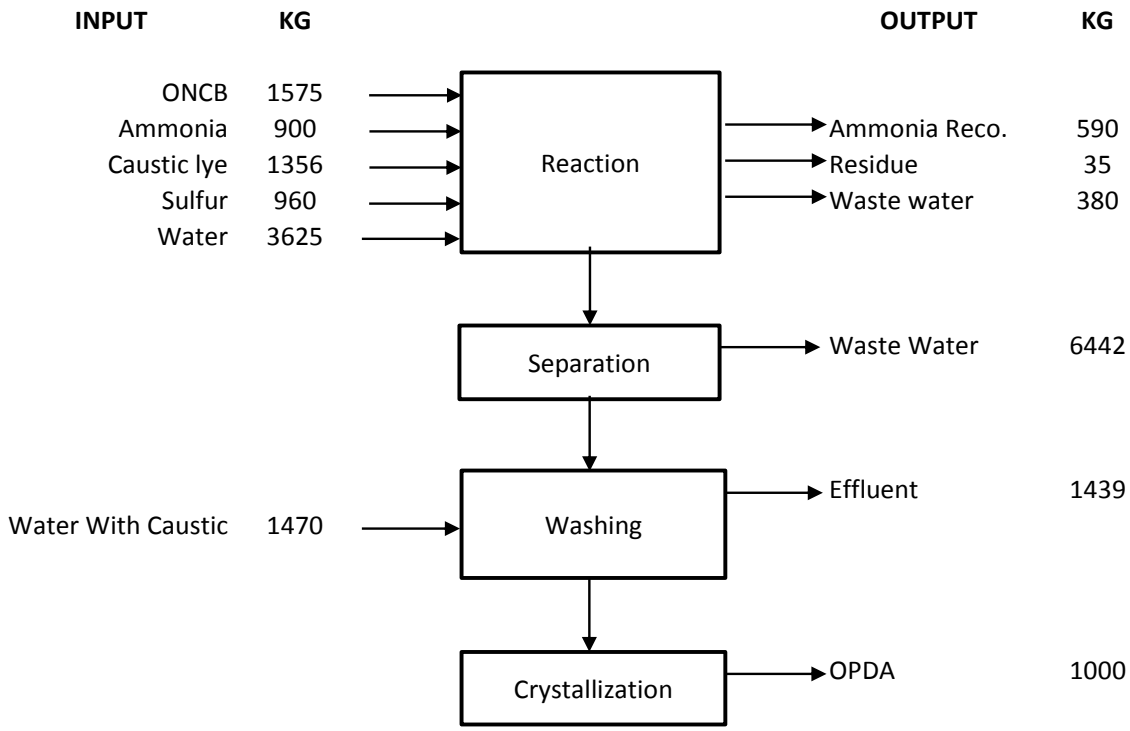
$$6\ NaOH + 6\ S = \underset{\text{Polysulfide}}{2\ Na_2S_2} + \underset{\text{thiosulfate}}{Na_2S_2O_3} + 3\ H_2O$$

**Reaction 4:**

$$\underset{\text{ONA}}{C_6H_4.NH_2.NO_2} + Na_2S_2 + H_2O = \underset{\text{OPDA}}{C_6H_4.NH_2.NH_2} + \underset{\text{Thiosulfate}}{Na_2S_2O_3}$$

## Mass Balance:

**MASS BALANCE OF OPDA**

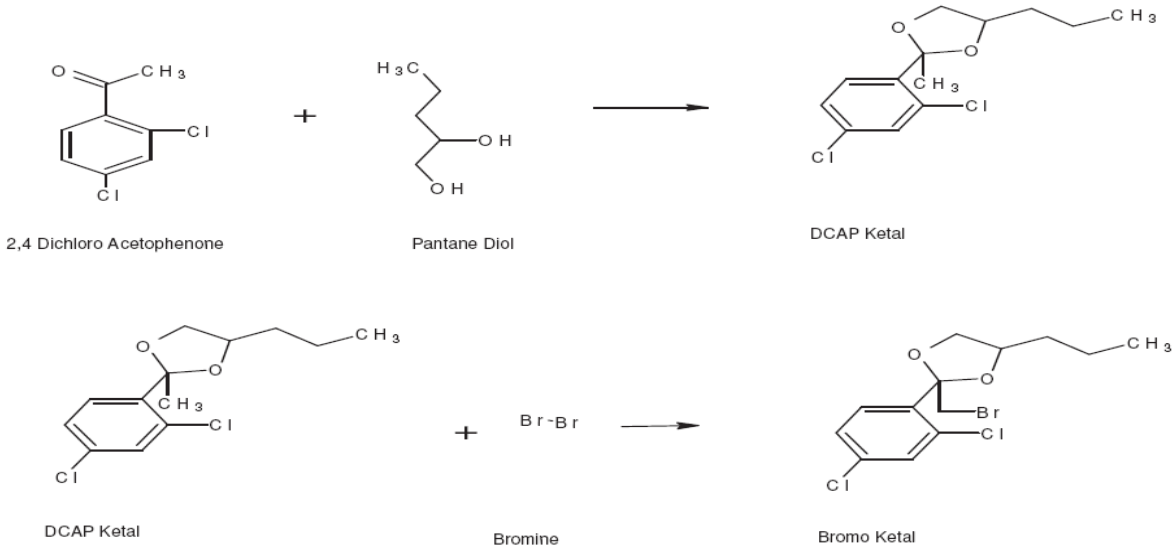


## 22. Bromoketal

### Manufacturing Process:

2, 4 DCAP, PTSA and Pantane diol is charged in to Cyclohexane and refluxed to remove water to form DCAP Ketal. Bromine is charged to form Bromoketal. HBr gas is scrubbed and cyclohexane is distilled out after washing of reaction mass to get Bromoketal.

### Chemical Reaction:




### Mass Balance:

**MASS BALANCE OF BROMOKETAL**

| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| 2,4 DCAP | 525 | Reaction | Waste water | 71 |
| 1,2 Pantane Diol | 315 | | | |
| Cyclohexane | 1300 | | | |
| PTSA | 15 | | | |
| Bromine | 313 | Bromination | | |
| Water | 545 | Clarification | HBr Solution | 1272 |
| Caustic Lye 32% | 210 | | | |
| Water Wash | 420 | | | |
| | | Distillation | Cyclohexane | 1275 |
| | | | Residue | 25 |
| | | | Bromoketal | 1000 |
| **TOTAL** | **3643** | | | **3643** |

## 23. 2,4 Dichloro Valerophe

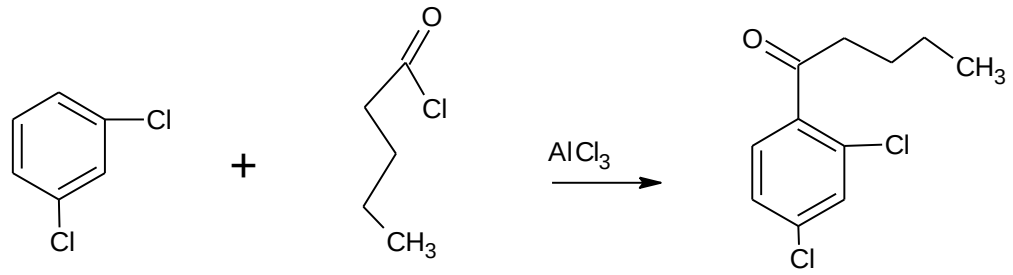
**Manufacturing Process:**

Valeryl Chloride is charged slowly into Aluminum Chloride and MDCB mixture and heated to elevated temperature to complete the reaction.

Reaction mass is quenched in water to separate organic mass and aqueous layer containing Aluminum chloride.

Organic mass is distilled to get pure 2,4 DichloroValerophenone.

**Chemical Reaction:**



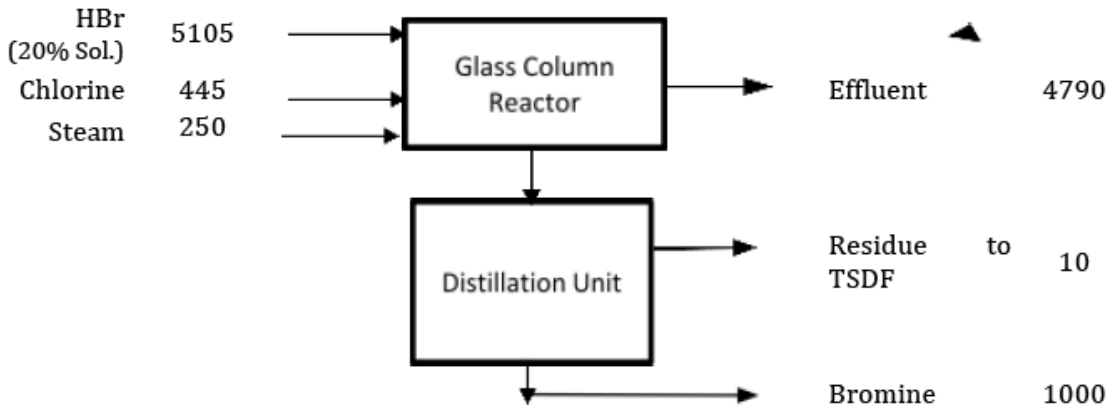

Meta Dichloro Benzene  Valeryl Chloride  2,4 Dichloro Valerophenon

**Mass Balance:**

**MASS BALANCE OF 2,4 Dichloro Valerophe**

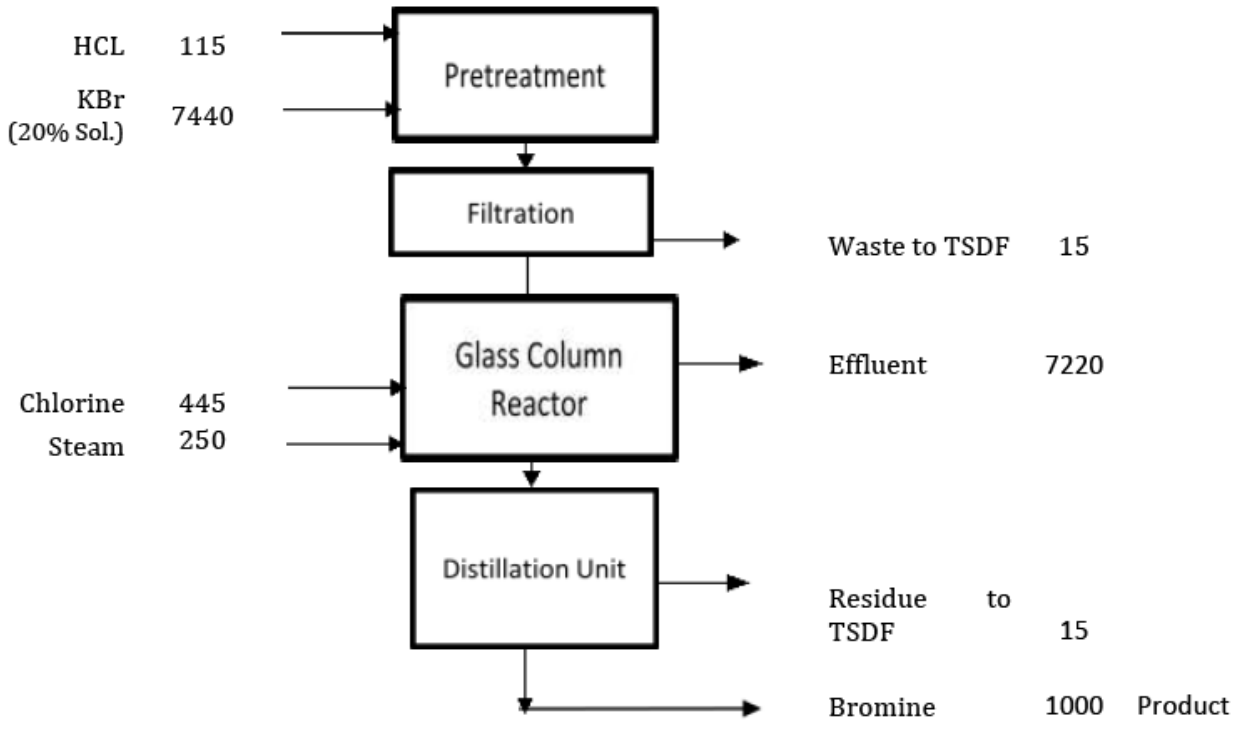
| INPUT | KG | | OUTPUT | KG |
|---|---|---|---|---|
| MDCB | 700 | Reaction | HCl Gas | 180 |
| Alluinium Chloride | 950 | | | |
| valeroyl Chloride | 610 | | | |
| Water for Scrubber | 250 | | | |
| Water | 2300 | Drowning & Separation of aqueouse Layer | Alluminium Chloride | 3550 |
| | | Distillation | 2,4 Dichloro Valerophe | 1000 |
| | | | Residue | 80 |
| **TOTAL** | **4810** | | | **4810** |

## Bromine Recovery System




| | | | |
|---|---|---|---|
| **Total** | **5800** | | **5800** |

## Bromine recovery From KBr




| | | | | |
|---|---|---|---|---|
| **Total** | **8250** | | **8250** | |

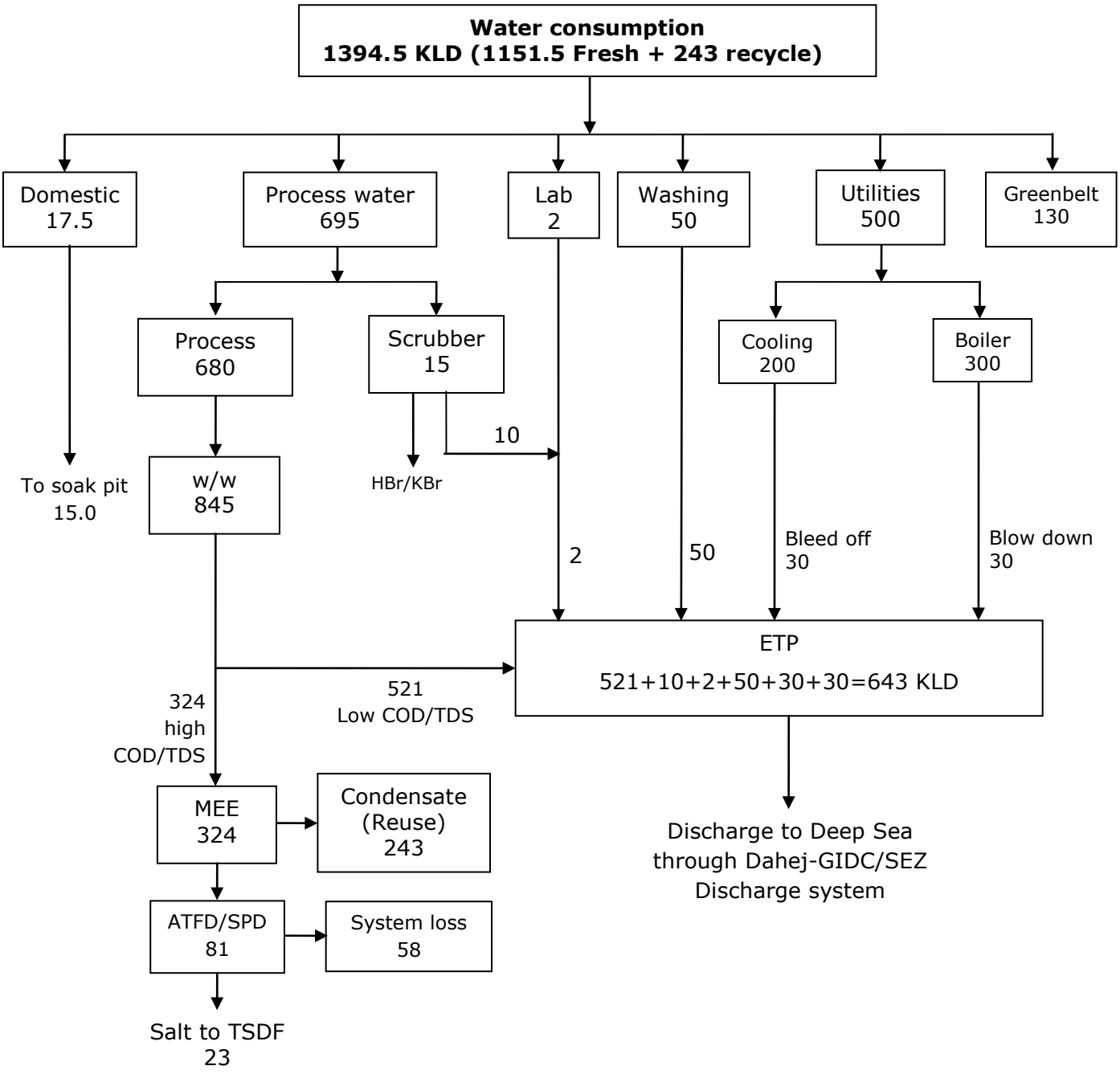
## Annexure-III

## Break up of water consumption and waste water generation

| Sr. No. | Sources | Water Consumption (KLD) | Waste water Generation (KLD) |
|---|---|---|---|
| 1. | Domestic | 17.5 | 15.0 |
| 2. | Gardening | 130.0 | -- |
| 3. | **Industrial** | | |
| i) | Process | 680.0 | 845.0 |
| ii) | Lab | 2.0 | 2.0 |
| iii) | Scrubber | 15.0 | 10.0 |
| iv) | Cooling | 200.0 | 30.0 |
| v) | Boiler | 300.0 | 30.0 |
| vi) | Washing | 50.0 | 50.0 |
| **Total Industrial** | | **1247.0** | **967.0** |
| **Total (1+2+3)** | | **1394.5** | **982.0** |
| **Less recycle** | | **243.0** | -- |
| **Actual fresh w/c** | | **1151.5** | -- |

**Source of water: GIDC water supply**

## Water Balance Diagram



## Annexure-IV

## Details of Hazardous & Solid waste Generation & its disposal

| Sr. No. | Type of Waste | Category of Waste as per HWM Rules 2016 | Quantity | Disposal facility |
|---|---|---|---|---|
| 1. | ETP Sludge | 35.3 | 750 MT/month | Collection, Storage, Transportation & Disposal at TSDF site approved by GPCB. |
| 2. | Salt from MEE | 35.3 | 700 MT/month | Collection, Storage, Transportation & Disposal at TSDF site approved by GPCB. |
| 3. | Distillation Residue | 20.3 | 145 MT/month | Collection, Storage, Transportation, Disposal at CHWIF or send for co-processing in cement kiln after approval from concern authorities. |
| 4. | Alluminium Chloride | B-15 | 2200 MT/month | Collection, Storage & Sale to authorized users under Rule-9 of Haz. Rule, 2016. |
| 5. | HBr (20%) + KBr (20%) solution And/or Recovered Bromine | B-15 | 250 MT/month And/or 50 MT/month | Collection, Storage & Sale to authorized users under Rule-9 of Haz. Rule, 2016 or captive recovery and reuse in process. |
| 6. | Sodium/ Potassium Methyl Sulphate | -- | 100 MT/month | Collection, Storage & Sale to authorized users under Rule-9 of Haz. Rule, 2016. |
| 7. | Spent Sulphuric Acid (30-45%) | B-15 | 950 MT/month | Collection, Storage & Sale to authorized users under Rule-9 of Haz. Rule, 2016. |
| 8. | Formic Acid (40-45%) | B-15 | 48 MT/month | Collection, Storage & Sale to authorized users under Rule-9 of Haz. Rule, 2016. |
| 9. | Spent Hydro Chloric Acid (HCl) (20-22%) | B-15 | 150 MT/month | Collection, Storage & captive use in other products within premises/sale to authorized users under Rule-9. |
| 10. | Discarded containers/ liners | 33.1 | Drum: 2400 Nos./ month Liner: 2.0 MT/month | Being used for packing of ETP sludge in case of excess it will be sold to approved recycler. |
| 11. | Used Oil | 5.1 | 1.0 Kl/Year | Collection, Storage, Transportation & disposal by selling to Registered Recyclers. |
| **Solid waste** | | | | |
| 1. | Fly Ash | -- | 150 MT/month | Collection, Storage, Transportation & sold to brick manufacturers. |

## Annexure-V

## Details of Air Emission

| Sr. No. | Stack attached to | Fuel Type | Stack Height (m) | APC measures | Probable emission |
|---|---|---|---|---|---|
| ➢ **Flue Gas Stacks** | | | | | |
| 1. | Boiler (6 TPH) | Briquette/ Coal-20 MT/day | 30 | Multi Cyclone & Bag Filter | PM<150 mg/$NM^3$ $SO_2$<100 ppm $NO_x$<50 ppm |
| 2. | Boiler (6 TPH) | Briquette/ Coal-20 MT/day | 30 | Multi Cyclone & Bag Filter | PM<150 mg/$NM^3$ $SO_2$<100 ppm $NO_x$<50 ppm |
| 3. | Boiler (6 TPH) | Briquette/ Coal-20 MT/day | 30 | Multi Cyclone & Bag Filter | PM<150 mg/$NM^3$ $SO_2$<100 ppm $NO_x$<50 ppm |
| 4. | Hot Air Generator (30 lacs KCal/hr.) | Coal-14 MT/day | 25 | Multi Cyclone & Bag Filter | PM<150 mg/$NM^3$ $SO_2$<100 ppm $NO_x$<50 ppm |
| 5. | TFH (10 lacs KCal/hr.) x 4 nos. | LDO/FO-0.45 KL/hr. | 20 | -- | PM<150 mg/$NM^3$ $SO_2$<100 ppm $NO_x$<50 ppm |
| 6. | D.G. Set (1000 KVA) x 2 nos. | Diesel-500 lit/Hr | 11 | -- | PM<150 mg/$NM^3$ $SO_2$<100 ppm $NO_x$<50 ppm |
| ➢ **Process Gas stack** | | | | | |
| 1. | Reactor of Pendimethalin | -- | 15 | Alkali Scrubber | NOx<25 mg/$Nm^3$ |
| 2. | Reactor of Metconazole | -- | 15 | Water and alkali scrubber | HCl<20 mg/$Nm^3$ SOx<40 mg/$Nm^3$ |
| 3. | Reactor of Fenaxoprop P Methyl /Benalaxyl/ Metalaxyl /Kresoxim Methyl/ Pethoxamide /Pretilachlor | -- | 15 | 2-stage water scrubber & 1-stage Alkali scrubber | HCl<20 mg/$Nm^3$ $Cl_2$<9 mg/$Nm^3$ |
| 4. | Reactor of Bromoketal | -- | 15 | 2-stagewater scrubber & 1-stage Alkali scrubber | HBr<5 mg/$Nm^3$ $Br_2$<2 mg/$Nm^3$ |
| 5. | Reactor of DCVP/ DCAP | -- | 15 | 2-stage water scrubber & 1-stage Alkali scrubber | HCl<20 mg/$Nm^3$ $Cl_2$<9 mg/$Nm^3$ |
| 6. | Reactor of Chlorothalinil | -- | 15 | Water and alkali scrubber | HCl<20 mg/$Nm^3$ |
| 7. | Spray Dryer | -- | 30 | Cyclone & bag filter | PM<45 mg/$Nm^3$ |
| 8. | Spin flash dryer (6 nos.) | -- | 21 | Inbuilt Cyclone & bag filter | PM<45 mg/$Nm^3$ |
| 9. | Bromine recovery system | -- | 15 | 2-stage water scrubber & 1-stage Alkali scrubber | $Br_2$<2 mg/$Nm^3$ $Cl_2$<9 mg/$Nm^3$ |

**Annexure - VI**
**Land Possession Document**

GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION
( A GOVT. OF GUJARAT UNDERTAKING )
Administrative Office Building,
Plot No.624/B, GIDC, Ankleshwar, Dist. Bharuch
Phone: 02646-221351,221451,221403

NO./GIDC/GM GR-1/CG/ALT/ 166 BY RPAD DATE:- /01/2017
02 FEB 2017

"OFFICE ORDER"

Sub: Change of name of Unutilized open Plot No. 42/5 area admeasuring 97756.87 Sq.mtrs (Tent.) at Dahej industrial Estate.

Ref: 1. Policy circular No.GIDC/O & M/CIR/ALT/POLICY/46 DTD-28/2/2012
2. Policy circular No.GIDC/O & M/CIR/ALT/POLICY/28 DTD-31/3/16

Plot No. 42/5 area admeasuring about 97756.87 sq.mtrs (Tent.) has been allotted to M/s. Unison Industries Limited in Dahej Industrial Estate on dated 15/10/2008. The Agreement was executed on dated 30/7/2009. The Licensee has applied to the corporation for change of name of plot in favor of M/s. Meghmani Industries Limited. Permission for transfer of plot, with certain terms and conditions has been issued by the Divisional Manager (CG), GIDC, Ankleshawar as per letter No. GIDC/DM/CG/ANK/1716 dated 28/11/2016.

The licensee has paid all dues of the Corporation up to March-2017. According to the policy of the corporation, an amount of Rs. 70,38,495/- has been paid towards 5% NU penalty. The supplementary Agreement has been executed between the licensee, transferee and corporation on 04/01/2017 and deed of assignment has been executed on 04/01/2017 between transferor and transferee.

In view of above facts the plot now stand transferred in the name of M/s. Meghmani Industries Limited with effect from 04/01/2017, with permission to utilize the plot by 30/06/2017 and this plot is transferred for the purpose of set up a unit for manufacturing of Agro chemical technical, Agro chemical intermediates, Agro chemical formulations.

This permission will not be in any case considered as a permission for building bye – laws of the corporation. This transfer order will not be taken into cognisance as an order for regularization of unauthorized construction, if any unauthorized construction exist on the allotted property said cannot be considered as authorized one and it shall be the sole responsibility of the transferee to get such construction regularized or removed as per the building bye laws of the corporation.

The transferee's water requirement, power requirement and quantity of liquid Efficient discharge of the proposed project are as Under:-

| YEAR | WATER REQUIREMENT | POWER REQUIREMENT | DRAINAGE |
|---|---|---|---|
| First Year | 470 KL/ day | 1500 KW | 200 KL/day |
| Second Year | 470 KL/ day | 1500 KW | 200 KL/day |
| Third Year | 470 KL/ day | 1500 KW | 200 KL/day |

General Manager Gr.-1 (CG)
GIDC Ankleshwar

To,
M/s. Meghmani Industries Limited,
Plot No. 42/5, GIDC Indl. Estate,
Dahej Dist. Bharuch.

Copy to:-
M/s. Unison Industries Limited,
Plot No. 42/5, GIDC Indl. Estate,
Dahej Dist. Bharuch.

Copy Fwcs to:
1.Executive Engineer, GIDC, Bharuch
2.SAO, GIDC, Ankleshwar
3.Deputy Executive Engineer GIDC Bharuch

GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION

**GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION**
**(A GOVT. OF GUJARAT UNDERTAKING**
**Office Of The Deputy Executive Engineer (Water Supply),**
**1st Floor , Narmada Comm. Complex,**
**Station Road, Panchbatti, Bharuch –392001**
**PH :242432/244184 FAX:(02642)241902**

**GIDC/DEE(WS)/BRH/** 64 **Date:** 23/01/2019

**To**
**M/s. Meghmani Industries Ltd.,**
Plot No-42/5,
GIDC- Dahej.

**Sub**: Request for assurance letter for water supply of Plot No- 42/5, at Dahej.
**Ref**: Your Letter dated 18/12/2018.

Dear Sir,

Vide letter under reference, you have demanded an assurance letter to provide total of 1200 KLPD of water quantity for above said Plot No 42/5.

In this regard, this office assures that total 1200 KL per day of water can be supplied to M/s. Meghmani Industries Ltd., subject to the following conditions:

1. You will have to made deed of rectification for revision in water quantity, if required.
2. Availability of spare water quantity.
3. The allottee pays the contribution and other applicable charges for the said quantity of water.
4. The allottee has to make their own provision to convey water from GIDC water source i.e. Sump/Reservoir if the quantity demanded is more than the entitled quantity.
5. The water connection would only be released after the approvals from the competent authority.
6. The water connection shall only be released after the submission of GPCB consent as per the approved quantity.
7. GIDC supply the water as per availability of water from source. In case of non-availability / less availability water arrangement shall be made by allottee at their cost.
8. If the quantity of water is not available from the nearby GIDC water supply network, the allottee have to lay the appropriate diameter size line from the nearest GIDC location from where the approved quantity is available at their own cost.

This is for your information please.
Thanking you,

Yours faithfully,

**Dy. Executive Engineer (WS),**
**GIDC Bharuch**

GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION

**GUJARAT INDUSTRIAL DEVELOPMENT CORPORATION**
**(A GOVT. OF GUJARAT UNDERTAKING)**
Office of the Dy. Executive Engineer (DRG)
1st FLOOR ,NARMADA COMM. COMPLEX,
STATION ROAD, PANCHBATTI,
BHARUCH –392001PH :242432/244184 FAX:(02642)241902
Mail ID: gidcbharuch@rediffmail.com

NO: GIDC/BRH/DEE (DRG)/ 900 Date:31 /12/2018

To,
M/s.Meghmani Industries Ltd.,
Plot No. 42/5 at Dahej-I
GIDC, Estate
Dahej

**Sub:** **Assurance letter to discharge of Total 600.00 klpd of Treated Industrial Effluent by M/s.Meghmani Industries Ltd.Plot no. 42/5 at Dahej-I**

Ref : - Your Letter no. Dtd.18/12/2018

Dear Sir,

Vide letter under reference, you have demanded an assurance letter to discharge of Total quantity of 600.00 Klpd of Treated Industrial Effluent.

In this regard, this office assures that total 600.00 Klpd of Treated Industrial Effluent can be discharged by M/s.Meghmani Industries Ltd. Plot no.42/5 subject to the following conditions:

1. Availability of infrastructure.
2. Availability of spare quantity in design capacity of sewer line. If the effluent quantity exceeds the entitled quantity, you will have to lay the pipeline up to collection well as directed by engineer in charge.
3. You will have to pay the contribution and other applicable charge for the said quantity of Treated Industrial Effluent.
4. You will have to make your own arrangement to discharge Treated Industrial Effluent in to GIDC's sewer line or in to collection wells directed by GIDC.
5. The Treated Industrial Effluent discharge connection would only be released after the approvals from the competent authority.
6. The Drainage connection shall only be released after the submission of GPCB consent as per the approved quantity.

This is for your Information Please.

28/12/18

Dy. Executive Engineer (DRG),
GIDC Bharuch.