Care Labs
assuring quality check
(Estd : 2005)
Recognised by Ministry of Environment Forest & Climate Change, Govt. of India
An NABL Accredited Laboratory in Chemical & Biological Scope. TC - 12742
Food Safety Standards Authority of India, Govt. of India
An ISO 45001 : 2018 Certified Laboratory

Corp. off. : # 3-11-482/2, Plot No. 1, 3rd Floor,
Sai Sadan Complex, Shiva Ganga Colony,
L.B. Nagar, Hyd-500 074.
Branches : Vijayawada, Vizag & Bangalore
Office Contact. : 9966375550
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Web : www.carelabs.in

TO WHOM SO EVER IT MAY CONCERN

Date: 12.09.2025

Sub: Verification of Environmental Audit Report

Dear Sir,

This is to certify that in view of above Government order **M/s. Care Labs** Hyderabad has verified and Audited Environmental Audit Report **M/s. Bhagiradha Chemicals & Industries Ltd (BCIL)**, Sy No.191,213 to 217 & 220, Cheruvukommupalem (V), Ongole (M), Prakasam (Dist) -523272, Andhra Pradesh.

Data mentioned in below mentioned annexure are Correct and Certified by **M/s. Care Labs**, Hyderabad.

Scope of Verification and Audit is as mentioned below

Annexure I : Environmental Audit Report (From 2024 April to 2025 March) for the CFO order No.-

Order No. 333938/APPCB/VJA/OGL/CTO&HWA/HO/2024 Dated: 16.02.2024

For Care Labs

J. Sushma

Asst. Environmental Engineer

CARE LABS Regd. No. 2461/65 Hyderabad-500 074.

ACKNOWLEDGEMENT

M/s. Care Labs express sincere debt of gratitude **M/s. BHAGIRADHA CHEMICALS & INDUSTRIES LTD(BCIL)** for the opportunity given by assigning the preparation of **ENVIRONMENTAL STATEMENT (AUDIT)** for their unit located in Survey No.197,213 to 217 & 220 of Cheruvukommupalem village in Ongole rural area of Prakasam District of Andhra Pradesh. The Environment statement (Audit) is prepared for the financial year April2024 to March2025. Special needs to be made of Executive of **M/s. Bhagiradha Chemicals & Industries Ltd.,** especially **Mr. S. Chandra Sekhar, Managing Director** for their cooperation and assistance during the preparation of Environmental Statement. We also wish to acknowledge our gratitude to all them helped during the data collection and report preparation.

CARE LABS
Regd. No. 2461/65
Hyderabad-500 074.

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LIST OF TABLES

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FORM-V
(See rule 14)
ENVIRONMENTAL STATEMENT FOR THE FINANCIAL YEAR ENDING 31stMARCH, 2025
PART-A

i)	Name and address of the owner / occupier of the industry operation or process	**Mr. S.CHANDRA SHEKHAR** **Managing Director** **Register Office:** **Bhagiradha Chemicals & Industries Limited** **Prestige Sky Tech Building,** **SKY 1 (Wing A), Level 1,** **ISB Road, Back Side Continental Hospital,** **Nanakramguda, Financial District,** **Hyderabad – 500 032.Telangana. India** **Ph No:040-65440409/9440471962** **Factory:** **Cheruvukommupalem Village, Yerajarla Road, Ongole Mandal, Prakasam District, Andhra Pradesh.**
ii)	Industry Category	Red–Hazardous
iii)	Production Capacity(Units)	The unit obtained Consent Order No: 333938/APPCB/VJA/OGL/CTO&HWA/HO/2024 Dated 16-12-2024 for the production of various technical grade pesticides with formulations. The list of products and their capacities are presented in the table1.
iv)	Year of Establishment	1996
v)	Date of the last environmental audit report submitted	September2024

TABLE-1: List of Products and Capacities during 2024-2025

Group-A

S. No.	Name of the Product	Quantity Kg/day
Combination-I	Chlorpyriphos or	4000
	Chlorpyriphos Methyl or	3500
	Azoxystrobin or	1600
	Dinotefuron or	4000
	Pymetrozine or	3500
	4-amino-2,5 dimethoxypyrimidine (4-ADMP) or	1200
	Acequinocyl or	1300
	Thiamethoxam or	4000
	Thiamethoxam or	1750
	Chlorantraniliprole or	1500
	Acetamprid or	4000
	Indoxacarb or	4000
	Tebucanazole or	4000
	Pyrazosulfuron or	4000
	Chlorantraniliprole	4000

Combination -II	2,6-Dichloroaniline or	2000
	Lambda Cyhalothrin or	1000
	Dinotefuron or	2000
	Pyrazole or	0
	Pymetrozine or	500
	Mesosulfuron or	2000
	CAS No 247236-09-5 or	1500
	Quinalphos or	2000
	Tembotrione	2000
Combination –III	TFMA or	0
	Azoxystrobin or	2000
	4-amino-2,5 dimethoxypyrimidine (4-ADMP) or	0
	Acequinocyl or	0
	Triclopyr Technical or	3500
	Diafenthiuron or	3000
	Imidacloprid or	2000
	Thiamethoxam or	0
	Thiamethoxam or	0
	Clodinafop-Propargyl or	3500
	Cloquintocet-mexyl or	3000
	Fluroxypyr Technical or	3500
	Fipronil or	1500
	Trifloxystrobin or	2000
	Bifenthrin or	3500
	Thifluzamide or	3500
	Flubendamide or	3500
	Tolfenpyrad	3000
Combination– IV	Fipronil or	1900
	Sulfosulfuron or	1000
	Ethiprole or	1250
	Pinoxaden or	750
	Bispyribac or	0
	4-amino-2,5-dimethoxypyrimidine (4-ADMP) or	900
	Chlorpyriphos or	3000
	Dinotefuron or	3200
	Pymetrozine or	2750
	Diafenthiuron or	3000
	Difenconazole or	3200
	Novaluron or	3000
	Pyripyroxyfen or	3200

	Sulfantrazone or	3200
	Diclosulam or	3000
	Trifloxystrobin(N-1)	3000
Combination-V	R&D and Pilot plant Products	500

Group-B

S. No	Name of the Product	Quantity
	Emulsifiable Formulations	
1	Chlorpyriphos	5.0 KLD
2	Chlorpyriphos-Methyl	5.0 KLD
3	Triclopyr	5.0 KLD
4	Fluroxypyr	5.0 KLD
5	Imidacloprid	5.0 KLD
6	ClodinafopPropargyl	5.0 KLD
7	Fipronil	5.0 KLD
	Wettable Powder	
1	Clodinafop – 15%	5.0 TPD
	Wettable Granules	
1	Imidacloprid – 70%	5.0 TPD
2	Fipronil -80%	5.0 TPD
3	Thiamethoxam – 25%	5.0 TPD
	Suspension Concentrates	
1	Fipronil – 5%	5.0 TPD
2	Buprofezin – 25%	5.0 TPD

The industry shall manufacture 39 no. of Pesticide Technical Products and manufacture one product from each combination of Group-A products and one product from Group – B at any point of time. The total of pesticide production shall not exceed 3250 TPA as permitted in the EC order, dt. 21.10.2008

PART–B

1. The source of water is Bore wells. The following is the permitted water consumption:

S. No	Purpose	Quantity (in KLD)		
		Fresh	Recycled	Total
1.	Process & Washings	55.2	14.12	69.32
2.	Boiler Feed	126	--	126
3.	Industrial Cooling (Makeup)	74	110.88	184.88
4.	Domestic	21	-	21
5.	Gardening	30	21	51
	Total	**306.2**	**146**	**452.2**

Name of Products	Water consumption per unit of product (m^3/Batch)	
	During the previous financial year (2023-2024)	During the Current financial year (2024-2025)
ChlorpyriphosTechnical	26.41	26.41
AzoxystrobinTechnical	21.04	21.04
FipronilTechnical	8.24	8.24
PymetrozineTechnical	0.88	0.88
Acequinocyl	6.80	--
Diafenthiuron	--	4.5
Dinotefuron	--	8.0
Trifloxystrobin	--	20.04

ii) Raw material & chemicals consumption:
(CHLORPYRIPHOSTECHNICAL)

Name of raw materials	Name of product	Unit	Consumption of raw material per unit of output	
			During the previous financial year (2023-2024)	During the Current financial year (2024-2025)

Trichloroacetylchloride	CHLORPYRIPHOSTECHNICAL		0.86	0.85
Acrylonitrile			0.28	0.27
Catalyst-1			0.035	0.052
Caustic Lye			1.13	1.11
SodiumCarbonate			0.032	0.032
Dichloroethane			0.11	0.11
Diethyl ThiophosphoylChloride			0.65	0.64
Catalyst-2			0.008	0.012
Methanol			0.026	0.026

(AZOXYSTROBINTECHNICAL)				
OCBN	AZOXYSTROBIN TECHNICAL		0.701	0.645
Caustic Lye 48 %			1.111	2.15
30% HCl			1.681	1.039
Trimethylorthoformate			0.799	0.768
Salicylamide			0.531	0.529
Thionyl Chloride			0.459	0.502
Dihydroxypyrimidine			0.509	0.434
Phosphorous oxy chloride			1.51	1.06
Toluene			0.131	0.150
Sodium Methoxide			0.19	0.18
Acetic Anhydride			1.54	1.48
Methanol			0.08	0.27

(FIPRONIL TECHNICAL)				
Chlorine	FIPRONILTECHNICAL		1.78	1.71
Carbon Disulphide			0.33	0.32
36 % HCL			1.1	2.22
Sodium Meta Bisulphate			0.37	0.37
KF			1.02	0.84
Benzyl Chloride			0.43	0.04
Acetonitrile			0.15	0.10
Caustic Lye (100%)			0.23	0.78
Di Chloro Methane			0.2	0.2
Hydrogen Peroxide			0.33	0.32
TFAA			0.28	0.03
Chloro Benzene			0.89	0.08
Methanol			0.07	0.58

(PYMETROZINE TECHNICAL)				
3-Cyanopyridine	PYMETROZINETECHNICAL		0.75	0.57
4-Acetylamino triazine			0.94	0.93
Hydrogen			0.01	0.01
Raney Nickel			0.027	0.027
36% HCL			1.10	1.10
48% NaOH			0.91	0.91
Methanol			0.194	0.192

(ACEQUINOCYL TECHNICAL)				
Beta-Naphthol	ACEQUINOCYL TECHNICAL		0.779	--
Caustic lye			2.256	--

Hydrogen peroxide			3.680	--
36 % HCL			2.744	--
Dodecanal			0.836	--
N butyl amine			0.316	--
Xylene			0.140	--
Sulphuric acid			0.361	--
Hydrogen			0.035	--
Acetic Anhydride			0.580	--

(DIAFENTHIURON TECHNICAL)				
2,6 Diisopropylaniline	DIAFENTHIURON TECHNICAL		--	0.68
30% Hydro bromic acid			--	2.07
30% Hydrogen peroxide			--	0.44
Phenol			--	0.34
30% Hydrochloric acid			--	0.39
Sodium thiocyanate			--	0.26
Potassium Carbonate			--	0.49
tert-butyl amine			--	0.22
IPA			--	0.22
Xylene			--	0.10
Sulphuric Acid				0.18
(DINOTEFURON TECHNICAL)				
3-AMT	DINOTEFURON TECHNICAL		--	0.63
MNNA			--	0.75
Sodium hydroxide Flakes			--	0.15

(TRIFLOXYSTROBIN TECHNICAL)				
(E)-Methyl 2-(methoxyimino)-2-(o-tolyl)acetate	TRIFLOXYSTROBIN TECHNICAL		--	0.615
MDC			--	0.284
48% HBr			--	0.501
H2O2 30%			--	0.101
Methyl Acetophenone			--	0.56
Hydroxylamine.HCl			--	0.20
IPA			--	0.11
NaOH Flakes			--	0.12
32% HCl			--	0.02
Acetone			--	0.19
K2CO3			--	0.37
TBAB			--	0.03
Ethyl Acetate			--	0.05
Methanol			--	0.19

PART - C

POLLUTIONGENERATED

(Parameterasspecified intheconsentissued)

Pollutants	**Quantity of Pollutants Discharged (Kg/day) 2024-2025**	**Concentrations Of Pollutants in Discharged (mg/l) 2024-2025**	**Percentageof Variationfrom prescribed standardswith reasons**
a)Treated Waste Water			
Total Suspended Solids	Zero Liquid Discharge system is adopted		
Biochemical Oxygen Demand			
Oil&Grease			
Average effluent quantity : 172.92 m^3/Day			

b) Air				
Stack Attached to	Pollutants	Quantity of Pollutants Discharged (Kg/day) 2024-2025	Concentrations Of Pollutants in Discharged (mg/L) 2024-2025	Percentage of Variationfrom prescribed standardswith reasons
Coal fired Fluidized bed boiler	PM	11.62	40.00	65.21%less

-

PART - D

HAZARDOUSWASTE

(As Specified under Hazardous wastes/Management and handling rules, 2003)

Hazardous wastes	Total Quantity in MT per year	
	During the Previous financial year (2023-2024)	During the current financial year (2024-2025)
From Process		
From process and pollution	4270.590	4137.170
Control Facilities		
Organic Residue	473.860	473.180

PART – E

SOLIDWASTES

Solid Wastes	Total QuantityMT per year	
	During the previous financial year (2023-2024)	During the current financial year (2024-2025)
From Process		
FromProcess	4262.950	4137.170
From Pollution Control Equipment		
BoilerAsh	3520	3640
ETPSludge	7.64	7.11

PART-F

Please specify the characteristics (in terms of concentration and quantum) of Hazardous as well as solid wastes and indicates disposal practice adopted for both these categories of wastes.

The hazardous waste as well as solid waste generated, its composition and method of disposal is shown in table:

S.No.	Sources	Quantity Kg/Day	Composition %W/W	Methodof disposal
1.	Inorganic solid waste	14364	NaOH–5-10 NaCl–90-95	Through M/s APEMCL, send to common TSDF,CWMP-II, SPSR Nellore(Dist.)
2.	Process Residue (Organic)	1516	pH –7.0 Calorific Value - 4259 Water - 8.04 CPP - 0.5 Organiccoloredimpurities–3	Through M/s APEMCL, send to preprocessors/Cement industries for Co-Processing.
3.	ETP Sludge	25	--	Through M/s APEMCL, send to common TSDF, CWMP-II, SPSR Nellore (Dist.)
4.	Boiler Ash	13500	--	Disposed to brick manufacturers.

PART -G

Impact of the Pollution Control measures on conservation of natural resources and consequently on the cost of production.

The Distillate from Multiple Effect Evaporation (MEE) & ATFD system has considerably reduced the load on effluent treatment plant and the final effluent quality is well within the prescribed limits. The Treated Effluents are used for cooling towers makeup within the premises. The cost of Production however has increased.

PART-H

Additional Investment Proposal for Environmental Protection including abatement of pollution.

Additional measures/investment proposal for environmental protection including abatement of pollution, prevention of pollution.

The Industry has spent around Rs. 2 Cores of Rupees for up-gradation of existing Effluent Treatment Plant. 17 No. of two stage scrubbers provided to improve the environment.

PART - I

Any other particulars in respect of environment protection and abatement of pollution.

Sewage treatment plant was constructed and operating continuously.

Thick green belt is developed around the plant.

Dr. Akiramiyawaki Method High Density Plantation was developed in the premises.

1. INTRODUCTION

M/s. BHAGIRADHACHEMICALS&INDUSTRIESLIMITED has setup Chlorpyriphos (Technical grade) manufacturing plant. The unit is located in Survey No.197, 213 to 217 & 220 of Cheruvukommupalem Village in Ongole Rural area of Prakasam District. Open lands surround the plant site on all sides except west side, which is covered by Ongole-Yerajarla R&B Road. The plant facilities are established in 35.76 Acres, which includes 23.96 Acres of plant area and 11.8 Acres of greenbelt area. The installed capacity of 300TPA of Chlorpyriphos is subsequently expanded to 1000 TPA during 2000 & 3250 TPA During 2008. The CTO was issued for the changed Product Mix by the APPCB with effect from 16-12- 2024.For meeting the prevailing competition in the Agrochemicals, the plant capacity is expanded to 3250 TPA.

2. OBJECTIVE OF THE STUDY

The objective of the present study is to review the performance of pollution control systems installed by the industry so as to identify efficient pollution prevention and control systems, which could be beneficial to both environment and its components. Every person carrying on an Industry, operation or process requiring Consent under section25 of the water Act1974(prevention and control of pollution 6 of 1974) and under section21 of the Air Act 1981(Prevention and Control of Pollution 14 of 1981) or both and Authorization under the Hazardous Wastes (Management and Handling Rules,1989)issued under the Environmental(Protection) Act1 986(29of1986)shall submit an environmental audit report for the financial year ending 31st March in Form–V to the concerned state pollution control board on or before the 30th day of September every year beginning 1993.In alater notification vide GSR386(E), 28thApril1993, the Govt. of India (MoEF&CC) have conveyed the environment(Protection)Amendment Rules,1993 wherein rule 14the "Audit Report" substituted by

word "statement". It means every industry is required to submit an Environmental statement in Form-V for every financial year.

3. BENEFITSOFENVIRONMENTALAUDIT

Environmental Audit creates awareness in the conservation of natural resources and helps to improveProductionSafetyandHealth. Thebenefitsofaudit are:

1. It helps in reduction of Raw Material consumption by way of waste minimization and adoption of recovery of Raw Materials and recycles the same.
2. Determination of the performance of process systems will help to improve the systems.
3. Efficiency of pollution control systems can be calculated.
4. This gives the awareness of environmental requirements of the industry.
5. Data available will help the management for use in the plant modification and adopting pollution control for different types of technology.
6. It helps to identify pollution creating systems and exposure to it by the employees for taking remedial measures.
7. The management will be assisted in complying with local, regional and national laws regulations by adopting standards.
8. It helps to identify Hazardous Wastes, handling measures taken and exposure to litigation can be reduced.
9. To determine the impact on the surrounding environment due the disposal of its pollutants and identify suitable preventive measures.

10. Energy saving systems can be adopted by considering fuel consumption data.

M/s. BHAGIRADHACHEMICALS&INDUSTRIESLIMITED has entrusted the task of preparation of Environmental Statement (Audit) to M/s. CARE LABS, Hyderabad. An in-depth study was conducted by Care Labs, to review the process efficiency, wastewater generated and the present treatment systems, emissions generated and air pollution control equipment provided mode of solid waste collection and disposal and the other associated problems leading to the pollution and impact on environment.

4. LOCATION

Bhagiradha Chemicals & Industries Ltd. ,is located at Cheruvukommupalem village, Prakasam District of Andhra Pradesh. The plant is located at a distance of 7km from Ongole town in west direction and the distance from National Highway No.5 (Kolkata-Chennai) is 4km. nearest Airport is Gannavaram, Vijayawada, which is about 150km from the unit. The plant is located at Latitude $15^{O}27'58''$ N and Longitude $80^{O}0'50''$ E. The Site plan of the project is shown in Fig.1.

DESCRIPTION	EXISTING HP	PROPOSED HP	TOTAL INSTALLED HP
A C N RECOVERY	414.5		414.5
BOILER 5TPH OIL	61.5		61.5
BOILER 8TPH COAL	136.5		136.5
BOILER 12TPH OIL	92		92
BOILER 12TPH COAL	483		483
CHLORINE	31		31
ETP	833.5		833.5
PACK,DRYING	235		235
PRODUCTION BLOCK-1	631.5	5	636.5
PRODUCTION BLOCK1 EXP	475		475
PRODUCTION BLOCK 2	1626.5		1626.5
PRODUCTION BLOCK 3	1392.5		1392.5
R & D, PILOT PLANT	69	112.5	181.5
STP	47		47
STRIPPER	285		285
TANK FARM-1	55		55
UTILITY-1	1425		1425
UTILITY-2	4657	350	5007
UTILITY-3	330		330
WORKSHOP	63		63
TANK FARM-2	20		20
CHEMICAL OXYGEN PLANT		325	325
OTHER PUMPS	41.5		41.5
COOLING TOWER-10		225	225
	13405	1017.5	14422.5

BHAGIRADHA CHEMICALS AND INDUSTRIES LIMITED
YERAJARLA ROAD, CHERUVUKOMMUPALEM VILLGE
ONGOLE MANDAL, PRAKASAM DIST, ANDHRAPRADESH - 523272

SITE PLAN

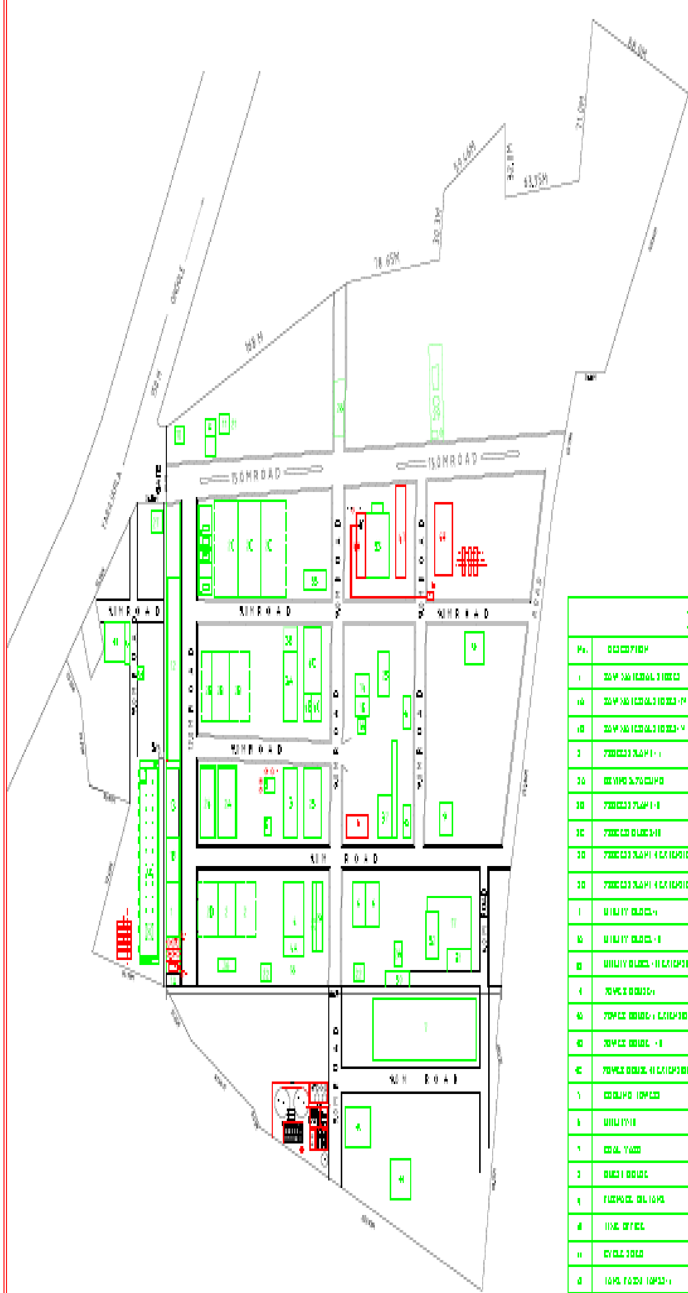
SCALE : 1:1200
ALL DIMENSIONS ARE IN METRES

NORTH
N

DETAILS OF PROPOSED BUILDINGS AND SHEDS

GROSS TOTAL POWER - 14422.50 HP
TOTAL EXISTING POWER - 13405.00 HP
TOTAL PROPOSED POWER - 1017.50 HP

PROPOSED
EXISTING



DETAILS OF EXISTING BUILDINGS AND SHEDS

APPLICANT

ENGINEER

N. VENKATA RAO

APPROVED

5. RAWMATERIALS AND PRODUCTS:

The Raw materials used for producing the products for the financial year 2024-2025 are as follows:

Products:

Chlorpyriphos technical-1565.388 MT

S.No.	Name of the raw material	Quantity in Tons/year
1	Trichloroacetylchloride	1330.58
2	Acrylonitrile	422.65
3	Catalyst-1	81.40
4	Caustic Lye	1737.58
5	Sodium Carbonate	50.09
6	Dichloromethane	172.19
7	Diethyl Thiophosphoyl Chloride	1001.85
8.	Catalyst-2	18.78
9.	Methanol	40.70

Azoxystrobin technical–198.475 MT

S. No.	Name of the raw material	Quantity in Tons/year
1	OCBN	128.02
2	Caustic Lye 48 %	426.72
3	30% HCl	206.22
4	Trimethylorthoformate	152.43
5	Salicylamide	104.99
6	Thionyl Chloride	99.63
7	Dihydroxypyrimidine	86.14
8	Phosphorous oxy chloride	210.38
9	Toluene	29.77
10	Sodium Methoxide	35.72
11	Acetic Anhydride	293.74
12	Methanol	53.58

Fipronil Technical – 464.015 MT

S. No.	Name of the raw material	QuantityinTons/year
1	Chlorine	793.47
2	Carbon Disulphide	148.48
3	36 % HCL	1030.11
4	Sodium Meta Bisulphate	171.69
5	KF	389.77
6	Benzyl Chloride	18.56
7	Acetonitrile	46.40
8	Caustic Lye	361.93
9	Di Chloro Methane	92.80
10	Hydrogen Peroxide	148.48
11	TFAA	13.92
12	Chloro Benzene	37.12
13	Methanol	269.13

Pymetrozine Technical – 181.860 MT

S.No.	Name of the raw material	Quantity in Tons/year
1	3-Cyanopyridine	103.66
2	4-Acetylamino triazine	169.13
3	Hydrogen	1.82
4	Raney Nickel	4.91
5	36% HCL	200.05
6	48% NaOH	165.49
7	Methanol	34.92

DIAFENTHIURON TECHNICAL –267.000 MT

S.No.	Name of the raw material	Quantity in Tons/year
1	2,6 Diisopropylaniline	181.56
2	30% Hydro bromic acid	552.69

3	30% Hydrogen peroxide	117.48
4	Phenol	90.78
5	30% Hydrochloric acid	104.13
6	Sodium thiocyanate	69.42
7	Potassium Carbonate	130.83
8	tert-butyl amine	58.74
9	IPA	58.74
10	Xylene	26.7
11	Sulphuric Acid	48.06

TRIFLOXYSTROBIN TECHNICAL- 20.730 MT

S.No.	Name of the raw material	Quantity in Tons/year
1	(E)-Methyl 2-(methoxyimino)-2-(o-tolyl)acetate	12.75
2	MDC	5.89
3	48% HBr	10.39
4	H2O2 30%	2.09
5	Methyl Acetophenone	11.61
6	Hydroxylamine.HCl	4.15
7	IPA	2.28
8	NaOH Flakes	2.49
9	32% HCl	0.41
10	Acetone	3.94
11	K2CO3	7.67
12	TBAB	0.62
13	Ethyl Acetate	1.04
14	Methanol	3.94

DINOTEFURON TECHNICAL-104.000 MT

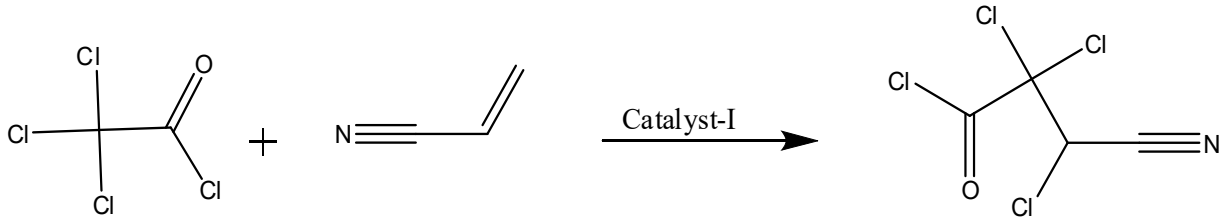
S.No.	Name of the raw material	Quantity in Tons/year
1	3-AMT	65.52
2	MNNA	78
3	Sodium hydroxide Flakes	15.6

6.0 Process Description:

Process Description of Chlorpyriphos:

a) Formation of adduct :

Trichloroacetyl chloride (TCAC) is reacted with acrylonitrile (ACN) in the presence of Cucl catalyst to form adduct. At the end of reaction excess TCAC and ACN are distilled off. Catalyst is removed by filtration and the filtrate is taken to next step



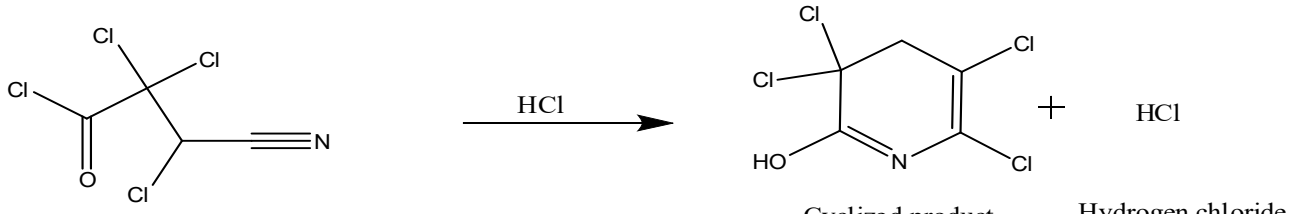
Trichloroacetyl chloride
M.wt:182

Acrylonitrile
M.wt:53

Adduct
M.wt:235

b) Cyclization of adduct :

The adduct is cyclized in presence of HCl.



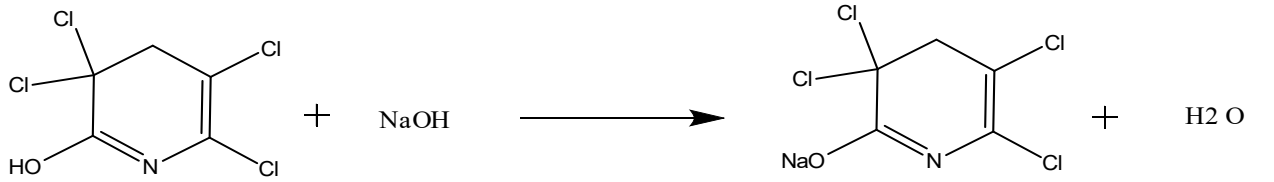
Adduct
M.wt:235

Cyclized product
M.wt:198.5

Hydrogen chloride
M.wt:36.5

c) Formation of sodium salt of 2-hydroxy, 3,5,6-trichloropyridine (NaHTCP):

The cyclized compound is drowned in caustic lye solution resulting in the formation of NaTCP. The mother liquor is centrifuged to obtain wet NaTCP which is directly taken to next reaction



Cyclized product
M.wt:198.5

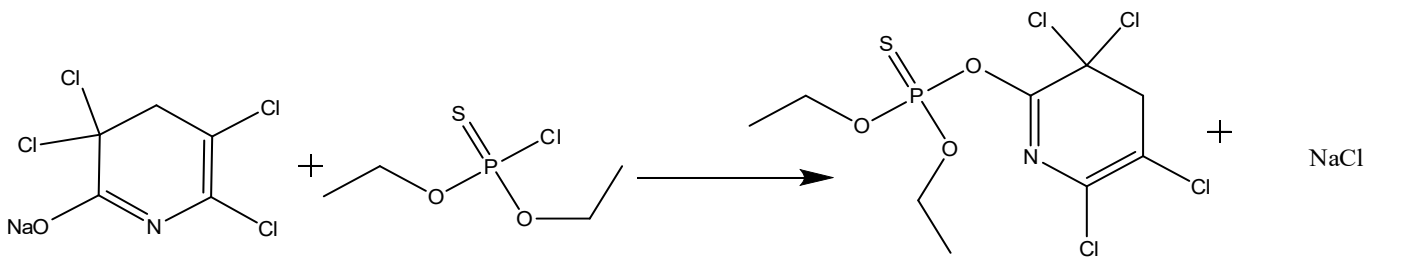
Sodium hydroxide
M.wt:40

NaHTCP
M.wt:220.5

Water
M.wt:18

(d) Formation and Concentration of Chlorpyriphos:

Aqueous solution of Sodium Salt of Hydroxytrichloro Pyridine (Na-HTCP) is reacted with Diethyl Thiophosphoryl Chloride (DETC) in the presence of phase transfer catalyst resulting the formulation of Chlorpyriphos. Dichloro ethane (DCE) is used to extract the Chlorpyriphos. At the end of reaction the organic layer is separated and concentrated under vacuum to give crude Chlorpyriphos. Crude Chlorpyriphos is crystallyzed in methanol.



NaHTCP
M.wt:220.5

DETC
M.wt:188.5

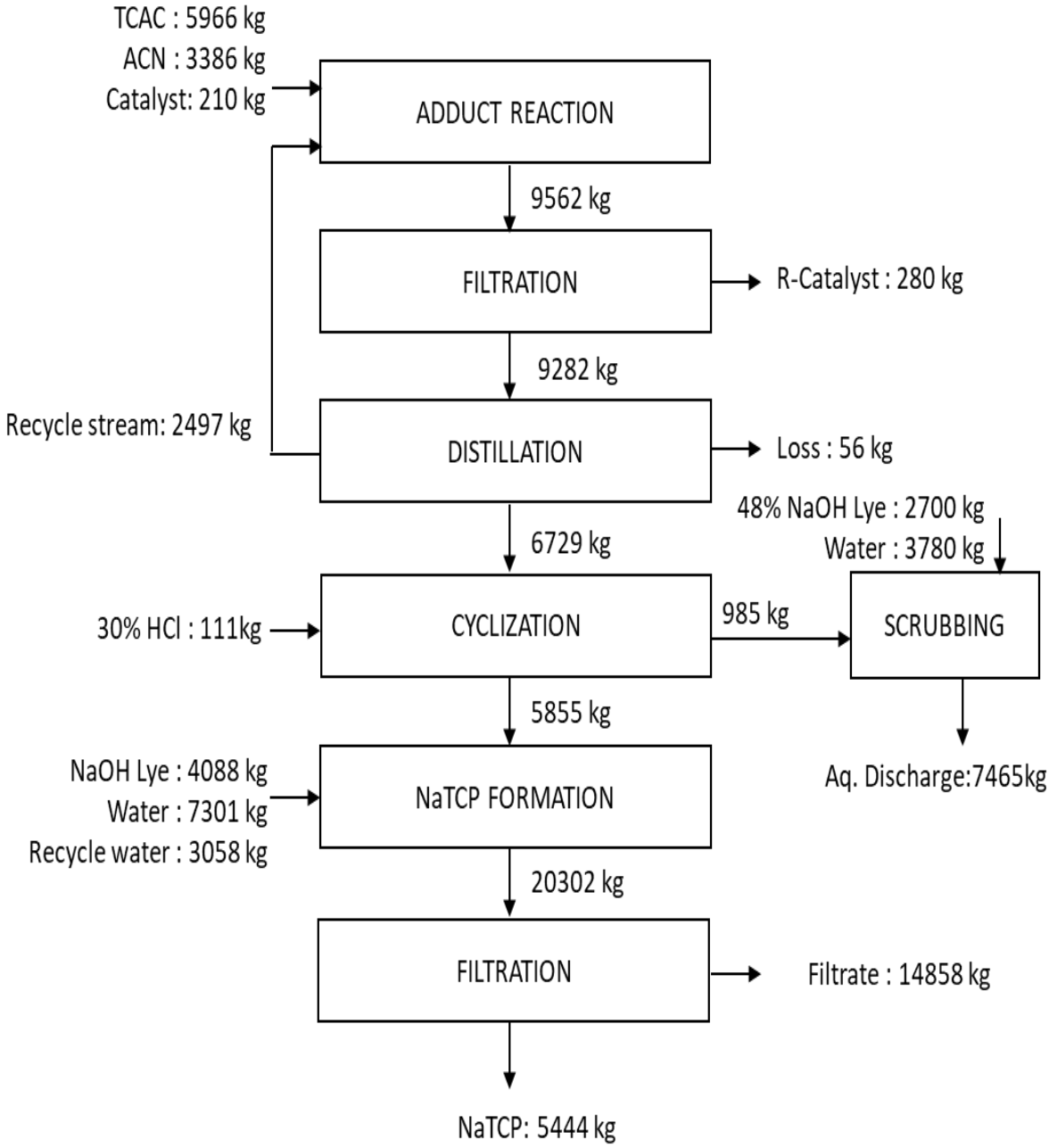
Chlorpyriphos
M.wt:350.5

Sodium chloride
M.wt:58.5

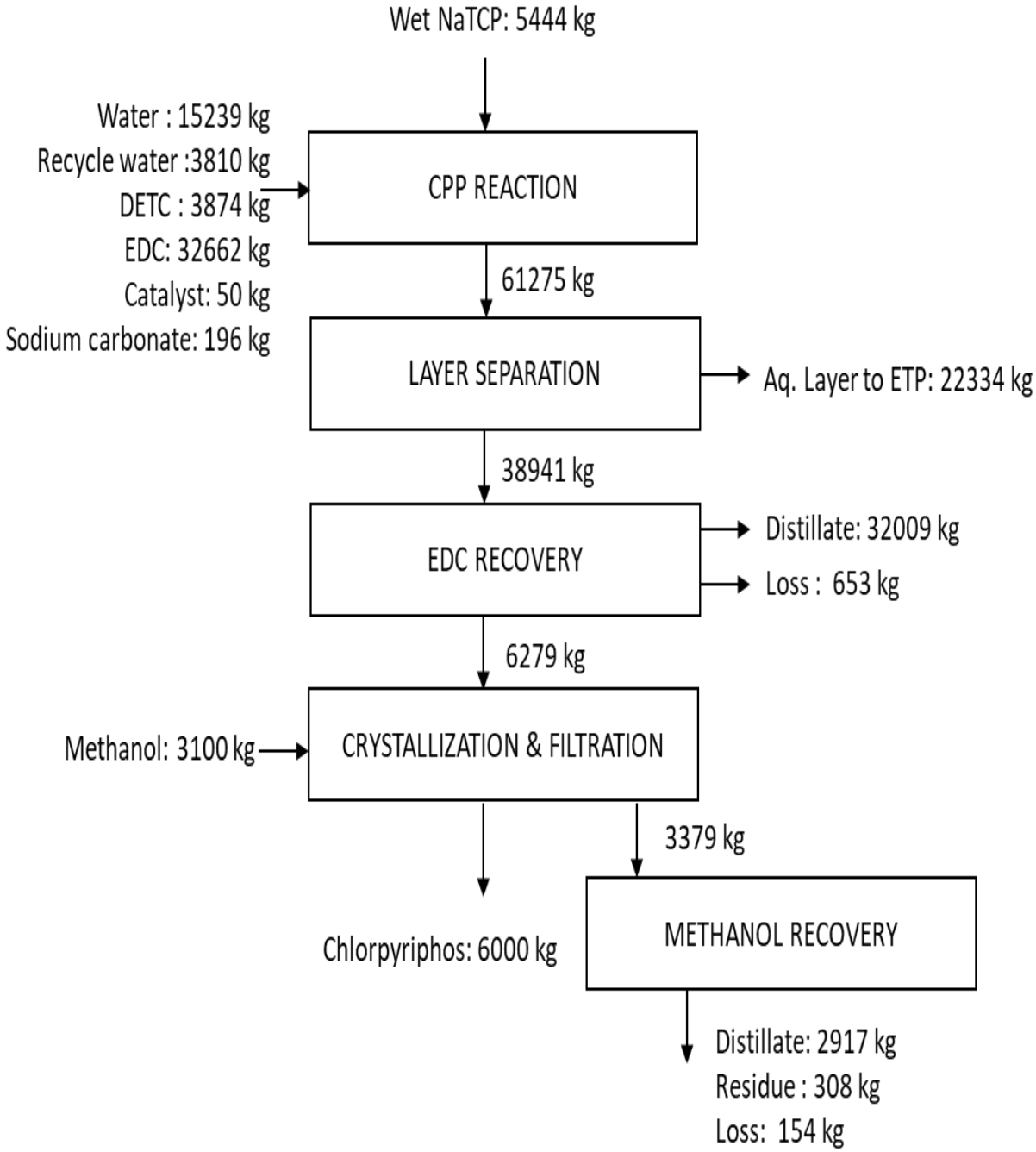
PROCESS FLOW DIAGRAM– CHLORPYRIPHOS

CAPACITY-6000 kg/day

Step 1:- NaHTCP Formation



Step 2:- Chlorpyriphos Formation

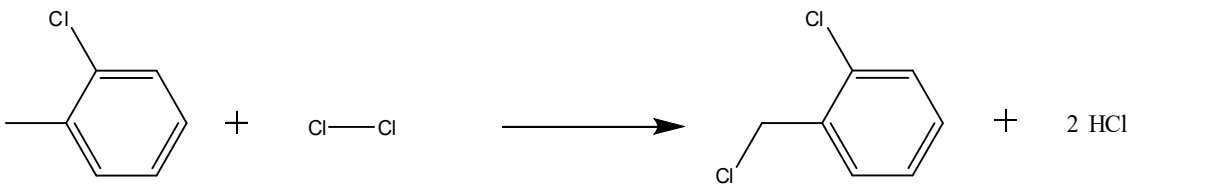


Process Description of Azoxystrobin

Azoxystrobin was first marketed in 1998 and is a systemic, broad-spectrum fungicide with activity against the four major groups of plant pathogenic fungi including Ascomcetes (eg powdery mildews), Basidiomycetes (eg rusts), Deutoromycetes (eg rice blast) and Oomycetes(eg: downy mildew). It inhibits spore germination and mycelial growth. It has worldwide uses on cereals, vines, rice, citrus, potatoes and tomatoes.

The manufacture of Azoxystrobin involves the following steps:

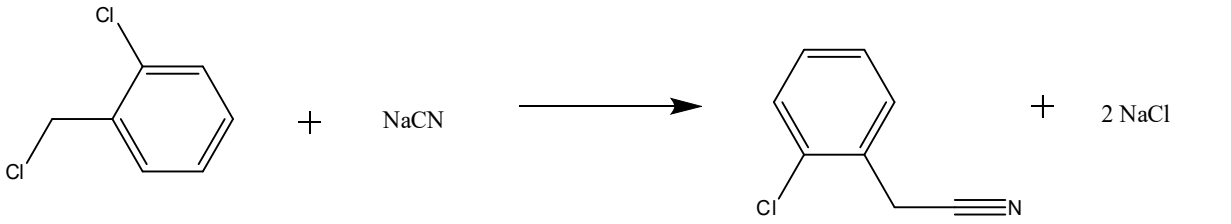
Step: Formation of 2-chlorobenzyl chloride:



2-Chlorotoluene M.wt:126.5 | Chlorine M.wt:71 | 2-Chlorobenzyl chloride M.wt:161 | Hydrogen chloride M.wt:36.5

Step: Formation of 2-chlorobenzyl cyanide:

To neat 2-chlorotoluene in reactor, chlorine gas is bubbled resulting in formation of 2-chlorobenzyl chloride. HCl generated during reaction is scrubbed in HCl scrubber. At the end of reaction, the reaction mass is washed with water and organic layer is taken to next step



2-Chlorobenzyl chloride M.wt:161 | Sodium cyanide M.wt:49 | 2-chlorobenzyl cyanide M.wt:151.5 | Sodium chloride M.wt:58.5

To the organic layer from previous step, water and sodium cyanide are added resulting in formation of 2-chlorobenzyl cyanide. At the end of reaction, the aqueous layer is separated and organic layer is washed with water and taken to next reaction. The aqueous layer containing sodium cyanide effluent is treated separately.

Following is the process description of treatment of sodium cyanide:

1. Scrubber will be installed for the treatment system with hypochlorite solution.

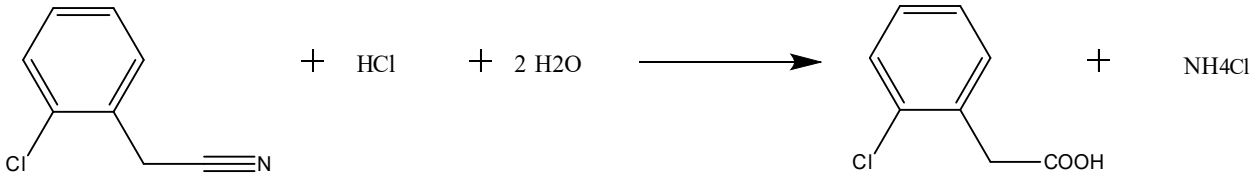
2. Caustic solution (12-14%) will be prepared in dosing reactor with cooling arrangement.

3. Sodium hypochlorite is charged is caustic solution as per requirement.

4. The hypochlorite solution is added to reactor containing.

5. The effluent is stirred at room temperature and sample is monitored for cyanide content. After cyanide level <1 ppm the effluent is transferred to ETP.

Step: Formation of 2-chloro-phenyl acetic acid:

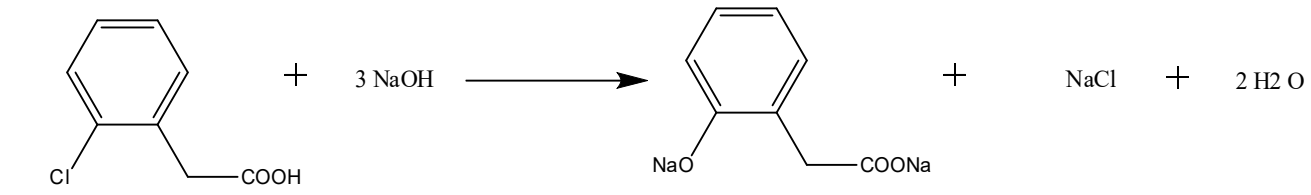


2-chlorobenzyl cyanide M.wt:151.5 | Hydrogen chloride M.wt:36.5 | Water M.wt:18 | 2-(2-chlorophenyl)acetic acid M.wt:170.5 | Ammonium Chloride M.wt:53.5

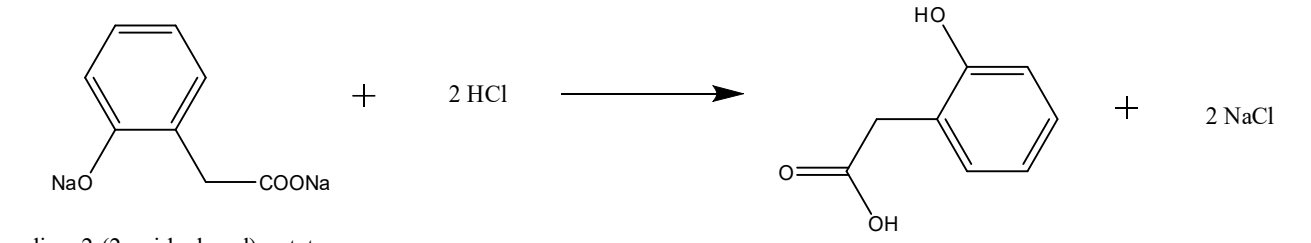
To the organic layer from previous step, aqueous hydrochloric acid is added and the reaction is allowed to complete. At the end of reaction, 2-chlorophenyl acetic acid precipitated is separated by filtration and taken to next step.

Step: Formation of 2-hydroxy phenyl acetic acid:

2-chlorophenylacetic acid is reacted with sodium hydroxide solution to give 2-hydroxyphenylacetic acid disodium salt in presence of catalyst. After the reaction, the mass is cooled and pH of the reaction mass is adjusted to 7.0 in another vessel and filtered to recover catalyst. The recovered catalyst is reused. The filtrate pH is adjusted to 2.5 in for converting disodium salt to 2-hydroxy phenyl acetic acid which is recovered by filtration.



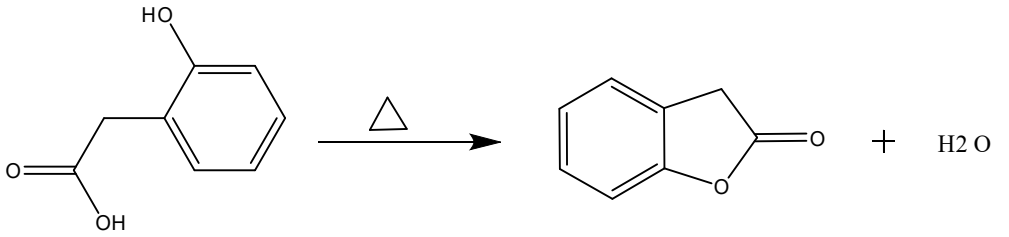
2-(2-chlorophenyl)acetic acid M.wt:170.5 | Sodium hydroxide M.wt:40 | sodium 2-(2-oxidophenyl)acetate M.wt:196 | Sodium chloride M.wt:58.5 | Water M.wt:18



sodium 2-(2-oxidophenyl)acetate M.wt:196 | Hydrogen chloride M.wt:36.5 | 2-Hydroxy phenyl aceticacid M.wt:152 | Sodium chloride M.wt:58.5

Step: Formation of benzofuran-2(3H)-one:

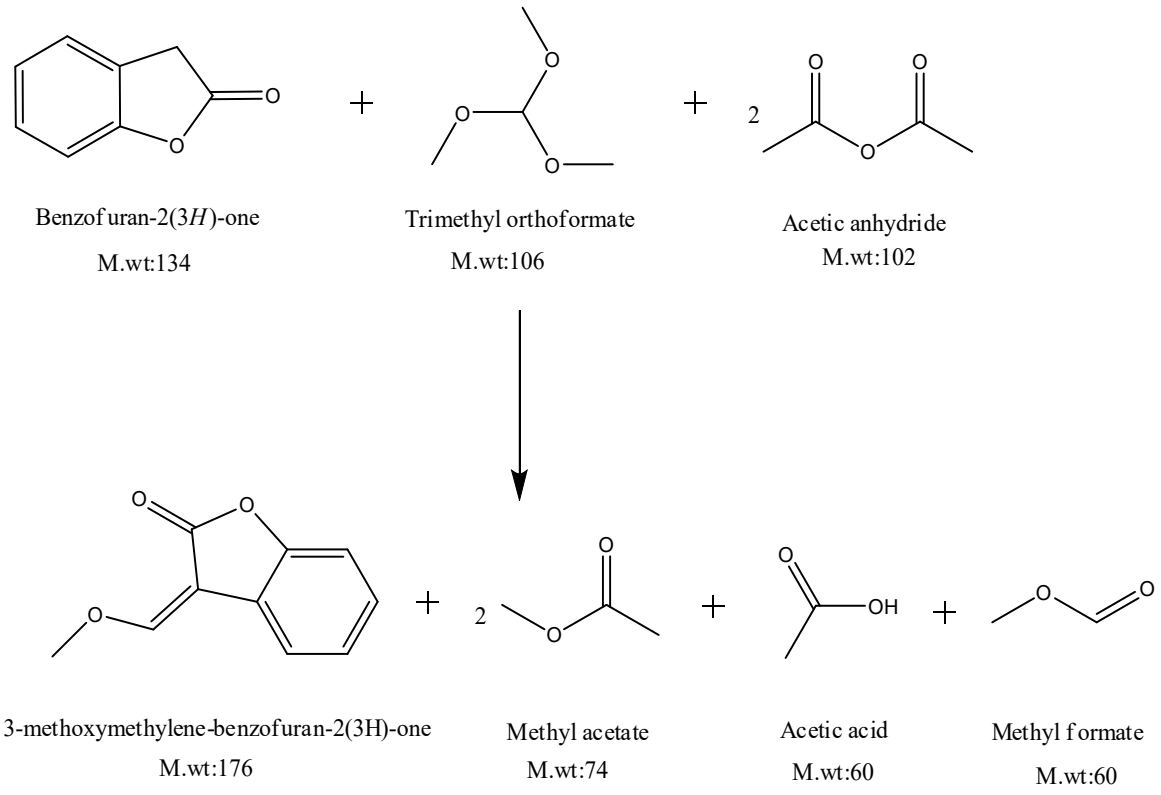
Wet 2-hydroxyphenyl acetic acid obtained from previous step is dehydrated in toluene resulting in the formation of benzofuran-2(3H)-one. At the end of reaction, toluene is removed and taken to next reaction.



2-Hydroxy phenyl aceticacid M.wt:152 | Benzofuran-2(3*H*)-one M.wt:134 | Water M.wt:18

Step: Formation of 3-methoxymethylene-benzofuran-2(3H)-one:

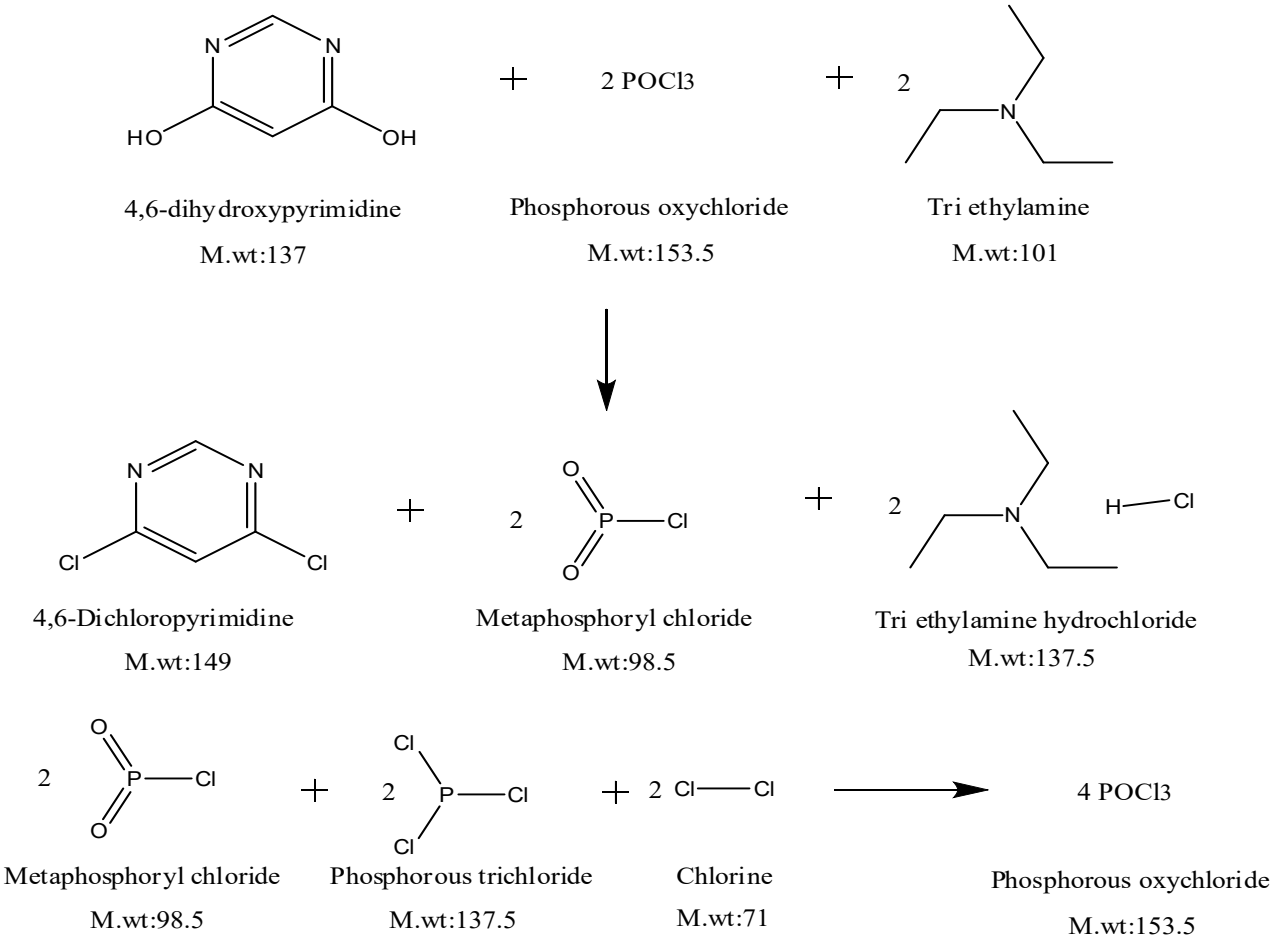
2(3H)-Benzofuranone is reacted with trimethylorthoformate in presence of acetic anhydride. After the end of the reaction, the methyl acetate and methyl formate which are formed as byproduct are removed under atmospheric pressure. Acetic is remove under vacuum. The product is taken to next step.



Preparation of Dichloropyrimidine:

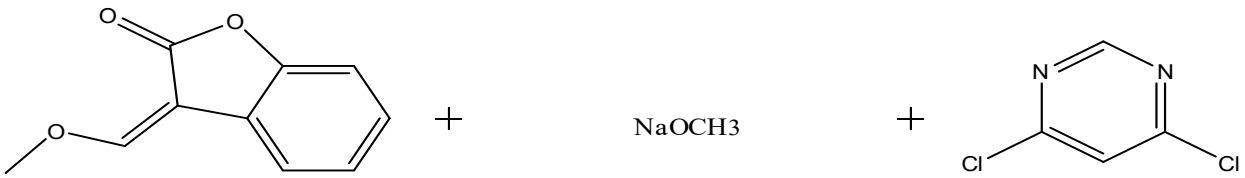
Step: Formation of 4,6-dichloropyrimidine

4,6-dihydroxypyrimidine is reacted with neat phosphorous oxychloride in presence of triethyl amine. At the end of reaction, PCl3 is added and chlorine gas is bubbled. POCl3 is distilled off under vacuum. The crude is dissolved intoluene and water. The toluene layer containing the product is part concentrated and taken to next step. The aqueous layer treated with caustic lye to recover triethyl amine.



Step: Preparation of (E) methyl 2-[2-(6-chloropyrimidin-4-yloxy) phenyl]-3-methoxypropenoate:

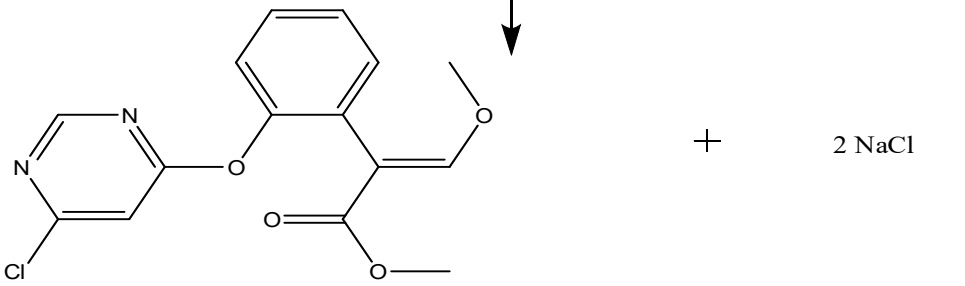
The product from previous step is dissolved in toluene to which sodium methoxide and toluene solution of 4, 6-dichloropyrimidine are added. At the end of reaction, reaction mass is washed with water and the organic layer is taken to next reaction



3-methoxymethylene-benzofuran-2(3H)-one
M.wt:176

Sodium methoxide
M.wt:54

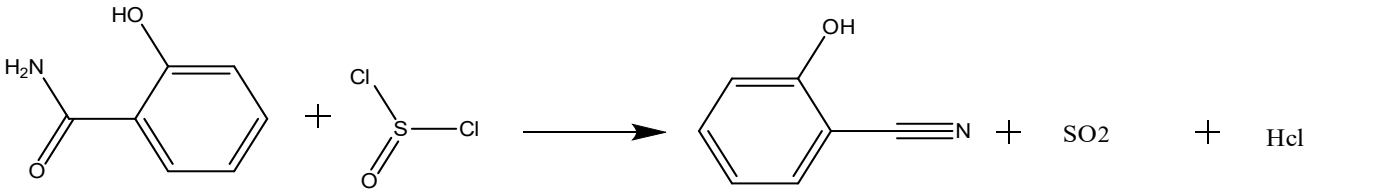
4,6-Dichloropyrimidine
M.wt:149



(E) methyl 2-[2-(6-chloropyrimidin-4-yloxy) phenyl]-3-methoxypropenoate
M.wt:320.5

Sodium chloride
M.wt:58.5

Step: Formation of 2-cyanophenol:



Salicylamide
M.wt:137

Thionyl chloride
M.wt:119

2-Cyanophenol
M.wt:119

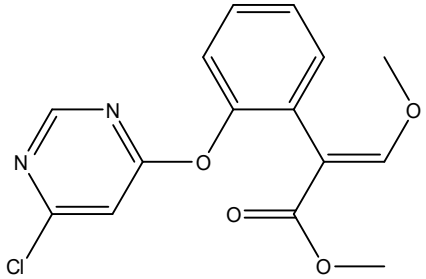
Sulphurdioxide
M.wt:64

Hydrogen chloride
M.wt:36.5

To a suspension of salicylamide in toluene, thionyl chloride is added. The Sulphur dioxide and HCl formed during reaction is scrubbed two stage scrubber. At the end of reaction, toluene is recovered by distillation and the residue is dissolved in dimethyl formamide and taken to next reaction.

Step: Preparation of Azoxystrobin:

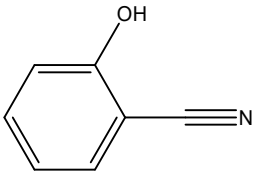
To the toluene solution of orthocyanophenol, potassium hydroxide pellets are added and reacted resulting in formation of sodium salt of orthocyanophenol which is then added to toluene solution of (E) methyl 2-[2-(6-chloropyrimidin-4-yloxy)phenyl]-3-methoxypropenoate resulting in formation of Azoxystrobin. At the end of reaction, reaction mass is filtered to remove inorganics, washed with water and solvent is recovered under vacuum by distillation. The product is recrystallized from methanol and dried.



(E) methyl 2-[2-(6-chloropyrimidin-4-yloxy) phenyl]-3-methoxypropenoate

M.wt:320.5

+ KOH +

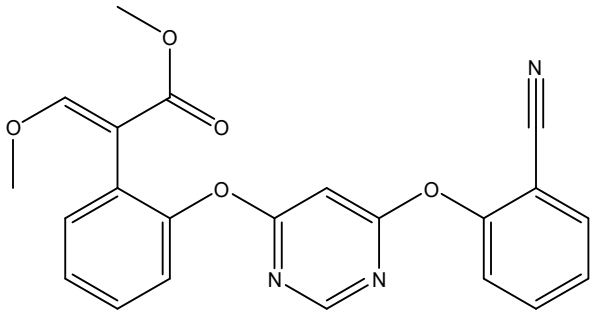


Potassium hydroxide

M.wt:56

2-Cyanophenol

M.wt:119



Azoxystrobin

M.wt:403

+ KCl +

Potassium chloride

M.wt:74.5

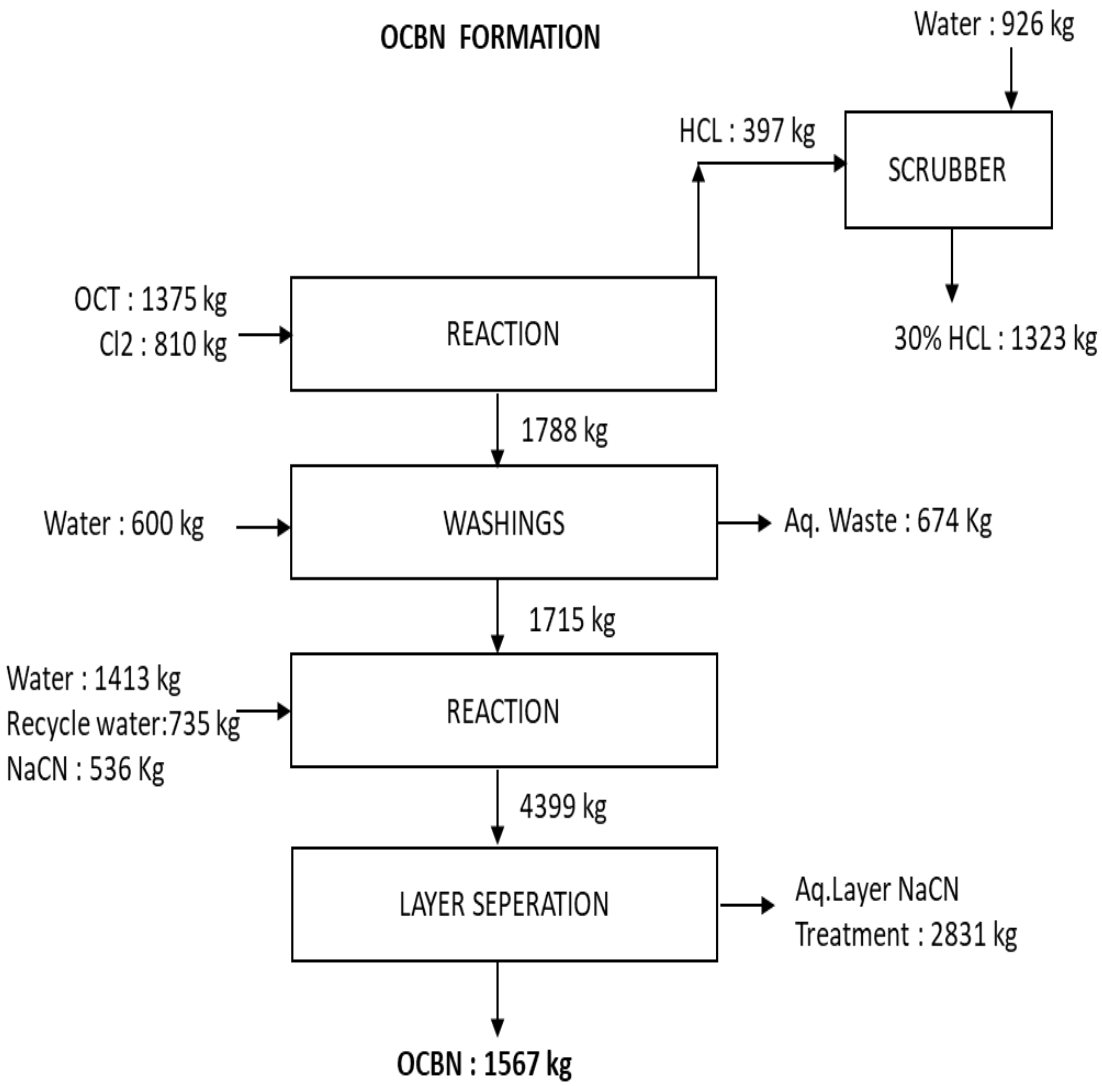
H_2O

Water

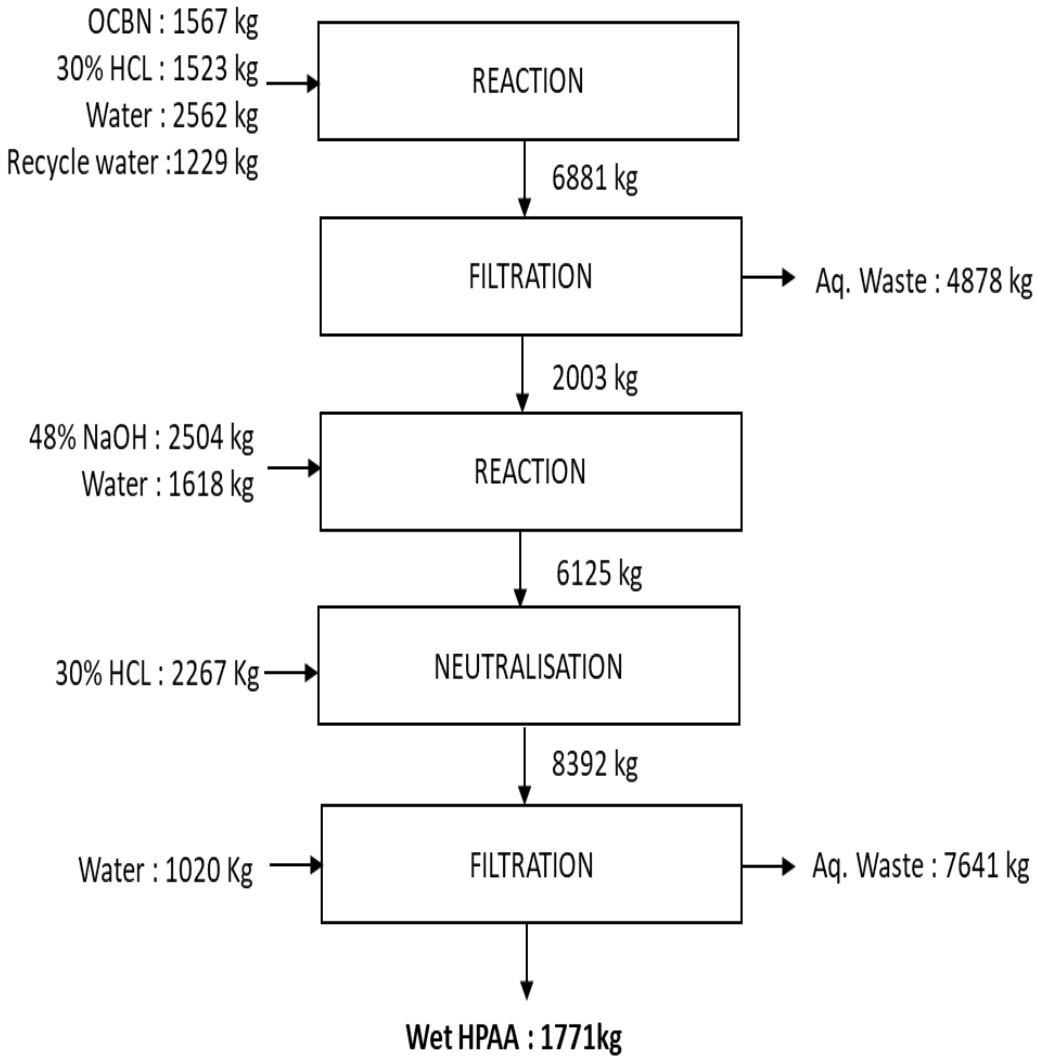
M.wt:18

PROCESS FLOW DIAGRAM – AZOXYSTROBIN

CAPACITY-2250 kg/day

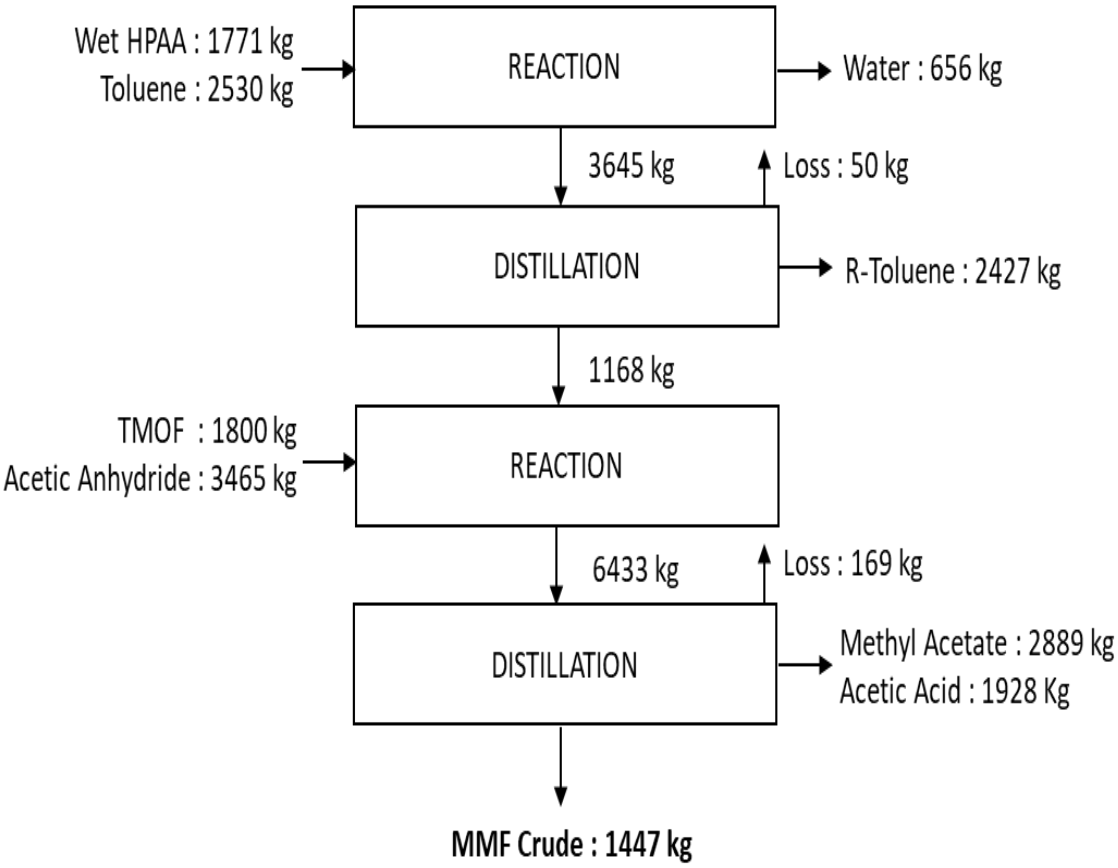


HPAA FORMATION



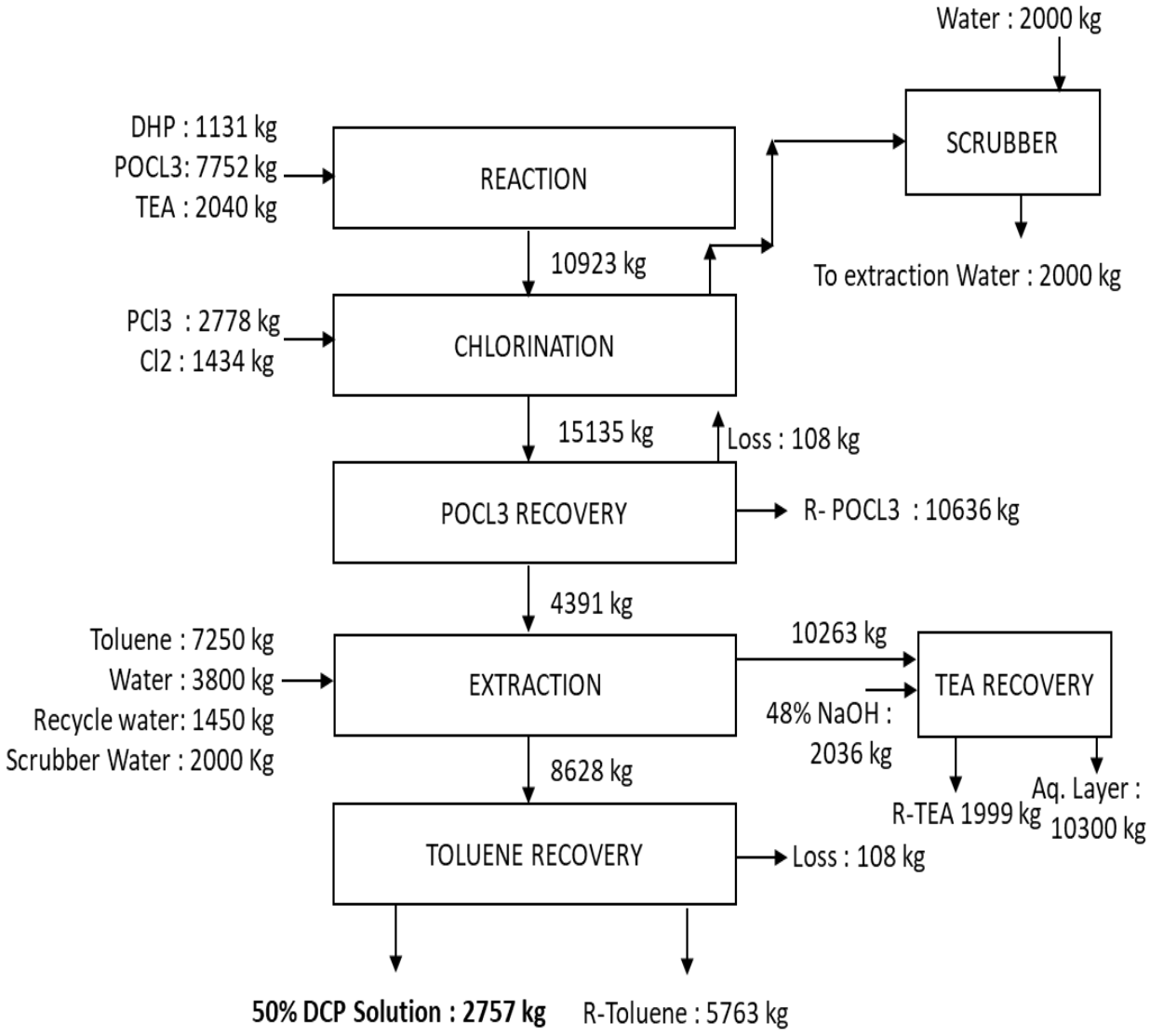
INPUTS : 14290 kg	Wet HPAA : 1771 kg	OUTPUTS : 12519 kg

3-(Methoxymethylene)-2(3H)-Benzofuranone(MMF) FORMATION



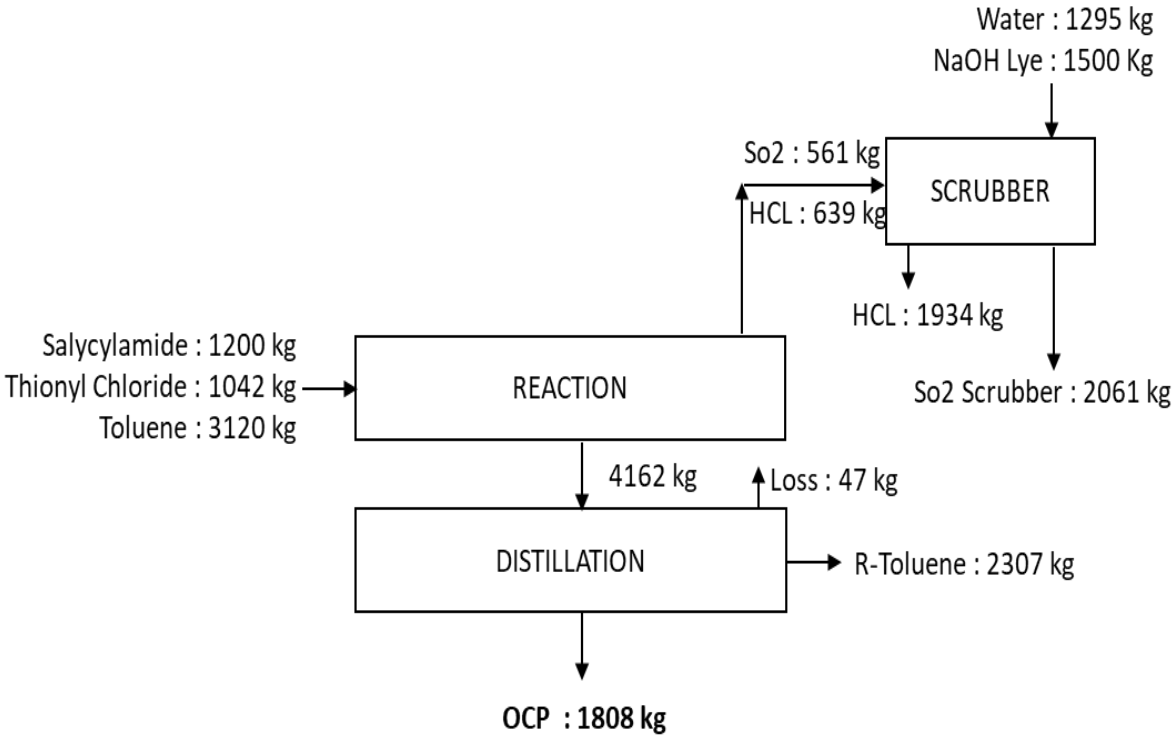
INPUTS : 9566 kg	MMF Crude : 1447 kg	OUTPUTS : 8119 kg

DCP FORMATION



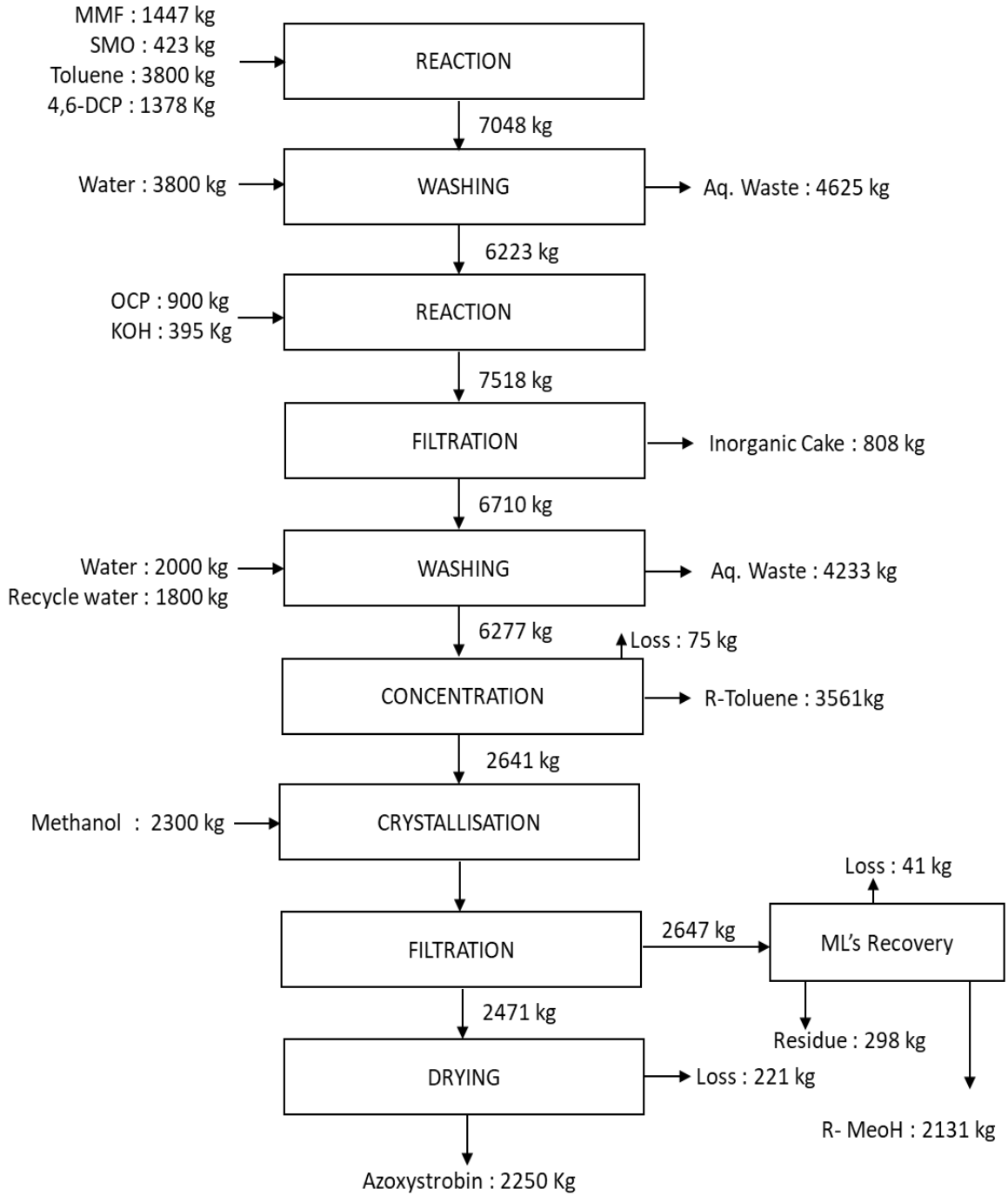
INPUT : 31671 kg	50% DCP Solution : 2757 kg	OUTPUT: 28914 kg

OCP FORMATION



INPUT : 8157 kg	OCP Solution : 1808 kg	OUTPUT : 6349 kg

Preparation of (E) Methyl 2-(2-(6-Chloropyrimidin-4-yloxy)Phenyl)-3-Methoxypropenoate (BIN-4)



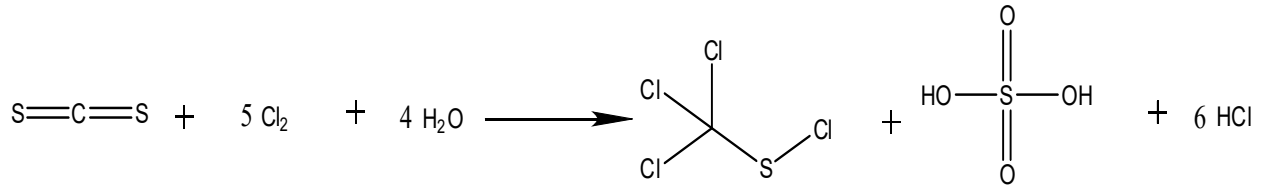
INPUT : 18243 kg	Azoxystrobin : 2250 kg	OUTPUT : 15993 kg

Schematic Diagram of Azoxystrobin

Process Description of Fipronil:

Fipronil is the active ingredient of the pesticide belonging to the insecticide category. It belongs to the chemical class of “phenylpyrazole”. Fipronil is a broad spectrum insecticide used in the control of multiple species of thrips on a broad range of crops by foliar, soil or seed treatment. It acts by disrupting the insect central nervous system by blocking the passage of chloride ions through the GABA receptor and glutamate receptor (GluCl), components of the central nervous system. This causes hyper excitation of contaminated insects' nerves and muscles. Insect specificity of fipronil may come from a better efficacy on GABA receptor but also on the fact that GluCl does not exist in mammals. Insects resistant or tolerant to pyrethroids, organophosphorous and/or carbamates are susceptible to Fipronil. Fipronil was discovered by Rhone-Poulenc (now Bayer Crop Sciences) in 1987 and marketed in the year 1993. Agriculture uses were acquired by BASF AG in 2003.

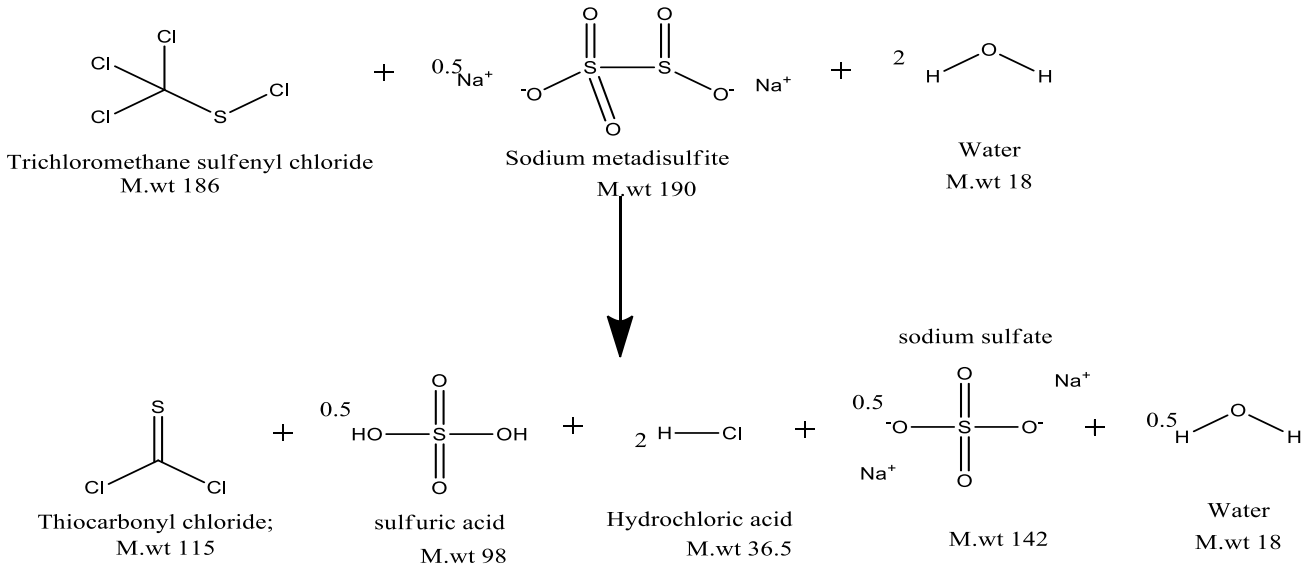
Step-1: Formation of Trichloromethanesulfenyl chloride:



Carbondisulfide	Chlorine	Water	Trichloromethane sulfenyl chloride	sulfuric acid	Hydrochloric acid
M.wt 76	M.wt 71	M.wt 18	M.wt 186	M.wt 98	M.wt 36.5

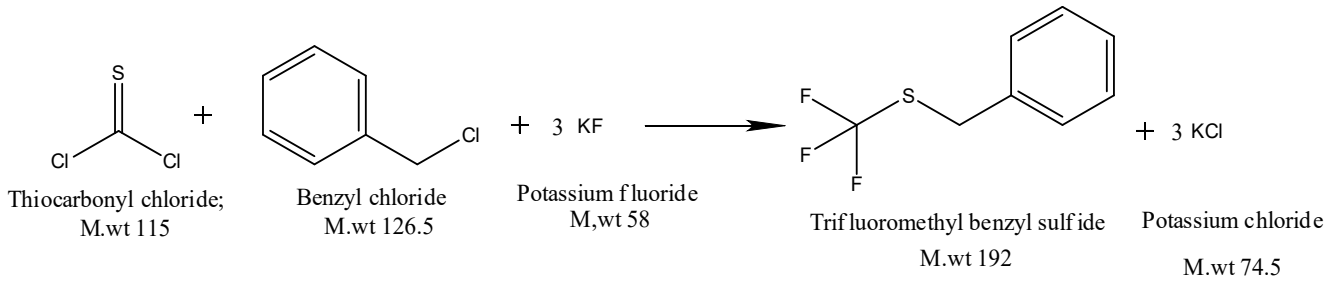
To a solution of 50% carbondisulfide, chlorine is passed resulting in the formation of trichloromethanesulfenylchloride.HCl and sulfuric acid formed during the reaction. At the end of reaction, organic layer is separated and taken to next reaction without further purification.

Step-2: Formation of Thiocarbonyl chloride:



Trichloromethanesulfenyl chloride reacted with sodium metadisulfate and water at 20°c resulting in formation of thiocarbonyl chloride. The reaction mixture is extracted with dichloromethane and taken to next reaction.

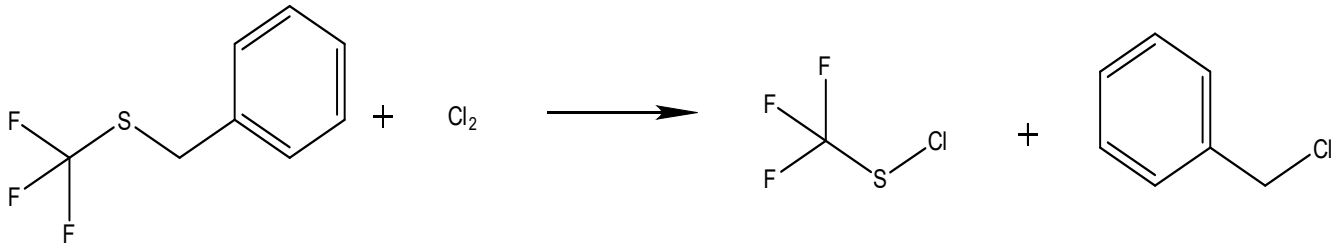
Step-3: Formation of Trifluoromethyl benzyl sulfide:



Thiocarbonyl chloride; M.wt 115 | Benzyl chloride M.wt 126.5 | Potassium fluoride M,wt 58 | Trifluoromethyl benzyl sulfide M.wt 192 | Potassium chloride M.wt 74.5

A slurry of finely powdered potassium fluoride is prepared in Acetonitrile to which Thiocarbonyl chloride and benzyl chloride is added resulting in the formation of trifluoromethylbenzyl sulfide which is separated by distillation and taken to next step.Reaction mass is filtered to separate inorganics and Acetonitrile is recovered by distillation.

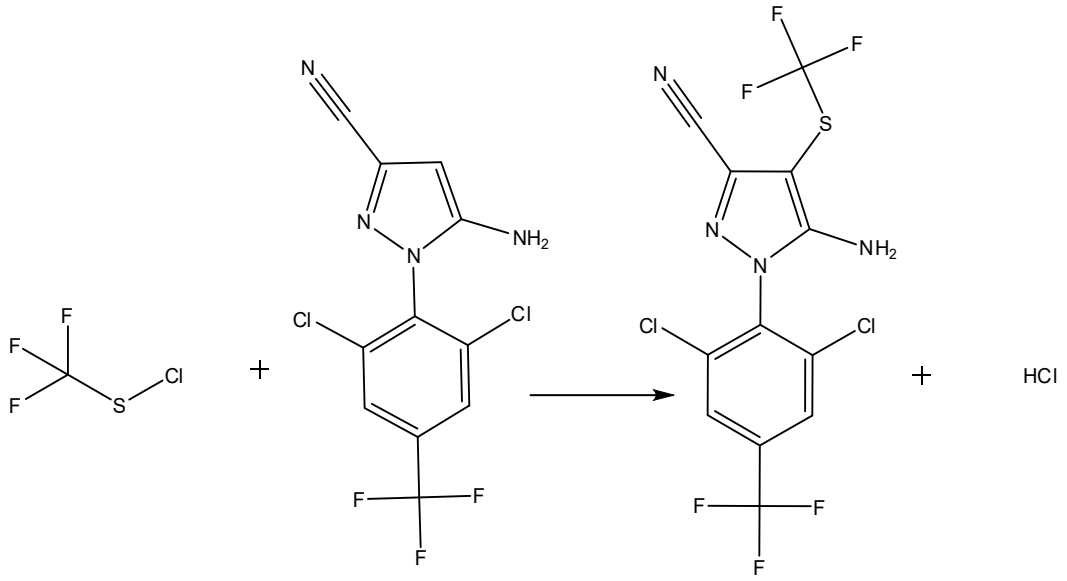
Step-4: Formation of Trifluoromethylsulphenyl chloride:



Trifluoromethyl benzyl sulfide M.wt 192 | Chlorine M.wt 71 | Trifluoromethylsulphenyl chloride M.wt 136.5 | Benzyl chloride M.wt 126.5

To a solution of dichlormethane&Trifluoromethyl benzyl sulfide, chlorine is passed resulting in the formation of Trifluoromethylsulphenyl chloride and benzyl chloride. Trifluoromethylsulphenyl chloride is separated by distillation and taken to next step. Benzyl chloride is distilled & recycled.

Step-5:Formation of thiopyrazole:



Trifluoromethylsulphenyl chloride
M.wt:136.5

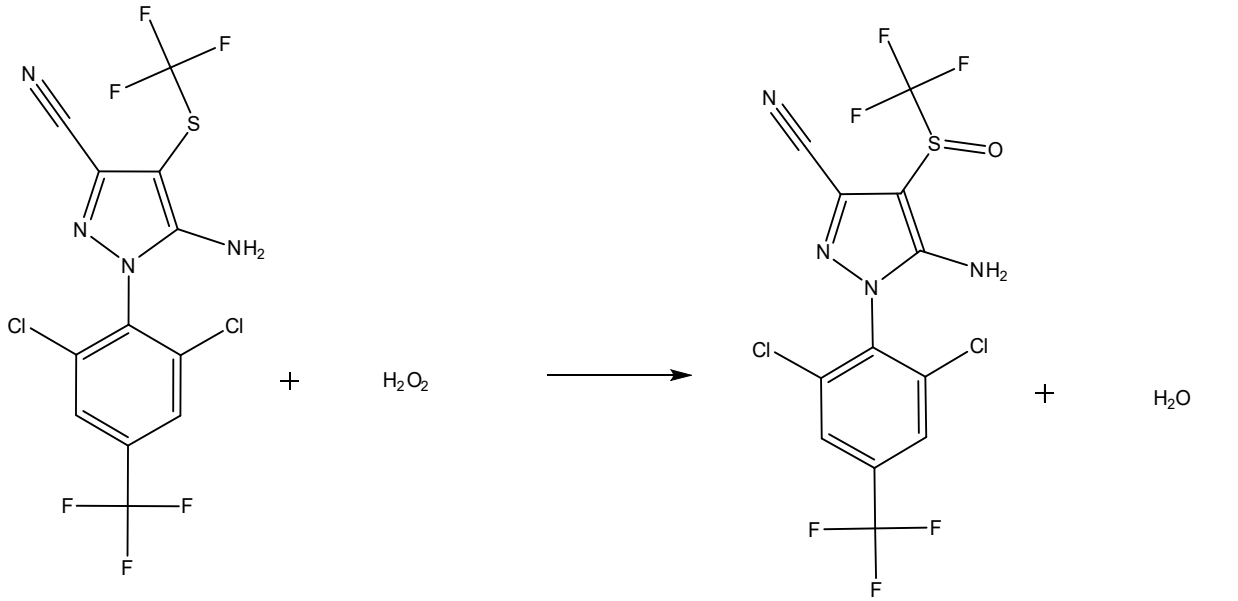
Pyrazole
M.wt:321

Thiopyrazole
M.wt:421

Hydrogen chloride
M.wt:36.5

To a reaction mixture of 5-amino-1-(2,6-dichloro-4-(trifluoromethyl)phenyl)-1H-pyrazole-3-carbonitrile (pyrazole) is MDC, trifluoromethylsulfphenyl chloride is added resulting in the formation of 5-amino-1-(2,6-dichloro-4-(trifluoromethyl)phenyl)-(4-trifluoromethylthio)-1H-pyrazole-3-carbonitrile (thiopyrazole). At the end of reaction, the reaction mixture is washed with dilute caustic solution and taken to next step without further purification.

Step-6: Formation of Fipronil:



Thiopyrazole
M.wt:421

Hydrogen peroxide
M.wt:34

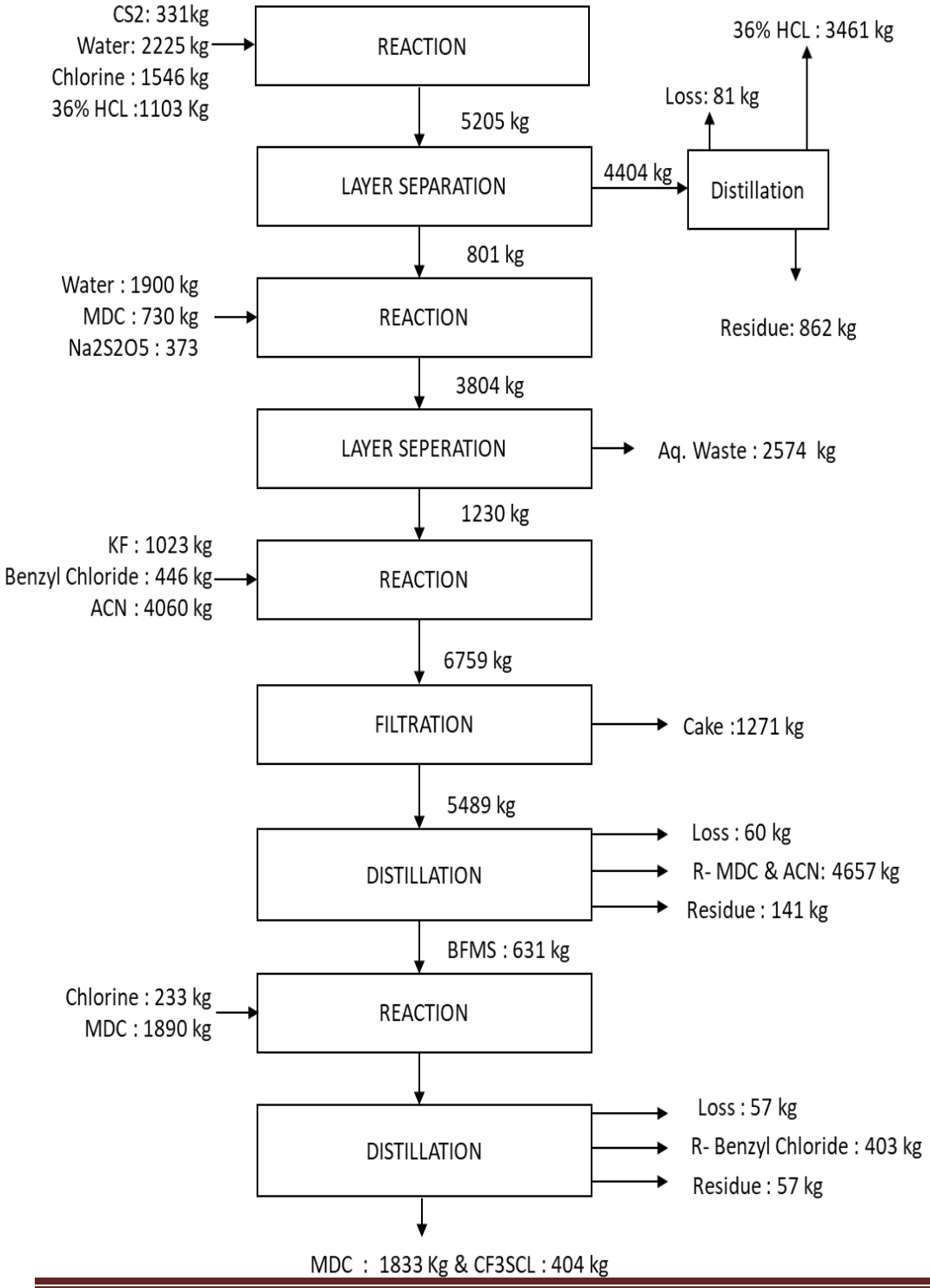
Fipronil
M.wt:34

Water
M.wt:18

To thiopyrazole from previous step, chlorobenzene&trifluoroacetic acid are used as solvent and controlled addition of hydrogen peroxide is done to obtain Fipronil. At the end of reaction, the chlorobenzene&trifluoroaceticacid layer is separated by distillation and organic layer is cooled to 0°c and filtered. The product is recrystallized from methanol and dried.

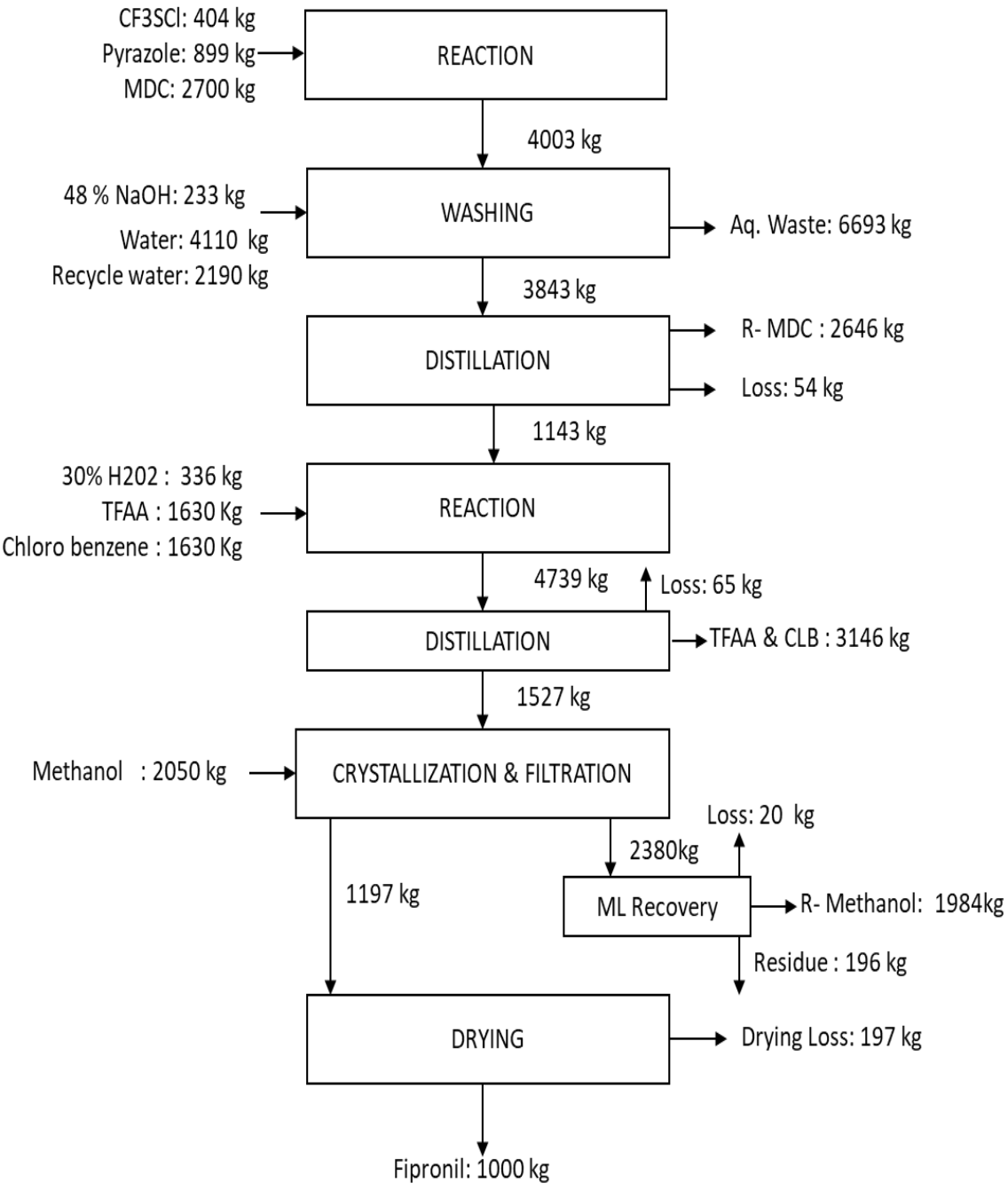
PROCESS FLOW DIAGRAM - FIPRONIL

CAPACITY : 1000 kg/day



PROCESS FLOW DIAGRAM - FIPRONIL

CAPACITY : 1000 kg/day



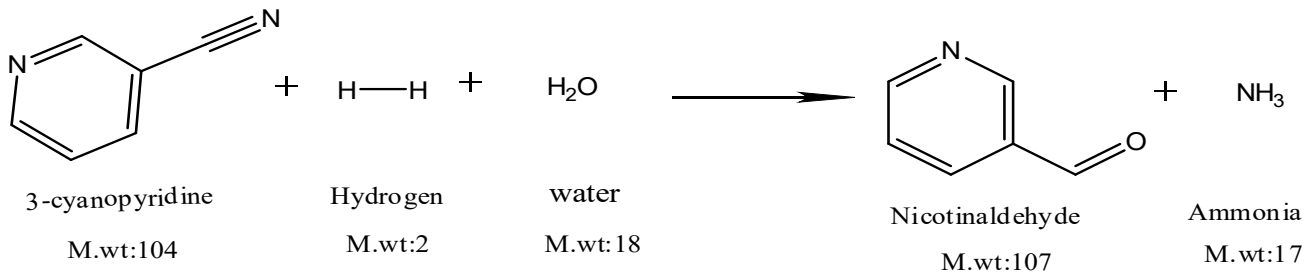
INPUTS :31638 kg PRODUCT: 1000 kg OUTPUT: 30638 kg

PYMETROZINE:

The manufacturing process of Pymetrozine involves the following reaction steps:

Step 1: Formation of Nicotinaldehyde:

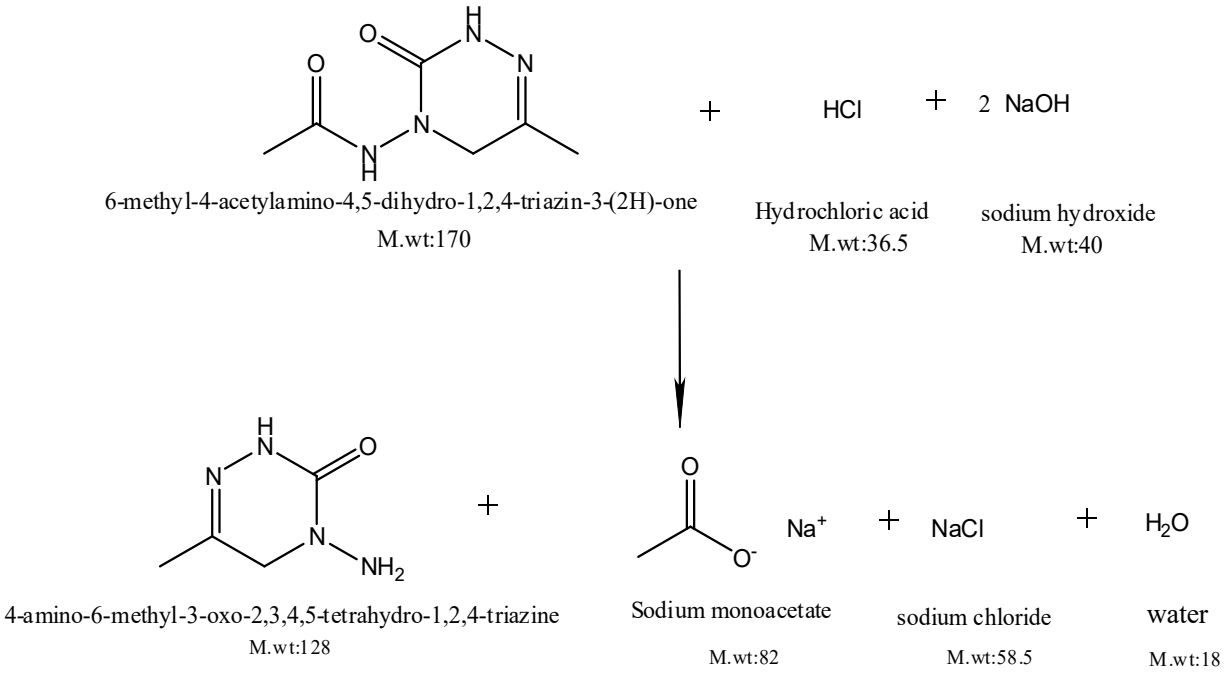
To a mixture of 3-cyanopyridine, water and methanol in autoclave, Raney nickel catalyst in water is added and the mixture is hydrogenated at constant hydrogen pressure at room temperature. When the required quantity of hydrogen is absorbed, the reaction mixture is quenched with nitrogen. The catalyst is filtered off under nitrogen atmosphere and rinsed with water. The product nicotinaldehyde is obtained as a solution in water which is taken to the next step without further purification.



3-cyanopyridine M.wt:104 + Hydrogen M.wt:2 + water M.wt:18 → Nicotinaldehyde M.wt:107 + Ammonia M.wt:17

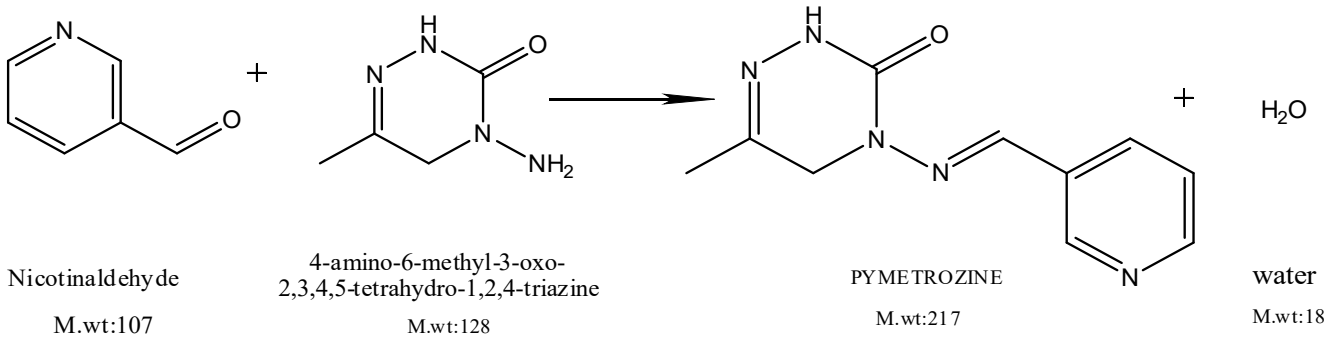
Step 2: Formation of 4-amino-6-methyl-3-oxo-2,3,4,5-tetrahydro-1,2,4-triazine:

A suspension of 6-methyl-4-acetylamino-4,5-dihydro-1,2,4-triazin-3(2H)-one in methanol is heated to 45 °C. To this suspension is added 36% aqueous HCL solution over a period of time. After completion of the reaction, the pH of the solution is adjusted to 5 by of 48% caustic lye and taken to the next step without further purification.



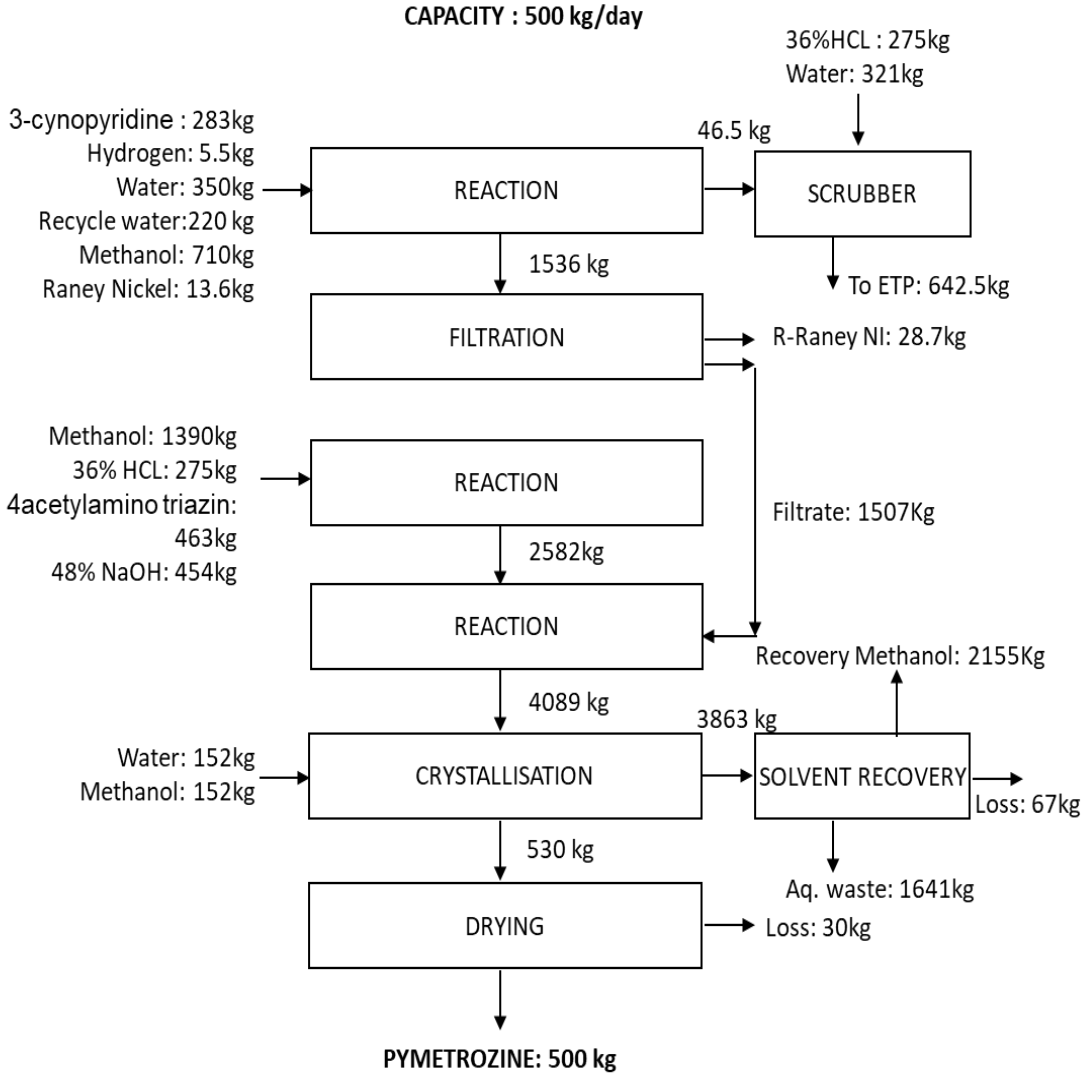
Step 3: Formation of Pymetrozine technical:

The reaction mixture from the previous step is heated to reflux followed by addition of aqueous aolution of nicotinaldehyde from step 1 over a period of time. After the completion of reaction, the reaction mixture is cooled to 5°C, filtered and washed with water. The wet cake is suspended in chilled methanol and filtered. The product is dried at 100°C to obtain Pymetrozine technical 98% min.



PROCESS FLOW DIAGRAM - PYMETROZINE

CAPACITY : 500 kg/day



7. POLLUTION CONTROL IN THE PLANT

The industry has given top priority to pollution prevention and control. There are Alkali wet scrubbers, cyclone separator and Wet scrubber followed by tall chimneys to arrest the air pollution. Coal fired boiler emissions are effectively controlled by using a bag filter in the FBC boiler. Pollution control equipment's are operated efficiently to minimize the pollution and bring down to the standards prescribed by the APPCB. Solid wastes generated as coal Ash from coal-fired boiler is Disposed to brick manufacturers. Effluents are sent to stripper to remove COD, followed by Multiple Effect Evaporators (MEE) and ATFD distillates from the MEE & ATFD are sent to effluent treatment plant Followed by RO. The RO Permeate are sent to cooling tower make up within the plant premises. The RO Rejects are sent to MEE. The MEE Concentrate sent to ATFD. ATFD Condensate sent to Effluent treatment plant followed by RO. The ATFD salts sent to Coastal Waste Management Project- II, TSDF, and SPSR Nellore Dist. All the parameters of the treated effluents are within the limits prescribed by APPCB. Extensive green belt is developed to minimize the impacts on environment and make it eco-friendly.

7.1AmbientAirQuality

The ambient air quality monitoring is carried out at three locations in the factory premises to know the status of the ambient air quality. Monitoring is carried out at the following places.

a) Near ETP

b) Near Security Room

c) Near Generator Room

Ambient air quality is monitored for 24hours at each station for the estimation of PM_{10}, $PM_{2.5}$,sulphur dioxide oxides of nitrogen and HCl concentrations. The analyzed values for the parameters monitored are represented in theTable7.1.The-analyzed values for PM_{10}, PM2.5, SO2, NOX and HCl

concentrations are within the limits prescribed by APPCB for industrial and mixed use.

7.2 Stack emissions

The industry is having 6 stacks; a stack attached to12TPH coal fired fluidized bed boiler(12TPH Oil fired boiler Stand by),a stack attached to 8TPH coal fired fluidized bed boiler(5 TPH Coal fired boiler stand by),and 4stacks for D.G.Sets. The emissions from the stack attached to the coal fired fluidized bed boiler, are monitored for the parameters like PM. The results are presented inTable7.2.The data presented in Table7.2 shows that the monitored values for all parameters are meeting the APPCB Standards.

Table7.1: AVERAGE VALUES OF AMBIENTAIR QUALITY DATA

S No.	Parameters	Near ETP	Near Security Room	Near Generator Room
1	PM_{10} Concentration (µg/m^3)	52.00	60.00	36.00
2	$PM_{2.5}$Concentration (µg/m^3)	26.00	32.00	18.775
3	Sulphur Dioxide Concentration (µg/m^3)	16.00	21.00	7.00
4	Oxides of Nitrogen Concentration(µg/m^3)	23.00	4.00	13.00
5	HCl Concentration(µg/m^3)	< 0.01	< 0.01	< 0.01
6	AcrylonitrileConcentration(µg/m^3)	< 0.01	< 0.01	< 0.01

Note: BDL–Below Detectable Limits.

Table7.2: AVERAGE VALUES OF STACK EMISSIONS DATA

Sl. No.	Parameters	Stack attached to Coal fired fluidized boiler
1.	Particulate matter Concentration	40.00

Note : All values are expressed in mg/Nm^3.

7.3. Water Pollution Control

Effluents are sent to Stripper for removal of COD then sent Multiple Effect Evaporators (MEE) for removal of TDS and distillates from the MEE are sent to effluent treatment plant. The MEE concentrate sent to ATFD. The ATFD Condensate sent to effluent treatment plant, the ATFD salts sent to TSDF. The treated effluents are sent to cooling tower makeup within the plant premises. All the parameters of the treated Effluent treatment within the limits. The plant flow diagram and MEE flow diagrams are shown inFig.3&4 respectively.

7.4. Solid Waste Management

Ash from the coal fired boiler is sold to brick manufactures. The Inorganic Solid Waste from ATFD, activated carbon and ETP sludge are sent to secured landfill facilities available with Coastal Waste Management Project- II, TSDF, and SPSR NelloreDist. The organic residues are sending to the authorized Cement plants for Co- Processing/AFRF.

8. HOUSEKEEPING

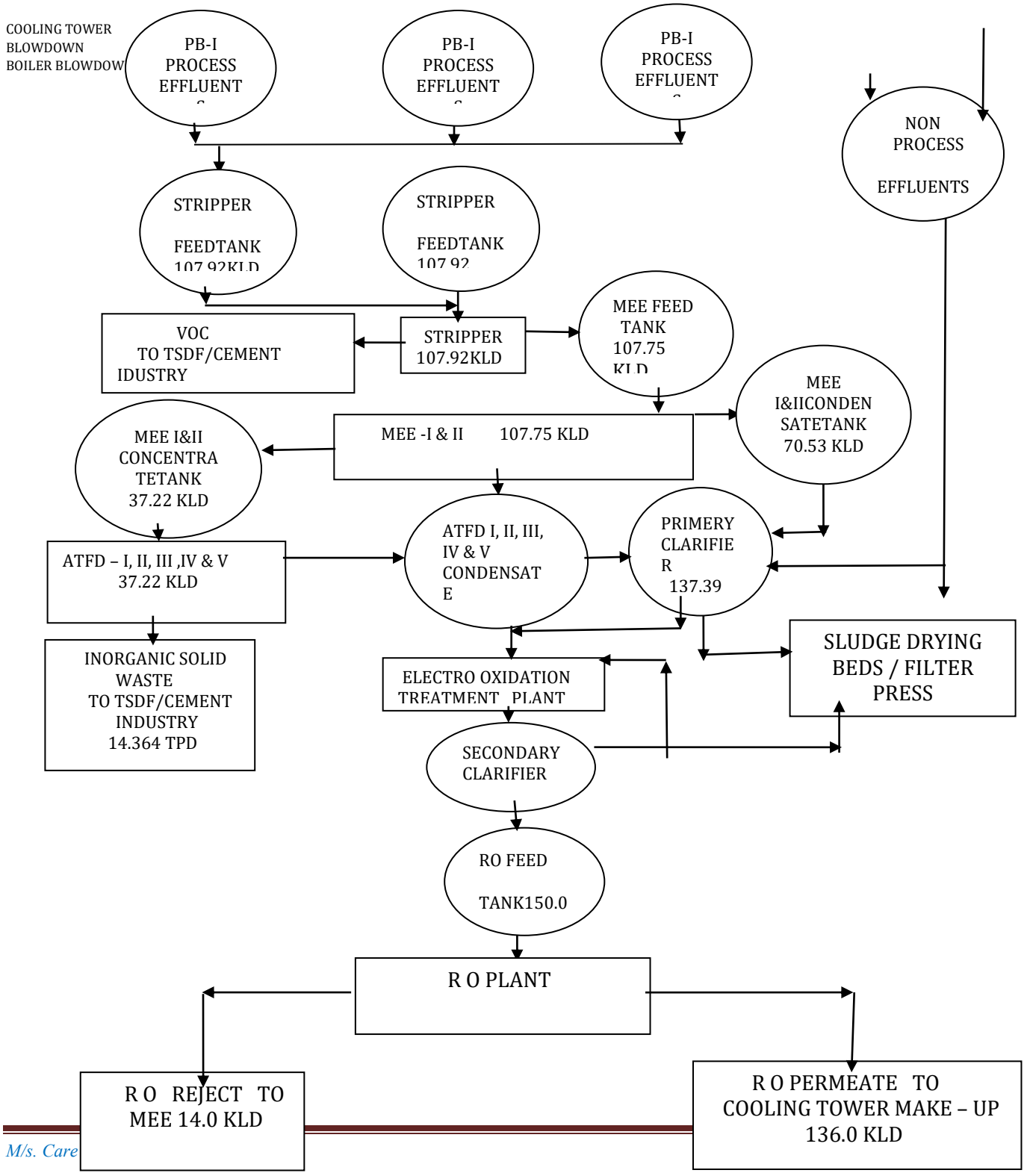
Proper cleaning of the different sections is required to maintain healthy atmosphere and a good quality product. Stores are to be maintained properly. Factory premises are to be clean and green to have good housekeeping. M/s. Bhagiradha Chemicals & Industries Limited is keeping their plant and premises neat and tidy. Housekeeping has been found to be satisfactory.

9. PROCESS DESCRIPTION OF EFFLUENT TREATMENT PLANT

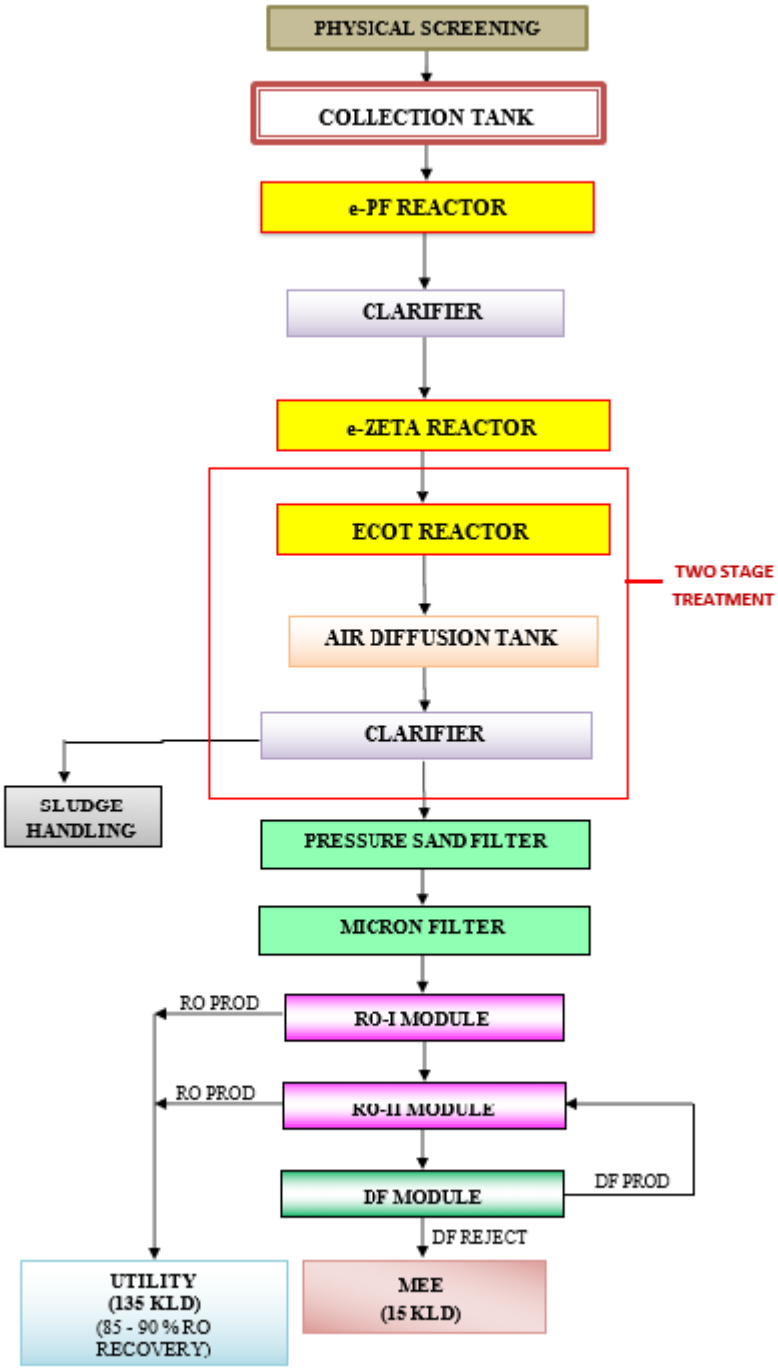
The main sources of effluent generation from plant are from process, blow downs from boiler and cooling tower and domestic effluents, The effluents generated in the process are both Organic and inorganic in nature. For efficient treatment the effluents are segregated based on COD and TDS content. Effluents with high COD are sending to stripper. After stripping the stripped liquid (VOC) sent to TSDF / authorized cement plants for co-incineration. Effluents with high TDS are treated in MEE. The MEE condensate is collected and further treated in effluent treatment plant followed by RO. The concentrate from MEE is further treated in ATFD. The condensate form ATFD sent to Effluent treatment plant followed by RO. The dried mass from ATFD packed in Jumbo HDPE bags and sent to TSDF, CWMP-II, SPSR Nellore Dist, for safe disposal in to secured land fill. The LTDS effluents comprise of steam condensate from ejectors, aqueous layers from layer separators and spent lye from caustic scrubbers and they are treated in a stripper for the removal of organics followed by evaporation in MEE. The condensate is sent to effluent treatment plant which is based on Electro Oxidation Treatment principle. The treated effluents are used as makeup water in cooling towers. Blow downs from utilities are sent to effluent treatment plant. The Domestic effluents are sent to Sewage Treatment Plant followed by RO. The total treated waste water in ETP are sent to RO, the RO product is used for cooling towers makeup and the reject water from the RO is further treated in MEE. The effluent treatment Scheme is shown in Fig.

BHAGIRADHA CHEMICALS AND INDUSTRIES LIMITED

EFFLUENT TREATMENT PLANT –ZERO LIQUID DISCHARGE (ZLD)



Treatment Schematics



e-PF Reactor: e-PF reactor initiates co-precipitation resulting in transformation of micro-colloids into larger denser settleable flocs getting separated and the treated outlet will be clear and transparent.

e-Zeta Reactor: Electro generated Zeta potential induces electromeric depolarization and the anodic reaction generates Metal-Oxy-Hydroxy (Fe-O-OH) that works as a pre-booster for Ferrate synthesis in ECOT reactor

ECOT reactor: ECOT reactor generates "Ferrate Ions, $(FeO4)^{2-}$" and set on oxidative destruction of COD/TOC and other related organic pollutants present in the wastewater through uptake of Dissolved Oxygen from diffused air

RO & DF Filtration: Reverse osmosis (RO) and Dia filtration membranes reduces total dissolved solids (TDS) and trace metals at the desired level.

ELECTRO-OXIDATION PLANT

Collection Tank Capacity: 100 KL

Intermediate Tanks Capacity: 15 KL

e-PF Reactor

Clarifiers

E-Zeta Reactor

Aeration Tank -01