Manufacturing & Effluent Treatment Process

Adroit Pharmaceuticals Pvt.Ltd
Amadi(V), Nagpur(D).
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# BULK DRUG - PARACETAMOL

## MANUFACTURING PROCESS

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STAGE-1. ACETYLYATION

STEP-1 REACTION

1. In the Reactor, ML(Mother Liquor)/ Water of required quantity is taken from Storage Tank,
2. Para amino Phenol powder (Batch Qty) is charged into the Reactor directly through Pneumatic conveying system from Dispensing Room in R.M Approved Store.
3. Then heating is applied to heat the mass up to 40 °C.
4. Acetic Anhydride (Predetermined Qty) is taken in Receiver from Storage Tank.
5. Acetic Anhydride charging is started at slow rate by monitoring temperature.
6. Apply Steam to the Jacket, the reaction will take place
7. After the reaction stop Steam heating and apply Cooling from Cooling Unit.
8. The total mass is allowed to cool upto 40 °C.
9. After cooling the Product, stop Cooling and apply Chilling from Chilling Unit till 15 °C.
10. Paracetamol will get crystallize. The by-product Acetic Acid is formed.

STEP-2 FILTRATION

1. The slurry is transferred to ANF by applying Air Pressure.
2. The slurry is filtered in ANF(Agitated Nutsch Filter) by applying Air Pressure.
3. The Liquid – ML (Dil.Acetic Acid) is transferred to Storage Tank in Distillation Plant for Distillation.
4. After filtration the cake is washed with D.M.Water.
5. Wash ML is collected separately in Storage Tank-20 KL in Distillation Plant.After Washing the cake is transferred into another Reactor for Purification.
STAGE-2. PURIFICATION

STEP-1 CARBON TREATMENT

1. In the Reactor, ML (Mother Liquor)/ Water of required quantity is taken from Storage Tank,

2. Technical Grade Para is charged from ANF into the Reactor directly through hopper.
3. Activated Carbon is charged into the reactor directly from the Carbon Room in slurry form through pipeline.
4. Apply Steam to heat the mass slowly till it dissolves completely.
5. Maintain the temperature the temperature for 30 min.

STEP-2 FILTRATION

1. Filter the mass to Crystallizer through on-line Filter. Filtration is done by applying Air Pressure.

STEP-3 CRYSTALIZATION

1. In Crystallizer, the Reaction mass is allowed to cool slowly upto 40 °C.
2. After cooling the Product, stop Cooling.
3. Paracetamol will get crystallize out in Pure form.

STEP-4 FILTRATION

1. The slurry is transferred to ANF by applying Air Pressure.
2. The slurry is filtered in ANF (Agitated Nutsch Filter) by applying Air Pressure.
3. The Liquid – ML is transferred to Storage Tank for Recycle.
4. After filtration the cake is washed with D.M. Water.
5. Wash Water is collected separately in Storage Tank- for recycle.
6. After Washing the cake is transferred into hopper for Drying and Pulverizing in Spin Flash Drier.

**STAGE-3. DRYING AND PULVERIZING**

**SFD – SPIN FLASH DRIER – 150 Kgs/Hr**

1. Drying & Pulverizing is done in SFD (Spin Flash Drier)
2. In this Process the Pure Paracetamol Crystals (Wet crystals) are fed into the hopper directly from ANF.
3. Heating source is Steam. Steam is applied at the inlet Point of Steam Heater in SFD.
4. Air Supply is given at the inlet Point of SFD for Bag Filter.
5. The Wet crystals are dried and pulverized simultaneously into dry Powder.
6. The powder is collected in Blender directly for blending.

**STAGE-4 BLENDING & PACKING**

**BLENDING**

1. The dried powder is collected in Blender from SFD.
2. The collected Powder is Blended and sample is collected and Tested in Quality control Dept. as per specification.
3. After QC approval, the batch is taken for packing.

**PACKING**

1. After blending, the Final Batch Quantity Is Packed in Bags in Primary Packing Section.
2. Composite sample is collected from each bag and sent to QC for analysis.
PARACETAMOL PROCESS FLOW CHART

Storage Tank
Acetic Anhydride

Para amino Phenol
Steam

Para Crystal + Recovery Para
Para +Acid ML

DM Water

Filter

Steam
Carbon
ML

Reactors
STAGE-1
STAGE-2

Cooling &
Chilling

Crystallizer

Spent Carbon
To CHWTSDF
To ETP

Storage Tank

DM Water

FILTER

ML & Wash ML

To Recycle

Storage Tank

PARACETAMOL CRYSTALS

Drier

Steam

Blender & Packing
PARACETAMOL
PARACETAMOL EFFLUENT TREATMENT PROCESS

DISTILLATION

1. The ML from Storage Tank is transferred to a Reactor for distillation.
2. In this Reactor, steam is injected into the Jacket as heating source to heat the ML to 120 deg C.
3. At this temperature Acetic acid along with water evaporates and Condensed in the Condenser attached to this Reactor.
4. Acetic Acid Distilled is in dilute form (30 to 35 %), which is collected in Storage Tanks for Sale.
5. The distill, which contains Paracetamol is transferred to another reactor for cooling in Crystalliser.
6. The cooled mass is filtered in Filter.
7. The solid product is sent for purification in Recovery Plant.
8. The liquid influent is stored in storage tank for Treatment.

PURIFICATION

STEP-1: CARBON TREATMENT

1. In the Reactor, ML(Mother Liquor) of required quantity is taken from Storage Tank,
2. Crude Para is charged into the Reactor.
3. Activated Carbon is charged into the reactor directly from the Carbon Room in slurry form through pipeline.
4. Apply Steam to heat the mass slowly till it dissolves completely.
5. Maintain the temperature the temperature for 30 min.
6. Filter the mass to Crystallizer through on-line Filter. Filtration is done by applying Air Pressure.
7. In Crystallizer, the Reaction mass is allowed to cool slowly upto 40 ºC.
8. After cooling the Product, stop Cooling.
9. Paracetamol will get crystallize out.
STEP-2: FILTRATION

1. The slurry is transferred to ANF by applying Air Pressure.
2. The slurry is filtered in ANF (Agitated Nutsch Filter) by applying Air Pressure.
3. The Liquid – ML is transferred to Storage Tank for Recycle.
4. After filtration the cake is collected sent to STAGE-2 for purification.

EFFLUENT TREATMENT

1. The Liquid influent is taken in an evaporator. If it is acidic, then it is neutralized with Soda ash.
2. The neutral water is evaporated by forced evaporation to atmosphere.
3. The residue if any is collected in bags and disposed to CHWTSDF Butibori.
PARACETEMOL E.T.P FLOW CHART

DISTILLATION & EVAPORATION

Para + Acid ML

Steam

Distillator (Distillation)

Para ML

Cooling

ACETIC ACID (Dil)

Storage Tank Acetic Acid

FOR SALE

Crystalliser (Crystallization)

Filter

Paracetamol-Crude
Purification in Recovery Plant

Influent ML

Storage Tank

Soda ash

Evaporator (Neutralization & Evaporation)

Solid Waste Disposal to CHWTSDF

Liquid Effluent NIL
PARACETEMOL E.T.P FLOW CHART (Contd…)

PURIFICATION

Steam  Carbon  ML

Paracetamol Crude

Cooling & Chilling

Reactor  (Carbon Treatment)

Crystallizer

Solid Waste
Spent Carbon
Disposal to CHWTSDF

DM Water

FILTER

ML & Wash ML

Storage Tank

RECOVERY PARACETAMOL
(Mixed in Stage-2)

To Recycle
**BULK DRUG - METFORMIN HCL**

**MANUFACTURING PROCESS**

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STAGE-1.
SYNTHESIS OF METFORMIN HCL

STEP-1 REACTION
1. In the Reactor, Solvent of required quantity is taken from Storage Tank,
2. Dicyanamide (Batch Qty) is charged into the Reactor directly /through Pneumatic conveying system from Dispensing Room in R.M Approved Store.
3. Then the mass is stirred for 2 Hrs.
4. The total mass is allowed to cool upto 15 °C.
5. Then Dimethylamine Hcl is charged into the mass slowly at constant rate.
6. Continue cooling and maintain the temperature at 15 –20 °C.
7. After completion of addition keep the mass under stirring for 3 Hrs.
8. Start purging of Hcl gas slowly under reflux.
9. Temperature of the reaction mass increases to 120 °C.
10. Reflux the mass till the sample passes GC result.
11. After QC result, start cooling the mass till RT.
12. Then filter the slurry in Filter to separate the solvent.

STEP-2 FILTRATION
1. The slurry is transferred to ANF by applying N2 Pressure.
2. The slurry is filtered in ANF(Agitated Nutsch Filter) by applying N2 Pressure.
3. The Liquid – Solvent is transferred to Storage Tank for Recycle.
4. The solids product, separated is dried in Vacuum Drier.
STAGE-2.  
DRYING  

VACUUM DRIER  

1. Drying is done under low vacuum in Vacuum Drier at 60oC.  
2. In this Process the Pure Wet form of product is fed into the drier.  
3. Heating source is Steam.  
4. The dried powder is collected for Blending & Packing.  

STAGE-3  
BLENDING & PACKING  

BLENDING  

1. The dried powder is collected in Blender from Vacuum Drier.  
2. The collected Powder is Blended and sample is collected and Tested in Quality control Dept. as per specification.  
3. After QC approval, the batch is taken for packing.  

PACKING  

1. After blending, the Final Batch Quantity Is Packed in Bags in Primary Packing Section.  
2. Composite sample is collected from each bag and sent to QC for analysis.
METFORMIN HCL PROCESS FLOW CHART

Day Tank Solvent Toluene

Dicynandiamide Dimethylamine Hcl

Cooling

Hcl → Reactor STAGE-1

Filter

Metformin Hcl

Vacuum Drier for Drying

Spent Solvent

Distillation & RECYCLE

PRODUCT (Powder)
METFORMIN HCL EFFLUENT TREATMENT PROCESS

DISTILLATION & SOLVENT RECOVERY

1. The solvent is transferred to a Reactor for Low Vacuum Distillation.
2. In this Reactor, steam is injected into the Jacket as heating source to heat the solvent to 60-80 deg C.
3. The distilled solvent is collected in Storage Tanks for Recycle.

**METFORMIN HCL - E.T.P FLOW CHART**

```
Spent solvent
       ↓
     Distillator (Distillation)
          ↓
    Recovered solvent
        ↓
    RECYCLE
```
# BULK DRUG - FERROUS ASCORBATE

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STAGE-1.

FERROUS HYDROXIDE PREPARATION

STEP-1 REACTION
1. In the Reactor, Water of required quantity is taken from Storage Tank,
2. Ferrous sulphate powder (Batch Qty) is charged into the Reactor directly
   /through Pneumatic conveying system from Dispensing Room in R.M
   Approved Store.
3. Then the mass is stirred for 1 Hr.
4. Then Sodium Hydroxide solution-48% is charged into the mass slowly at
   constant rate.
5. Apply Cooling from Cooling Unit.
6. The total mass is allowed to cool upto 25 °C.
7. Ferrous Hydroxide will get precipitate out. The by-product Sodium
   sulphate is formed and remained in solution (Effluent).

STEP-2 FILTRATION
1. The slurry is transferred to ANF by applying N2 Pressure.
2. The slurry is filtered in ANF(Agitated Nutsch Filter) by applying N2
   Pressure.
3. The Liquid – ML (Sodium sulphate) is transferred to Storage Tank in
   Distillation Plant for Evaporation.
4. After filtration the cake is washed with D.M.Water.
5. Wash ML is collected separately in Storage Tank-20 KL in Distillation
   Plant for evaporation.
6. After Washing the cake is transferred into another Reactor for Ascorbate
   synthesis.
STAGE-2.

ASCORBATE SYNTHESIS

1. In the Reactor, Water of required quantity is taken from Storage Tank,
2. Ferrous hydroxide is charged from ANF into the Reactor directly through hopper.
3. Ascorbic acid is charged into the reactor from day tank through pipeline at constantly and slowly over a period of 2-3 Hrs.
4. Maintain the temperature 30-35 °C during addition period.
5. Apply Steam and heat the mass up to 60 °C.
6. Maintain the temperature for 3 – 4 Hrs.
7. The resultant solution contains pure Ferrous Ascorbate in soluble form in water.

STAGE-3.

DRYING

SPRAY DRIER

1. Drying is done in Spray Drier.
2. In this Process the Pure Ferrous Ascorbate solution is fed into the drier.
3. Heating source is Steam.
4. The dried powder is collected in Blender for blending.
STAGE-4
BLENDING & PACKING

BLENDING

1. The dried powder is collected in Blender from Spray Drier.
2. The collected Powder is Blended and sample is collected and Tested in Quality control Dept. as per specification.
3. After QC approval, the batch is taken for packing.

PACKING

1. After blending, the final batch quantity is packed in Bags in Primary Packing Section.
2. Composite sample is collected from each bag and sent to QC for analysis.
FERROUS ASCORBATE PROCESS FLOW CHART

Day Tank
Sodium Hydroxide Solution

Ferrous Sulphate
Steam

Reactors
STAGE-1

DM Water

Filter

Ascorbic acid soln.

Ferrous Hydroxide
ML
Wash ML

Storage Tank

RECYLE
(Used for Preparation of Sodium Hydroxide solution.)

Reactor
STAGE-2

Spray Drier for Drying

PRODUCT
(Powder)

To ETP

Sodium Hydroxide Solution

Day Tank

Steam
FERROUS ASCORBATE EFFLUENT TREATMENT PROCESS

WATER EVAPORATION IN OPEN PONDS

Nature of Facility Proposed : Open Evaporation Ponds.
Location of Ponds : Inside the plot area.
Area of Ponds : 20000 Sq.Ft (100 Ft x 100 Ft x 2 Nos)
Capacity : 6000 Kgs / Day Water Evaporation

PROCEDURE.

1. Open ponds are made for the required facility.
2. The ML (Salt Solution) from Storage Tank is transferred to a open ponds for solar evaporation.
3. Water are allowed to evaporate by solar evaporation till the salts are formed.
4. The precipitated salts are collected in bags for sale.
FERROUS ASCORBATE - E.T.P FLOW CHART

Effluent ML

Open Pond (Evaporation)

Segregation

Sodium Sulphate (By-Product)

ML To Evaporation

FOR SALE
## PHARMACEUTICALS –
### GRANULES & TABLETS

### MANUFACTURING PROCESS

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STAGE-1. WET GRANULATION

1. In RMG(Rapid mixer Granulator), Paracetamol is fed and mixed well.
2. Starch paste is prepared separately by heating starch powder with water along with potassium sorbate.
3. This starch paste is added slowly in RMG.
4. The Paracetamol will mix with starch paste and form wet granules.

STAGE-2. MILLING

1. The wet granules, which is in lump form, are milled into fine granules.

STAGE-3 DRYING

1. The fine Wet granules are dried in FBD (Fluid bed drier) to get Dry granules.

STAGE-4 SIFTING

1. The Dried granules are sifted to eliminate lumps and fines to get required size of granules.

STAGE-5 BLENDING

1. The dried granules are charged into Blender for blending.
2. Sample is collected and tested in Quality Control Dept. as per specification.
3. After QC approval, the batch is taken for packing.
STAGE-6 PACKING

1. After blending, the Final Batch Quantity is Packed in Bags in Primary Packing Section.
2. Composite sample is collected from each bag and sent to QC for analysis.
3. After final analysis & approval from QC, the batch is released for sale.

STAGE-7 TABLET PUNCHING

1. The dried granules are punched in Punching machine to get tablets of required size, weight, shape, etc.
2. The tablets are then inspected for any defects.
3. The inspected tablets are then packed as per requirement.
GRANULES FLOW CHART

Paracetamol & Excipients

- Wet Granulation
- Milling
- Drying
- Sifting
- Blending
- Packing of ADROCIN GRANULES

DRY GRANULES

- Tablet Machine
- Tablets
- Inspection & Testing
- Packing