

AIR-COOLED CONDENSER INTRODUCTION

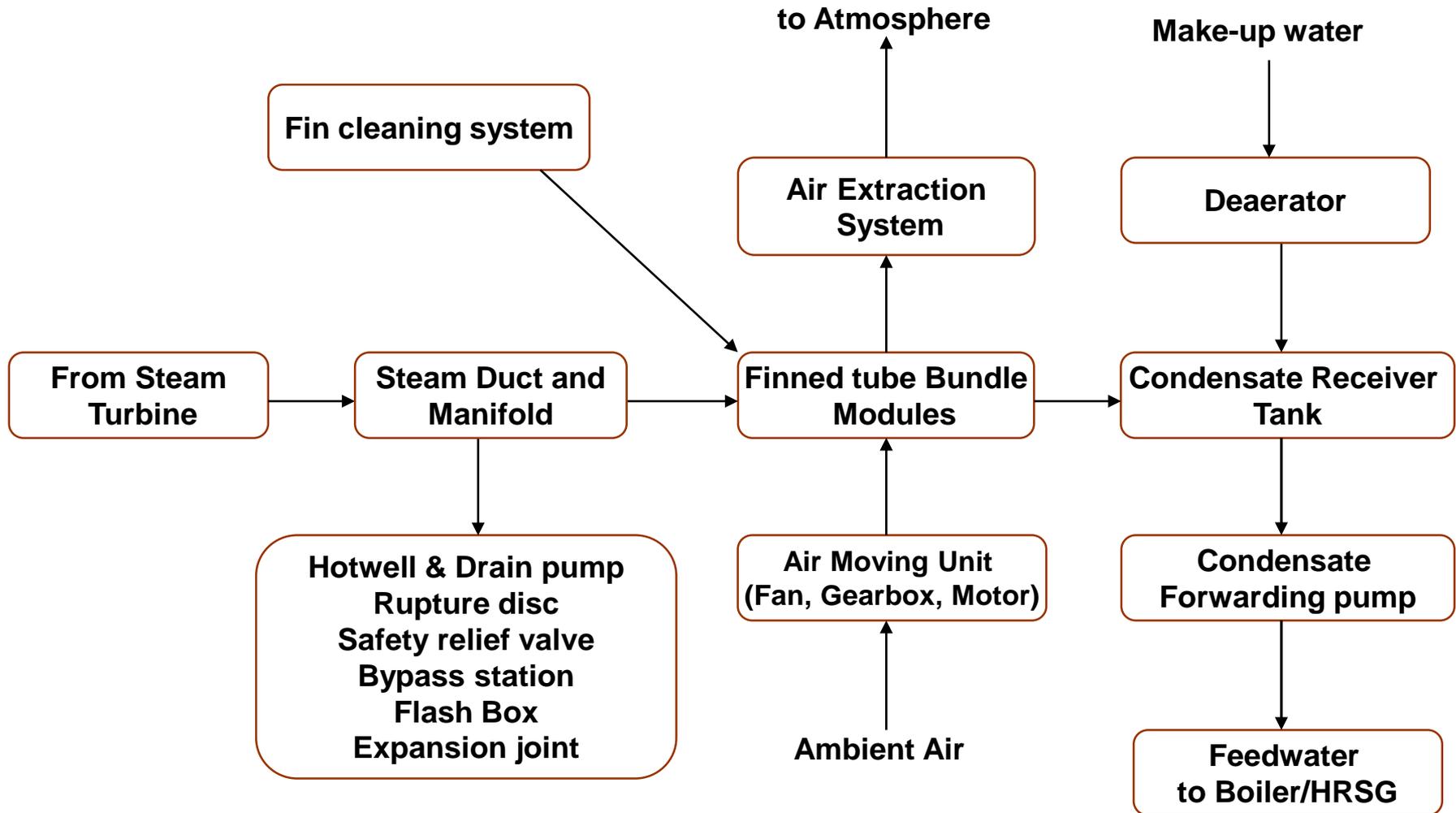


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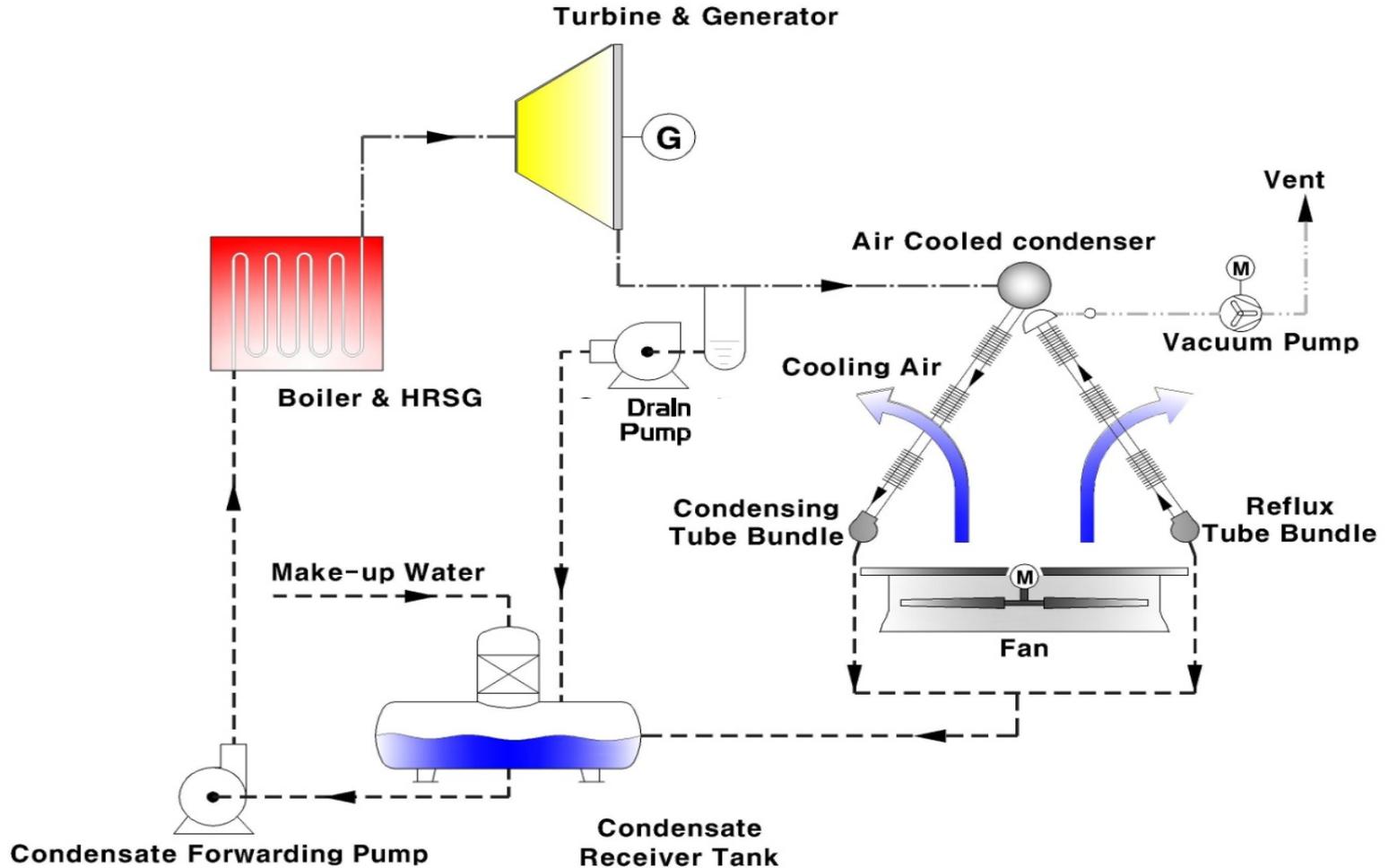
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1. ACC System Configuration

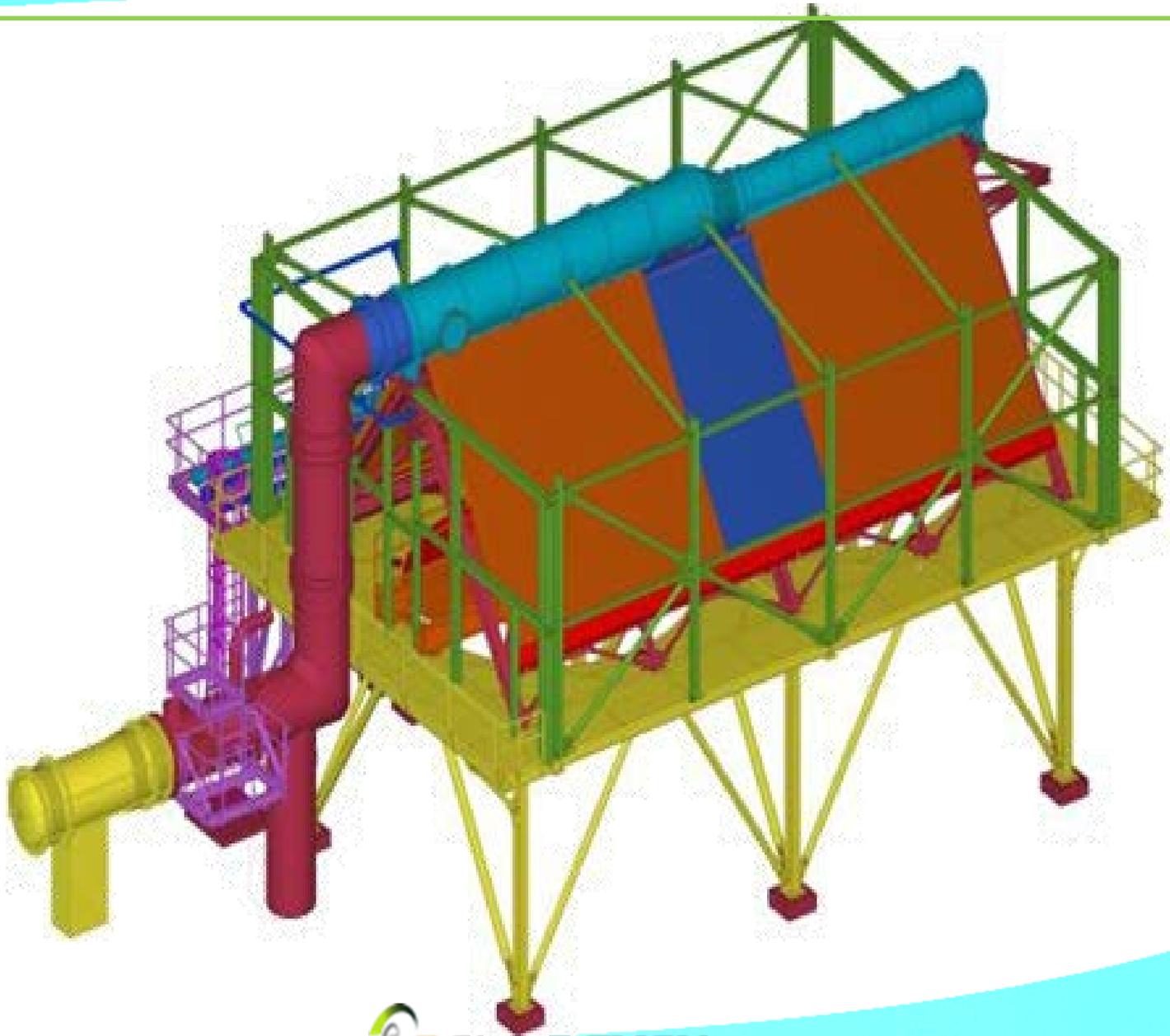


2. ACC Process Diagram

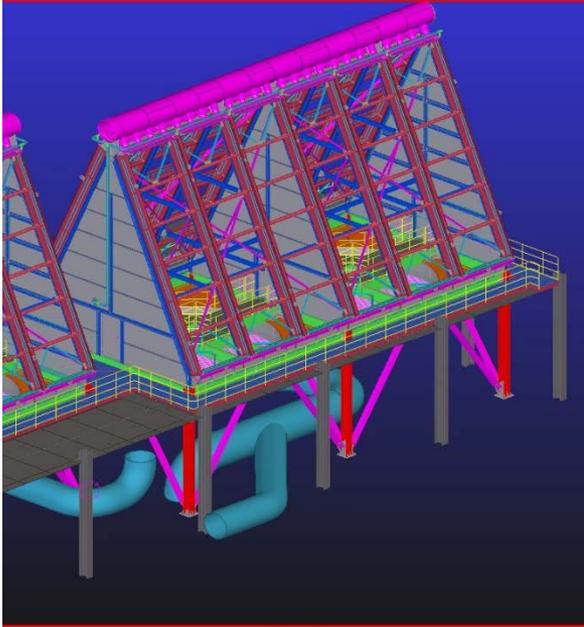
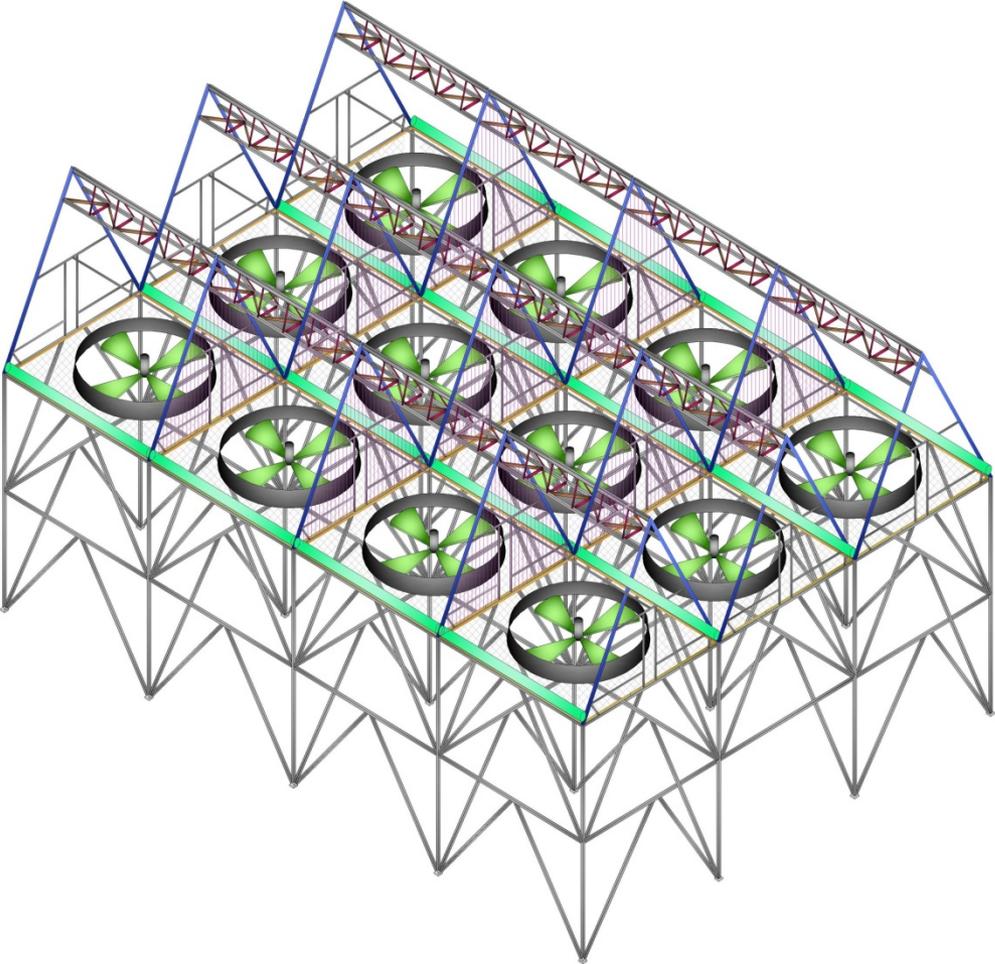


Process Diagram

3. ACC General Arrangement (3-D)



3. ACC General Arrangement (3-D)



4. ACC Module Features

- ❖ **A-Frame and Forced Draft Configuration**
- ❖ **Two Stage Condensing Bundles**
 - Primary – Main condensing, concurrent flow between steam and condensate**
 - Secondary - Non-condensable gas venting and condensing, Countercurrent flow**
- ❖ **Inclined gravity flow design**
- ❖ **Multi and Single Row Design**
- ❖ **Durable aluminum fin tube**
- ❖ **Each cell divided by Intermediate wall**

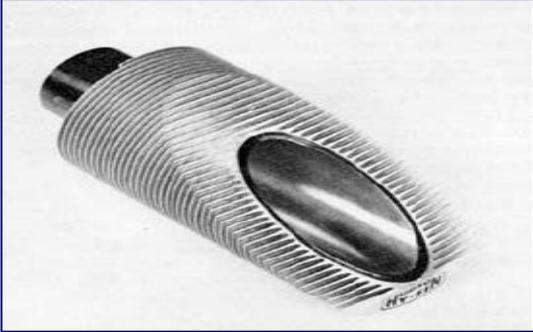
Single-Row Bundle



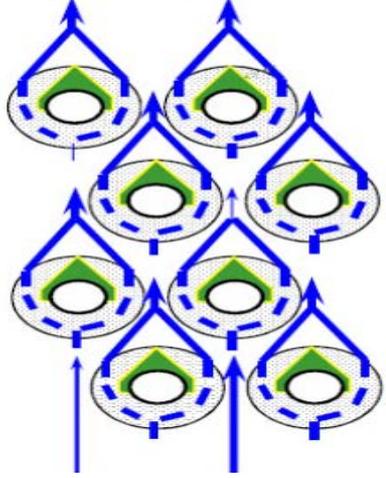
Multi-Row Bundle

5. Type of Finned tube

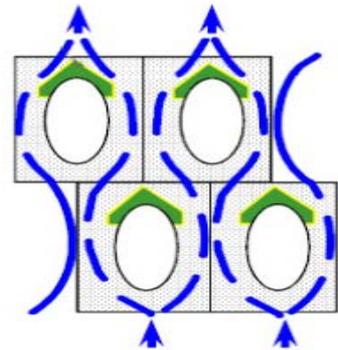
**Circular Finned tube
(Aluminum Fin)**



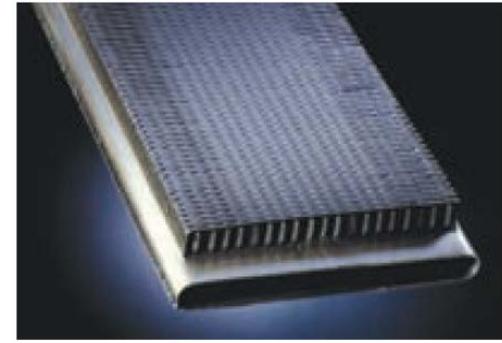
- . Conventional proven design
- . Good corrosion resistance
- . High power consumption
- . Some Dead zone
- . Weak flooding & freezing
- . Low investment cost



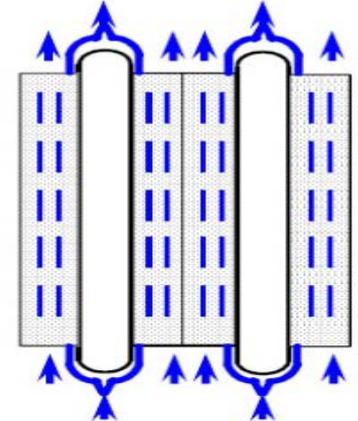
**Oval Finned tube
(Galvanized steel Fin)**



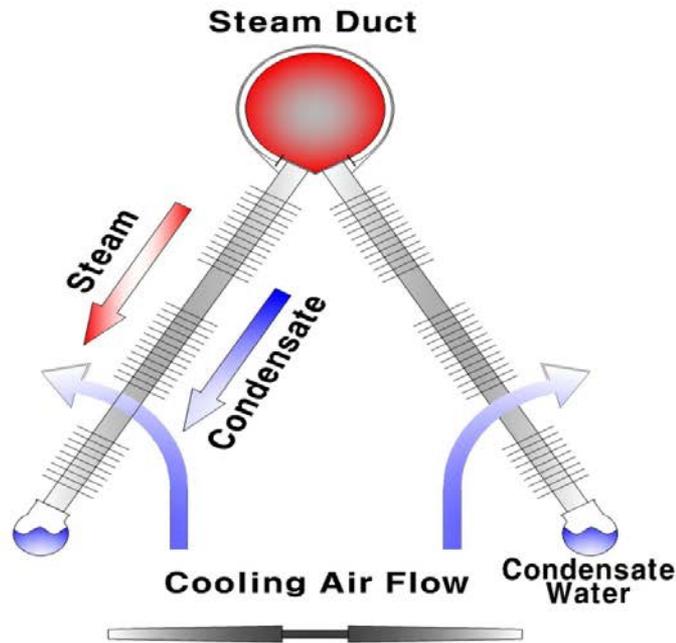
**Flat Finned tube
(Aluminium fin)**



- . Latest developed design
- . Easy HP water Fin Cleaning
- . Low power consumption
- . No Dead zone
- . Low flooding & freezing
- . High investment cost

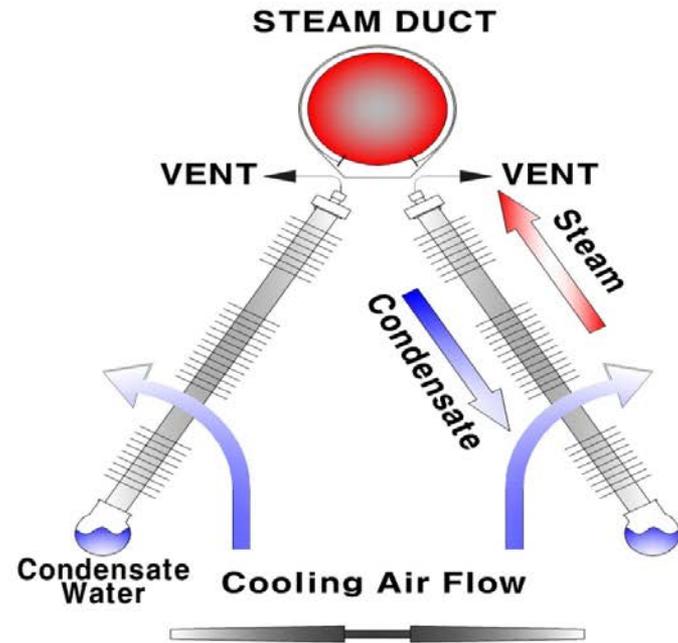


6. Two-Stage Condensing Process



Primary Condensing Bundle

Flow	Parallel(Concurrent)
Steam	75-90% flow
Air	To Reflux bundle
Others	-

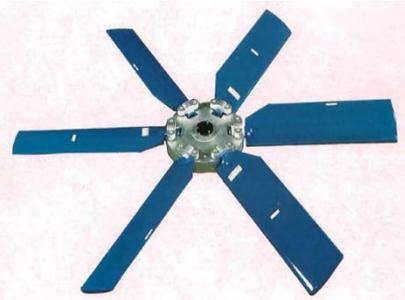


Secondary Reflux Bundle

Flow	Opposite(Countercurrent)
Steam	10-25% flow
Air	To Vacuum System
Others	Minimize Sub-cooling

7. Noise and Axial Fan

□ Axial Fan Type and Feature

Fan type	Figure	Feature	Noise level (dBA)
Standard		Classic Straight aerofoil	75-85
Low / Very Low Noise		Straight aerofoil w/wide Tip	70-75
Ultra Low Noise		Special Shaped aerofoil	60-70

8. Vendor Technical Evaluation Criteria

Electric Power Consumption

Near/Far Field Noise Level

Fan Deck Height

(Perimeter Entrance Velocity around 3.5-4.0m/sec)

Plot Area (Bay Arrangement)

Capital & Equipment Cost

9. ACC Components and Accessories (1/7)

1) Steam Duct and Manifold

Major Components

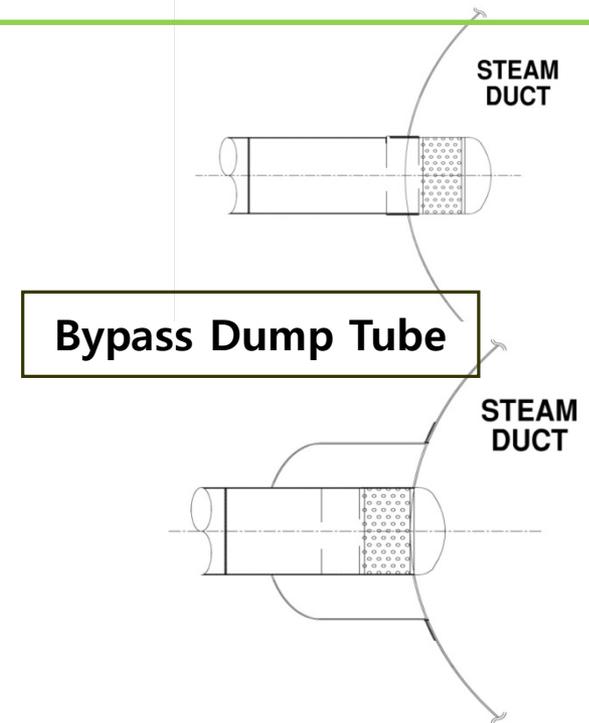
- Main steam duct, distribution, riser and manifold
- Hotwell and drain pump
- Flash box
- Multi-hole perforated IP/LP bypass station
- Expansion Joints (Dog bone or hinged bellows)

Safety Device

- Rupture disc for pressure protection
- Safety valves for pressure protection
- Vacuum breaker valve for vacuum destruction

Design consideration for erosion and expansion

- Steam flow guide for elbow section
- Low exhaust steam velocity
- Flexibility study for thermal growth



9. ACC Components and Accessories (2/7)

2) Air Moving System (Fan Driving Unit)

Axial Fan w/Hub

- Manual adjustable type
- Fan blade tip clearance adjustable
- FRP or Al material for fan blade
- Balancing test at fan supplier's shop
- FRP or steel bell shape Fan Ring (Smooth air flow)
- Fan guard for foreign matter protection

Advantages of FRP Fan

- Superior damping
- Corrosion resistance
- Easy & little maintenance

Speed Reduction Gearbox

- Helical or spiral bevel type
- Internal lubrication forced type
- Service factor 2.0
- Flexible coupling connection
- Oil level glass, level switch and oil pressure switch
- Back stop



9. ACC Components and Accessories (3/7)

Electric driver (Motor)

- Single, two or variable speed type
- Energy saving motor
- Freezing problem – use two or variable motor

Accessories

- Vibration Switch
- Motor Bearing temperature element
- Lube oil pressure & Level indicator

Noise guarantee

- Near field : 85db(A) at 1 meter from ACC perimeter
- Far field : In compliance with client's request



9. ACC Components and Accessories (4/7)

3) Air Evacuation System (Vacuum System)

Air removal for start-up (Hogging) and normal operation (Holding)

- Vacuum pump type
- Steam jet ejector type
- Silencer

If steam is not available for start-up, Vacuum pump shall be applied.

Hogging evacuation time to 0.34 Bara : < 30 minutes
Holding capacity : Based on HEI standards



4) Condensate Receiver Tank

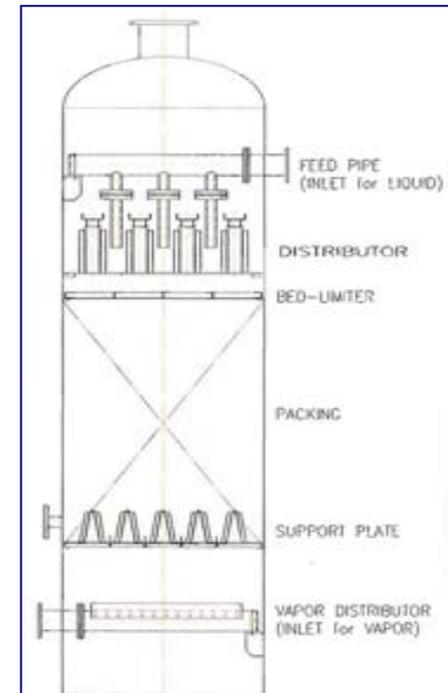
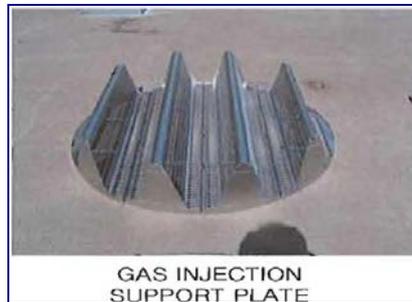
- Type : Horizontal Cylindrical
- Capacity : 5 minutes Holding time (NWL to LLWL)
- Installed at elevated structure for adequate pump NPSH



9. ACC Components and Accessories (5/7)

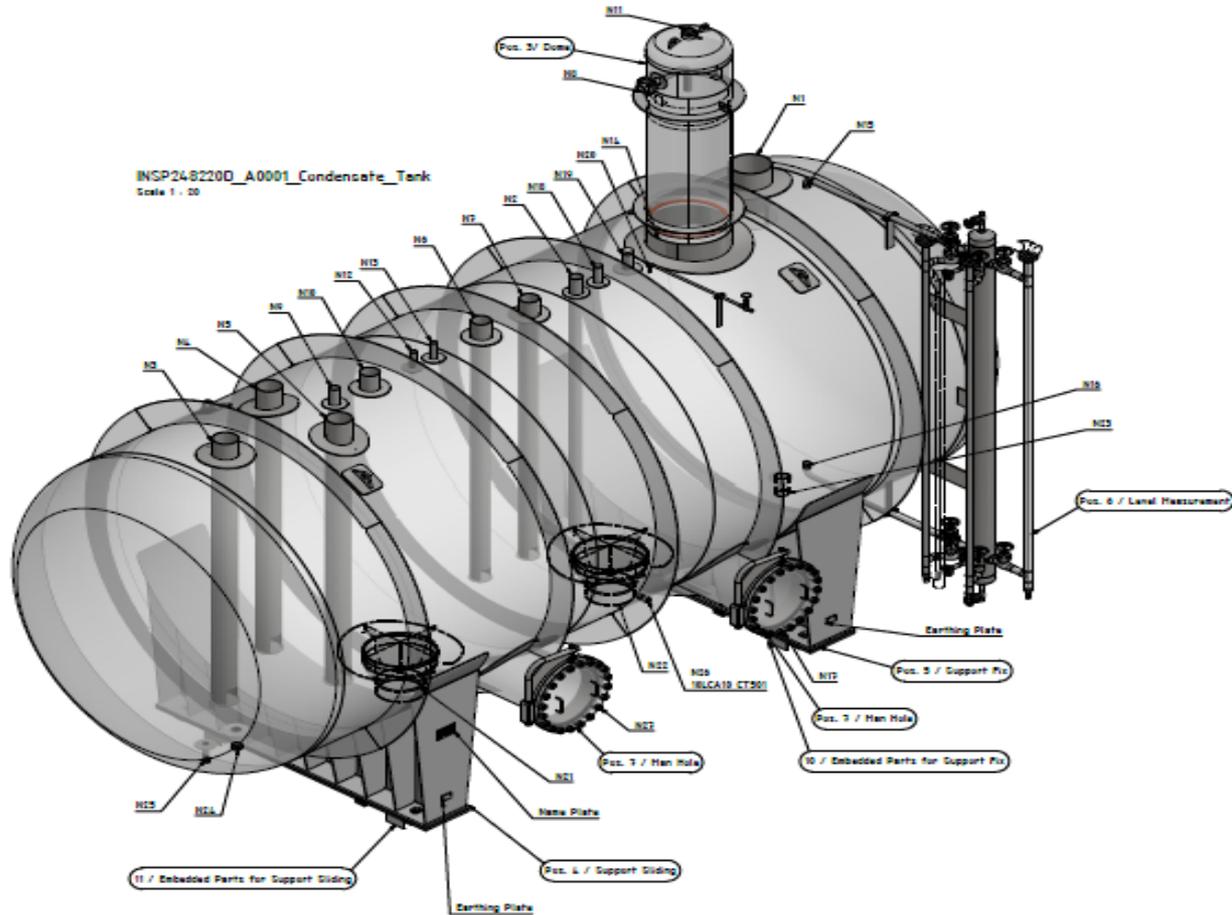
5) Make-up Deaerator (Vacuum Type)

- Oxygen Contents \leq 7-20 ppb
- Deaeration by stripping and heating w/exhaust steam
- Large surface contact by Packing (Pall ring)
- Installed at top of condensate receiver tank
- Vacuum system connected for good deaeration
- Shell made by stainless steel material



9. ACC Components and Accessories (6/7)

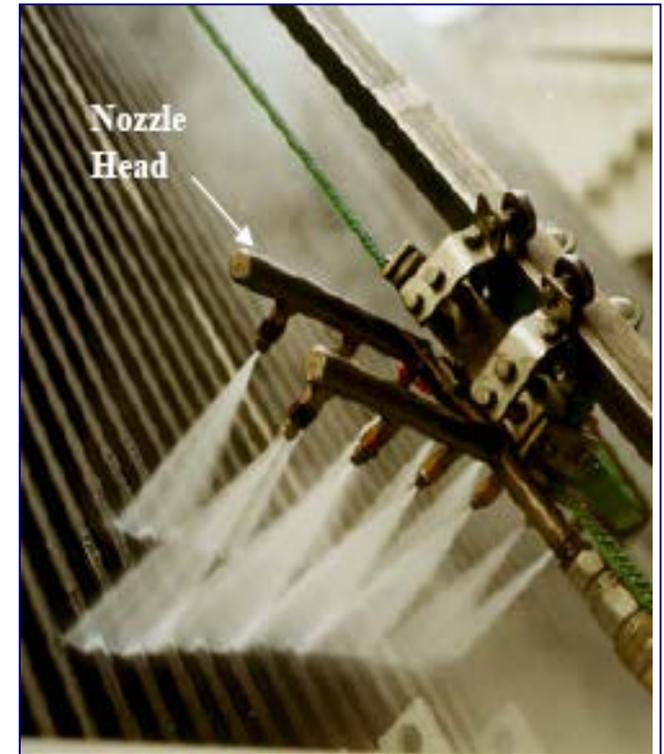
5) Make-up Deaerator on Condensate Tank



9. ACC Components and Accessories (7/7)

6) Finned Tube Cleaning System

- Performance improvement
 - Steam turbine back pressure : >15-20% decrease
 - Fan air volume flow : >10-15 % increase
- Semi-automatic operation
- Movement
 - Vertical – by motor w/tooth belt
 - Horizontal – by hand manual
- High pressure cleaning- Max 80 Bar
- Cleaning rig and Drive Unit
- Spray nozzle beam Unit
- Control panel



Thank you!



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