

Spray Dryer Specifications

CAPACITY	
Feed Rate	500 kg/hr
Evaporation Rate	200 kg/hr
Product Rate	300 kg/hr
FEED PROPERTIES	
Feed Solids	60 % w/w
Form	Pumpable liquid
Nature	Non settling
Solvent	Water
Temperature	35 deg c
PRODUCT PROPERTIES	
Product Moisture Range	<0.2 % w/w
No. of Product Collection Points	single
OPERATING CONDITIONS	
Mode of Heating	Indirect air heater
Inlet Air Temperature Range	300 deg c
Outlet Air Temperature Range	105 deg c
SITE CONDITIONS	
Ambient Temperature	Min 10 °C Max 400C Avg 30°C
Humidity	60-90% RH at 30°C
Altitude	< 100 M
Installation	Indoor
Area	Non Hazardous / Non Explosive / Non Flame roof
<p>Note: Temperature selected are used for design of spray Dryer. Depending upon the properties of different materials being dried, inlet and outlet operating temperature can be different. Evaporation capacity of plant will vary generally in direct proportion to the difference in inlet & outlet temperature.</p>	

MATERIAL OF CONSTRUCTION FOR SPRAY DRYER SECTION	
Feed Liquid	
Contact Parts	Stainless Steel 304
Product contact parts	
Contact parts	Stainless steel 316/316 TI
Hot Air contact parts	
Contact Parts	Stainless Steel 304
Cold Air	
Contact Parts	Stainless steel 304
Exhaust Air	
Contact Parts	Stainless steel 304/ carbon steel anticorrosive painted
Non-contact Parts / Supports / Stiffeners	Carbon Steel Anticorrosive Painted

UTILITY ESTIMATIONS	
Power for Motors	. Voltage : 415 V / 4 wire / 3 phase Frequency : 50 HZ
Fd blower	5 hp
Feed pump	0.5 hp
Rotary valve for cyclone	0.5
Rotary valve for chamber	0.5
Id fan	15 hp
Rotary disc atomizer	5 hp
Conveying blower	3 hp
Scrubber pump	2 hp
Connected load	33.0 hp
Consumed load	21.58 hp
instrument air requirement for instruments	Dry filtered and dehumidified, At 6 bar g pressure
Normal consumption	1-2 scfm
Fuel	Natural gas at 8600 kcal/nm ³ , 2 bar g
Normal consumption	24.83 nm ³ /hr
Tolerance	±10%
Utilities are specified at average ambient conditions.	

COMPONENT WISE DETAILS ARE AS BELOW

1. FEED SECTION

Water Tank

Capacity 25 Lit

Material of Construction Stainless Steel (Contact Parts)

Accessories Outlet valve.

Feed Pump

Feed pump works on progressive cavity principle. It is used to feed liquid to the spray dryer in regulated form.

Type Progressive cavity Screw Pump

Drive TEFC motor with variable speed drive

Material of Construction

Housing Stainless Steel

Rotor Stainless Steel

Stator Suitable

Accessories Drive guard, power transmission unit.

Note: Variable Frequency Drive is provided for motor for continuous variation of quantity.

Feed Tank

This tank is provided to store the liquid. It has inlet and outlet connections.

Type Vertical cylindrical

Support arrangement Self supporting

Material of construction

Contact parts Stainless steel 304, 2 mm thick shell and 3 mm bottom cone

Noncontact parts Carbon steel anticorrosive painted

Size of tank 1000 lit

Accessories

Drain connection Provided with plug

Inlet and outlet connection Flanged

Level gauge mounting connection point Provided

Feed Piping

Piping is provided to convey the liquid. The piping is designed for required pressure and velocity. The material of construction is selected to suit the required application.

Piping is provided from Feed pump to Atomiser

Material of construction

Pipe Stainless steel 304

Flanges Carbon steel anticorrosive painted (non-contact parts)

Pressure gauge Provided

Drain point Provided

Accessories 'U' Clamps, hardware and gaskets, hose pipe

Rotary Disc Atomizer

High Speed Centrifugal Rotary Disc Atomizer is provided for Atomizing the feed. The Wheel Spindle (Shaft) is driven by a TEFC Motor through a Flat Belt and Pulley arrangement.

Type Rotary Wheel

Wheel diameter 160 mm

Material of Construction

Wetted parts Stainless Steel

Non wetted parts /C I / Stainless Steel 304 Non exposed parts

Drive Through Belts, pulley, motor

Lubrication system Gravity, Wick

Accessories- Tool set, Stand for Atomizer, chain pulley block for atomizer lifting.

Accessories Tools, stand, three different size of pulleys.

2 AIR HEATING SECTION

Air pre- Filter (before HEPA filter)

Air filter is provided to filter the incoming process air. The air filters are in modular construction.

Design pressure drop 20 mm wc

Filter module size 900 x 450

Material of construction

Housing of filter module Carbon steel powder coated

Media Washable HDPE

Media support Stainless steel

Efficiency 95% down to 5 microns

HEPA Filter

Air filter is provided to further filter the incoming process air for more efficiency. The air filters are in modular construction. These filters are provided after the prefilters.

Design pressure drop	75 mm wc max
Filter module size	610 x 610 mm
<u>Material of construction</u>	
Housing of filter module	Aluminium / GI
Media	Water repellent micro glass filter
Media support	Stainless steel
Efficiency	99.97% down to 0.3 microns

Filter mounting duct

Size	Suitable for number of modules required for filtration
Material of construction	
Process air contact parts	Carbon steel anticorrosive painted after filtration
Non-contact parts	Carbon steel anticorrosive painted
Accessories	Pressure measurement tapping. Hardware, gaskets, support arrangement.

Ducting — cold air conveying

Cold air conveying duct is provided to convey the cold air to the system. The duct is designed for minimum pressure drop for low power consumption.

Material of construction	
Contact parts	Stainless steel 304
Non-contact	Carbon steel anticorrosive painted parts/flanges

3.	SPRAY DRYER SECTION								
<ul style="list-style-type: none"> Air Distributor (Atomizer Arrangement) Air distributor is provided on the top of the chamber to distribute air uniformly around the spray of liquid from atomizer. The entry of the air is tangential. The air distributor is designed for uniform air flow, air velocity and pressure drop. The air distributor has top plate which is strong enough to operate and handle the assembly of liquid atomizer. Material of construction Contact parts Stainless steel 304 Non-contact parts Carbon steel Insulation Mineral wool Cladding Carbon steel HRA painted. Accessories Lifting hooks, air dispersing cone, atomizer cooling cone, hardware and high temperature gaskets, <u>atomizer damping arrangement.</u> 									
<ul style="list-style-type: none"> Spray Chamber Material of Construction <table border="0" style="width: 100%;"> <tr> <td style="width: 50%;">Chamber</td> <td>Stainless steel 316 TI</td> </tr> <tr> <td>Chamber Diameter</td> <td>3400 mm for 200 lit/hr water evaporation (This is higher because of the higher solid content in feed liquid)</td> </tr> <tr> <td>Outside stiffener (Covered under cladding sheet)</td> <td>Carbon Steel Anticorrosive Painted</td> </tr> </table> Accessories Door 1040 x 640 — 1 Nos. Sight/Light Glasses 1 Set Hammers 1 Set Type Electromagnetic Hammer Mounting Bracket & Pad Carbon Steel Anticorrosive Painted Plate Insulation Cleats (Covered under cladding sheet) Carbon Steel Anticorrosive Painted Lifting Hooks For lifting during Transportation & Erection Manometer 'U' Tube 				Chamber	Stainless steel 316 TI	Chamber Diameter	3400 mm for 200 lit/hr water evaporation (This is higher because of the higher solid content in feed liquid)	Outside stiffener (Covered under cladding sheet)	Carbon Steel Anticorrosive Painted
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4.	EXHAUST AIR SECTION								
Interconnecting Duct Interconnecting ducting is provided to convey the process air from equipment outlet to further.									
Ducting is provided to convey air from		<u>Chamber</u>	to	<u>Cyclone separator</u>					
Length of ducting		<u>As per layout, max 8 mtr</u>							

Material of construction
 Ducting Stainless steel 316 TI
 Flanges Carbon steel stub on (non-contact part)
 Length Depending upon layout
 Accessories Drain plug, flanges, pressure drop measurement tapping, support bracket if required as per layout hardware and gaskets

High efficiency cyclone separator

The cyclone separator is provided to separate the solids from process air. The cyclone is designed for high efficiency. It has tangential air inlet and round product outlet. Air outlet is from the top.

Type	High efficiency
No of cyclones in parallel	Mono
Material of construction	
Contact Parts	Stainless Steel B16 TI
Non-contact parts	Carbon Steel anticorrosive painted
Cleaning nozzles	On top roof
Accessories	Support bracket, inlet and outlet air connection

Specially designed Vortex breaker is provided below the cyclone to enable smooth separation of powder from process air.

- **Interconnecting Duct**
 Interconnecting ducting is provided to convey the process air from equipment outlet to further.

Ducting is provided to convey air from	<u>Cyclone separator</u>	to	<u>ID Blower</u>
Length of ducting	<u>As per layout, max 12 mtr</u>		

Material of construction
 Ducting Stainless steel 316 TI
 Flanges Carbon steel stub on (non-contact part)
 Length Depending upon layout
 Accessories Drain plug, flanges, pressure drop measurement tapping, support bracket if required as per layout hardware and gaskets

Exhaust Blower

A centrifugal blower driven by a TEFC motor through V belt and pulleys is provided. The blower is statically dynamically balanced.

Type	Centrifugal
Drive	Belt Driven

Material of Construction (Contact parts)

Impeller	Stainless steel 304
Casing	Stainless steel 304
Shaft	EN8
Stiffeners	Carbon steel anticorrosive painted

Accessories Vibration isolator, motor mounting slide rail, locking and motor alignment bolts, common base frame, damper, V belt pulleys, belt guard, bearings, cleaning door, drain plug, heat slinger, Isolation bellows.

- **Wet Scrubber**

Wet scrubber is provided to remove particulate matter from the air before air is vented to atmosphere. The wet scrubber injects high velocity water in to high velocity air inside ventury. The mixing of air reduces temperature of air and the particulate matter gets wetted. The water containing particulate matter is separated in droplet separator. The water is drained in a circulating water tank wherein the same water is re-circulated. The water in circulating water tank is changed after attening specific solid content.

Type	Direct contact type with water jet
Material of Construction (Contact parts)	Stainless Steel 304
	Support bracket — Carbon Steel

Accessories Droplet Separator and interconnecting piping, spray nozzle, hose and clamp for recycle water, sight / light glass, support bracket, anti-vortex arrangement on bottom cone for water.

Circulating water tank

This tank is provided to store the liquid. It has inlet and outlet connections.

Type	Vertical cylindrical
Support arrangement	Self supporting

Material of construction

Contact parts	Stainless steel 304
Noncontact parts	Carbon steel anticorrosive painted
Size of tank	<u>500 lit</u>

Accessories

Drain connection	Provided with plug
Inlet and outlet	Flanged
Connection Level gauge mounting connection	provided

Circulating Water Pump

The scrubber pump is provided for supplying pressurized water to ventury spray nozzle.

Type	Centrifugal
Drive	Direct driven with TEFC motor
Shaft	Sealing Gland Packing
Material of Construction	Stainless Steel 304 (Contact parts)
Accessories	Base frame in Carbon steel, coupling, coupling guard, hardware.

Recirculation Piping

Piping is provided to convey the liquid. The piping is designed for required pressure and velocity. The material of construction is selected to suit the required application.

Piping is provided from scrubber pump to Spray nozzle

Material of construction

Pipe	Stainless steel 304
Flanges	Carbon steel anticorrosive painted (non-contact parts)
Pressure gauge	Provided
Drain point	Provided
Accessories	'U" Clamps, hardware and gaskets, hose pipe

Exhaust duct

Interconnecting ducting is provided to convey the process air from equipment outlet to further.

Ducting is provided to convey air from	<u>ID blower outlet to Exhaust</u>
Length of ducting	<u>As per layout, max 12 mtr</u>
<p>Material of construction</p> <p>Ducting Carbon steel anticorrosive painted</p> <p>Flanges Carbon steel stub on (non-contact part)</p> <p>Length Depending upon layout</p> <p>Accessories Drain plug, flanges, pressure drop measurement tapping, support bracket if required as per layout hardware and gaskets</p>	
5.	INSTRUMENTS & CONTROL SECTION
Control Panel	
<p>Control panel is provided to operate the system. It has prewired logic for the operation sequence, start up and shutdown sequence. It houses electrical components like relays, fuses, timers and contactors.</p> <p>Panel is floor mounted construction. The cable entry shall be bottom entry type The panel is made up of MSCRCA.</p> <p>There will be provision in the panel to place the drawings / wiring diagram of panel.</p> <p>Cooling fan shall be provided in the panel for prolonged life of hardware</p>	
<ul style="list-style-type: none"> • Panel Mounted Instrument 	
<p>Mimic Diagram showing motor status</p> <p>Audio-visual alarms system</p> <p>Temperature indicator controller (PID) with high / low Alarm & switches. Ammeters are provided for each motor bigger than 7.5 hp</p> <p>Frequency drive is provided for feed regulation.</p> <p>Emergency stop switch on panel</p> <p>Auto / maintenance switch</p> <p>Indicating lamps for incoming voltage status</p> <p>Voltmeter for incoming supply</p>	
<p>Sequential timer is provided for hammer operation. The on time and off time is selectable.</p> <p>Timer auto/manual switch</p>	
<p>Temperature indicating controller for air ingress.</p> <p>Sequential timer is provided for hammer operation. The on time and off time is selectable.</p> <p>Manual individual solenoid operation switch</p>	

• Locally mounted instruments are

1 No Manometers for pressure and temperature readings. each

1 Set Temperature sensors

1 Set Hammers for vibration

1 No. Feed pressure indicator (pressure gauge)

Audio Visual Alarm On control panel

Inlet Temperature High, very high

Outlet Temperature High / low

Motors Overload Trip condition

Parameter Control and Safety Interlocks

Inlet Temperature From Inlet air temperature Controller.

Fuel Cut-off From inlet temperature high alarm.

Feed control From outlet temperature controller control output.

Feed Stop From outlet temperature Low switch.

Motor Control Center (MCC)

MCC is also covered in to the same control panel. It has feeders and relays for motors. It is non compartmental type.

