COSMIC CONNECTION

GLASS MIRROR COATER

GC-468

Aluminum Coating on Glass Sheets
with Low Cost Vacuum Metalising process

SERIES - IVC
TYPE - GC

About Us

We are in the field of Vacuum Technology for the last 25 years and are leading manufacturers of Vacuum Equipments and Metallising Plants in India.

We have several plants of varying descriptions working successfully all over the country.

In the field of vacuum metallising, we have contributed a lot. Our R&D efforts have given us new designs of plants to get more production with the same investment and operating expenses.

This means more profit for our customers and good reputation for us.

We are first to introduce in India:

- Vertical, Double Door Plants
- Fully Computerised Plants
- Selenium Coaters
- Titanium Nitride Coating Plants
- Continuous Roll Metallising Plants
- Large sized systems

Horizontal Coating Plant

Vertical Coating Plant

Diffusion Pump-800 mm dia

Lacquer Curing U.V. - Oven

Introduction

COSMIC offers an extensive range of Industrial Vacuum Coating Plants for a wide variety of applications. These plants are comprehensively engineered and incorporate the latest innovations. The outstanding characteristics of these plants are the following :

- Introduction and use of Booster Pump is our exclusive addition which results in fast cycle time. Other plants would find it difficult to match the performance of our plant with Multistage Mechanical Booster Vacuum Pumping System.

- Rugged construction of all mechanical assemblies and use of Stainless Steel as primary construction material results in an exceptionally long life for the plant and also contributes to a faster cycle time.

- Our Baffle Valve is so designed that its closing plate closes towards chamber to prevent roughing/high-vacuum to be done in the Baffle Valve in repetition of cycles which reduces cycle-time a-lot. Also in Baffle Valve, vacuum is always maintained in the range of 10-6 torr and act as vacuum buffer-tank thus after roughing of chamber upto 10-2 torr, when Baffle Valve plate is opened, coating vacuum of 10-4 torr is achieved at much faster speed, even faster than the Diffusion Pump's own speed.

- In Diffusion Pump Jet Assembly, we provide jets angular rings which maintain the shape of jets thus speed of our pump will never reduce. This means same, faster cycle-time forever.

  Also, D.P. design is such that in the rainy season, cycle-time will not increase.

- We provide Double copper fins, optically dense chevron to avoid Back-Streaming of D.P. oil in work-chamber which improves brightness & adhesion of coatings.

- In Vertical Plants, we provide compact control panel containing fully functional operational controls for operator's convenience. All the operations of the plant are controlled from the control panel.

  Panel is near the viewing window to ease the operations of plant and to save costly floor space.

- Height of biggest plant is about 8 feet. Plant design is compact with pumps and pipe-lines lay-out thus our plant can fit in smaller area.

- Always develops and suggests new technologies.

  Only we have experience of making space saving, latest designed Vertical Double Door Plants.

  In India, only we can provide U.V. Lacquering technology and M.S. Plants.

- The design provides ease of maintenance which results in long production runs with a minimum of downtime.

- We are with customer to help them in developing their end-product. A faster and prompt after-sales service is available on a phone-call.

Cosmic has many years of experience in building Industrial Coaters and the above exclusive features have been arrived at after extensive R& D and field work.

Applications

Cosmic Plants in the GC Series can be fixture for the following applications:

- Production of Glass Mirror sheets by aluminium metallising process.
- Coating of moulded and pressed, almost flat glass/plastic items such as plastic security mirror domes, plastic mirror sheets.

Mirror Description

Glass Mirrors produced by our Vacuum Metallising Plants has unique properties over conventional silver coated mirrors:

- As Aluminum coating has High Surface Reflection, Images appear brilliant, sparkling, clear, perfect and distortion free.
- Unique for its improved optical quality due to Aluminum Coating of uniform thickness.
- Bright reflection, free from Black spots or grayish effect or haziness, during their entire lifetime. These defects are common in commercial silvered mirrors.
- Free from the effect of natural atmospheric conditions, viz., moisture, sun heat, dust etc. and better resistance to atmospheric corrosion (SO2, NO2, CO2) because of superior qualities of Aluminum Coating.
- Produced by pollution free, Vacuum Metallising process. This saves the environment from the harmful chemicals.

Process of Vacuum Metallising

The plants in the IVC-GC series are primarily designed for making Glass Mirror sheets by Aluminium coating of Float or Sheet Glass.

High Vacuum Metallising is used for coating of aluminium on glass sheets, in batch production. This process is suitable for various products described in applications.

The process of vacuum metallising is done in air free environment i.e. in vacuum of the order of 10-4 torr to 10-6 torr. In the absence of reactive or other gases, the evaporated aluminium retains its properties and original luster.

The vacuum metallising process involves loading of glass sheets on the jigs with the help of M.S. frames. It is to be ensured that the glass sheets are properly cleaned before loading.

After loading the jig, it is transferred to the process chamber with the help of a trolley, which is provided with the plant. The jig will be properly locked automatically in the chamber with the help of two pneumatic cylinders provided on the door of the chamber.

After closing the door, the chamber is evacuated by the pumping system upto the required vacuum level of the order of 10-4 torr to 10-6 torr. A better vacuum level gives better coating in terms of brightness and adhesion.

The coating is done according to the process using a variable transformer. The aluminium gets deposited on the glass sheets and the glass sheets are then removed from the jigs for further processing to protect the coating and to get the desired results.

Process of manufacturing Glass Mirrors

- Purchase and Un-Loading and Un-packing of Raw Glass Sheets in the Store.
- Stacking in Working Hall.
- Cleaning of sheets from one side by De-Mineralised water, after placing it on the washing machine.
  - D.M. water is required for this process.
- Loading in the plant with help of jigs and M.S. Frames, cleaned surface towards bus-bars.
  - Aluminium staples, filaments, clips, boats, insulating plates, thinner, cloth etc are required.
- Vacuum Coating of aluminum in the plant, as per process.
- Un-loading of the Aluminum Coated sheets from the plant.
- Transfer sheets from M.S. Frames to Wooden Frames.
- Painting on coated surface by spray painting process.
  (If Curtain Coater is installed for painting, this process will be handled by Curtain Coater)
  - Paint, thinner, cloth etc are required for this process.
- Drying of paint in an oven at 60^0 C.
- Un-loading/stacking of coated and painted Mirror Sheet from the oven.
- Cleaning of unwanted paint marks from the front surface by water/thinner.
  - Thinner, cloth, sponge etc are required.
- Inspection of the mirror for quality control.
- Packing and stacking.
  - Nails, clips, wooden boxes, tools, polythene, white paper roll (4' wide), tape etc are required.
- Dispatch.

Raw Material

Aluminium is required for bright, silver effect. The cost of aluminium is very small thus the production cost is negligible compared to the cost of actual silver coatings.

Tungsten filaments are required for evaporation of aluminium.

Other consumables, as described in the Process of manufacturing Glass Mirrors are required.

Given above is a general description.
The actual production of a particular product remains with the customer to try and attain.

Other Equipments (To be arranged by purchaser)

Other equipments required to be used with the plant depend upon the nature of the job to be carried out. The equipments which are required to operate the plant are:

Compressor

This is required to deliver 6-8 kg/cm2 of air with a flow of about 15 litres of air in one operation of the plant's electro-pneumatically operated components. The compressor unit is to be fitted with Filter, Regulator and Lubricator (F.R.L). A compressor having 3 H.P. motor is suitable.

Another compressor may be required for coat of protective paint onto the metallisied surface of glass sheets if so desired by the spray technique. A spray-gun is also required along with this compressor.

The capacity of the compressor having 5 H.P. motor can serve the purpose. Single compressor of bigger capacity may be install for both of the requirements.

Air-Compressor should be installed outside the working hall to avoid noise in the working hall.

Water Chiller

To provide specified quality of water at 20 ^{0}C-30 ^{0}C to the diffusion pump and to the rotary pump, a water chiller is required. Water Chiller can provide water at 20^{0} C and can be installed near to the diffusion pump of the plant.

An FRP cooling tower of 10 T capacity can also serve the purpose , which can provide water at 29^{0} C. FRP Cooling tower should be installed in outside, open area but not too far from plant.

Two water manifolds, behind the plant are required for inlet and outlet of water to different parts of the plant.

De-Mineralised Water treatment plant

Suitable capacity De- Mineralised Water Treatment Plant is required to remove all salts, minerals and chemicals from the water, which is to be used in the Glass Washing Machine to wash the glass sheets prior to metallising. Water storage tanks are also required to store this soft, treated water for glass washing.

Glass Washing Machine

This machine is required to wash the glass sheets with De- Mineralised Water before metallising.

Size and speed of the Glass Washing Machine depends on the size of the mirror to be made.

Ask us for its offer.

Paint Spray Arrangement

If Mirror back painting is desired by spray technique, a spray booth arrangement is required. Spray booth should be a separate room or far from the plant to avoid any paint fumes to deposit on raw sheets.

Good paint exhaust/dispose system is required to avoid any paint fumes in atmosphere.

Mirror back painting can also be done by Curtain Coater. In this process thickness of the paint can be adjusted accurately and surface of the paint is uniform. Machine is equipped with a paint circulation device. Paint can be re-cycled and will not be wasted.

Ovens

Box type

Oven having temperature range of 60^{0} C - 80^{0} C is required if the mirror back painting is desired to be done by spray process. The number and size of the ovens depend upon the production capacity and size of the mirror and can be worked out by COSMIC's technical department.

Conveyor type

This is conveyor type advanced infrared heating technology oven and much better then box type oven. It can heat and dry the paint surface rapidly. The width of the oven depends on the width of the required mirror.

We always suggest using Curtain Coating type painting arrangement and having conveyor type, Infra-red Heating oven, after the Curtain Coating arrangement. This gives good paint finish and prevents dusts in the painting process.

Frames

These are made of M.S. or wood and are required to hold the glass sheets at various steps of the process. The quantity is one's own decision. In any case, COSMIC' expert advice is always at your disposal

Two wooden tables are also required which helps in loading raw sheets into jigs for metallising..

Electricity Distribution Panel

This is required to connect with the main incoming electricity cable and from this panel, all machines of the project will be connected including Metallising Plant, Cooling Tower, Compressor, Ovens and all other such machines. This panel has MCB, Fuses, and Switches for ON/OFF of any individual item and such other safety devices. This is compulsory item for safety of all machines and to avoid any mis-happening.

Clean Room Facility

The clean room helps to remove the dust particles from the operating area to turn out an end product which is free from pin holes, saturated dust particles etc., there by improving the quality of the coatings.

The size and class of the unit depends upon the size of the operating area and the type of production.

Voltage Stabilizer

This is required for the plant and other machines if there are severe voltage fluctuations in the factory.

Generator

If there is regular electricity failure in the factory area, a generator of suitable capacity is recommended.

Plant Design

COSMIC plants are simple and straight forward in design and consist of following main system:

- Work Chamber
- Vacuum System and Pumping Group
- Low Tension Power Supply
- Control Panel
- Work Holders and other Fixtures

The Vacuum System is designed to give fast cycle time and trouble free operation. The diffusion pump, baffle valve and chamber are made of Stainless-Steel sheet for a long life and fast cycle time.

All valves are electro-pneumatically operated and the function of all the valves is controlled from the control panel.

Work Chamber

The work chamber is a Box type made of stainless steel sheet having M.S. Flanges and M.S. reinforced bars on all the outer sides with a full opening door at the front. The material of construction for the door sheet is also stainless steel. The inner surface of the chamber and all other parts of the plant are buffed giving good finish to avoid degassing.

There is a viewing port of 105 mm dia. on the door to inspect the coating process. A set of rails is provided inside, on the bottom of the chamber, to carry the jig.

The chamber rear is a stainless steel sheet welded to the main chamber body. The rear end has high vacuum current feed-throughs for making electrical connections inside the plant. The low tension current is provided to the bus-bars through these feed-throughs. As the bus-bars are on the jigs, the electrical contact is provided by spring-loaded contacts to carry current upon the entry of the jig in the chamber.

Vacuum System

COSMIC vacuum pumping system is the most reliable. The material of construction of Diffusion Pump is stainless-steel. Base of the D.P. is made of M.S. which is the best material for heat conduction. Top flange is made of M.S. An oil economiser is provided at the backing connection of the diffusion pump to prevent oil loss.

The design of the jet assembly is an exclusive COSMIC design which gives much faster speed of pumping compared to other diffusion pumps of the same size. The material or construction of the jet assembly is M.S. which is the best recommended material. This makes the plant to give a faster cycle time.

An optically dense, water cooled chevron baffle is provided at the top of diffusion pump to avoid back-streaming of oil into the work chamber. The material of the body for chevron baffle is M.S. and for the chevron, it is copper.

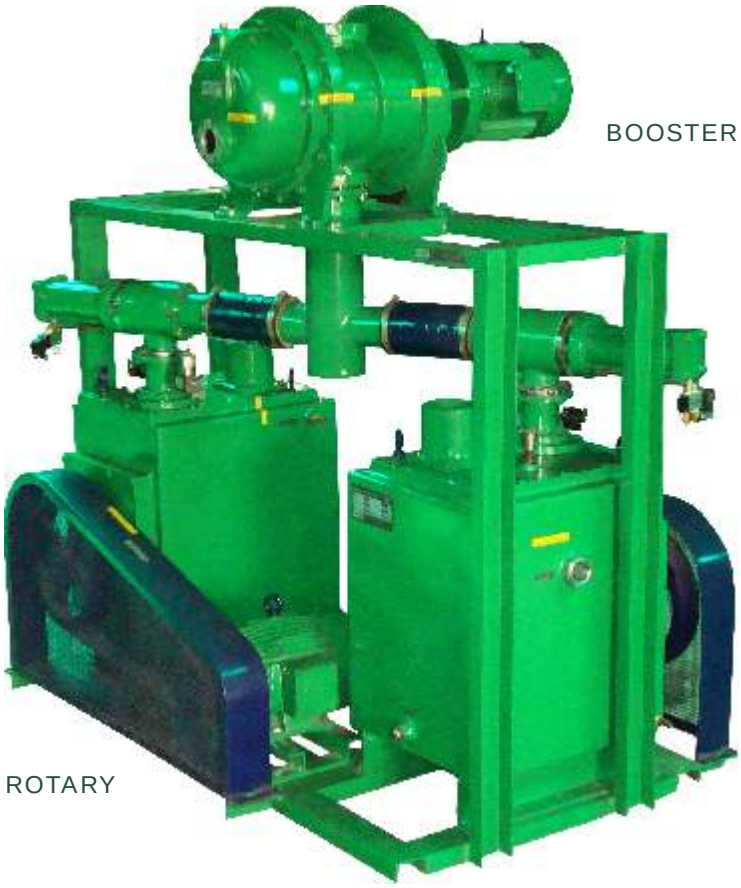
One electro-pneumatically actuated high vacuum right angle valve (baffle valve) of stainless-steel is provided above the chevron baffle to isolate the diffusion pump from the work chamber, when required at the time of getting the vacuum in the work chamber during recycling process. Closing plate and plate moving mechanism are made of M.S.

Two electro-pneumatically actuated right angle valves of M.S. are provided, one (backing valve) above the fore-line port of diffusion pump and other (roughing valve) above the roughing port of work chamber to isolate the ports as and when required during the process cycle.

One electro-pneumatically actuated right angle valve of M.S. (air admission valve) is provided on work-chamber to introduce air in the work chamber after the coating process.

Pressure pipe-lines of copper are provided to operate the valves. A main nozzle at the F.R.L. (Filter, Regulator, Lubricator) unit is provided to convey treated compressed air to the system from the compressor.

Pumping Group



This System is an exclusive feature of COSMIC

Booster Pump and Mechanical Rotary Pump combination is provided with the plant. This system is capable of reducing the cycle-time of the plant to half of what is achievable by conventional belt driven or direct driven rotary pumps.

Detailed specifications are enclosed.

Suitable pipe-lines of M.S. are provided to join Booster Pump combination with roughing and backing valves to make the plant operative.

Low-Tension Power Supply

Low Tension Power Supply is provided along with the plant. This power supply is used to heat the filaments in vacuum to evaporate the material by thermal resistance heating process. It consists of electrodes of copper, which is the best material for this application. The electrodes are provided with holders to hold filaments.

These electrodes are mounted on the jig to enable the operator an easy loading or unloading of evaporation filaments and aluminium.

The low tension power supply is mounted behind the work chamber to keep the leads to the feed throughs short.

A suitable capacity, motorised auto-transformer (variac) is provided to control the L.T. power supply.

Control Panel

Control panel is a separate cabinet that takes standard 19 inch panels. It has castor wheels for mobility. It contains the mimic diagram to show the status of switches, push buttons, knobs and indicators for proper plant operation. These controls are suitably interlocked for a fail-safe process control.

Work Holder

This jig is a frame work capable of moving on trolley and rails of the chamber. It is having arrangement to take up the glass sheets to be coated. Two work-holders (jigs) of same kind are supplied with the plant. While one of the work-holders is under process the other can be prepared outside for the next cycle.

The material of construction for these jigs is M.S.

The arrangement gives aluminum coatings on the glass sheets side facing the evaporation sources.

Specifications

MODEL			GC-322	GC-432	GC-462	GC-464	GC-466	GC-482	GC-484	GC-682	GC-684
CHAMBER											
Size	Height	mm	1065	1400	1400	1400	1400	1400	1400	2000	2000
	Depth	mm	850	1200	2100	2100	2100	2700	2700	2700	2700
	Width	mm	600	600	600	1150	1700	600	1150	600	1150
LOADING CAPACITY (per cycle)											
Size, Maximum		Feet	3 x 2	4 x 3	4 x 6	4 x 6	4 x 6	4 x 8	4 x 8	6 x 8	6 x 8
Loading/Cycle		Nos.	2	2	2	4	6	2	4	2	4
Other Sizes (Feet)											
	4 x 1	Nos.	–	6	12	24	36	16	32	24	48
	4 x 3	Nos.	–	2	4	8	12	4	8	8	16
	4 x 6	Nos.	–	--	2	4	6	2	4	2	4
	4 x 8	Nos.	–	--	--	--	--	2	4	–	--
	6 x 8	Nos.	–	–	–	--	--	--	--	2	4
N.B: The specified production capacity can be altered depending on a particular job.											
DIFFUSION PUMP											
Size		dia mm	400	500	710	800	915	800	915	800	1000
Speed - Air		Ltr/sec	9000	12500	24500	32000	41000	32000	41000	32000	50000
Stages		Nos.	4	4	4	4	4	4	4	4	4
Heater		KW	6	8	14	18	22	18	22	18	26
D. P. Oil		Ltr.	1.5	2.5	5	6	8	6	8	6	10
N.B: Actual pumping speed may be different.											
VALVES											
Baffle		dia mm	400	500	710	800	915	800	915	800	1000
Roughing		dia mm	83	96	96	120	120	120	120	120	155
Backing		dia mm	83	96	96	120	120	120	120	120	155
Air Admittance		dia mm	48	48	48	48	48	48 x 2	48 x 2	48	48 x 2
ROTARY PUMP											
Speed		Ltr/min.	3000	3000	5000	5000 x 2	5000 x 2	5000	5000 x 2	5000 x 2	5000 x 2
(Specifications are enclosed)						= 10000	= 10000		= 10000	= 10000	= 10000
BOOSTER PUMP											
Speed		Ltr/min.	–	13300	13300	27800	27800	13300	27800	27800	27800
(Specifications are enclosed)											

COSMIC CONNECTION

Specifications

MODEL		GC-322	GC-432	GC-462	GC-464	GC-466	GC-482	GC-484	GC-682	GC-684
EVAPORATION SUPPLY										
Regular	Ampere	600	1200	2400	2400 x 2	2400 x 3	3000	3000 x 2	4000	4000 x 2
	Voltage	10	10	10	10	10	10	10	10	10
Variac (motorised)	Amp./Phase	28/1	28/2	60/2	60/2 x 2	60/2 x 3	60/2	60/2 x 2	80/2	80/2 x 2
Evaporation Source Holders	Nos.	6	15	30	60	90	40	80	60	120
Material of Bus-Bar		Copper	Copper	Copper	Copper	Copper	Copper	Copper	Copper	Copper
OTHERS (GAUGE)										
Pirani & Penning with two Pirani and one Penning head	range torr	1 x 10-6	1 x 10-6	1 x 10-6	1 x 10-6	1 x 10-6	1 x 10-6	1 x 10-6	1 x 10-6	1 x 10-6
CYCLE TIME										
Clean and empty chamber										
atm to 1 x 10-1 torr	min.	2-3	2-3	2-3	3-4	3-4	2-3	3-4	3-4	3-4
atm to 5 x 10-4 torr	min.	4-5	4-5	4-5	5-6	5-6	4-5	5-6	5-6	5-6
TO BE ARRANGED BY PURCHASER										
Power - 3 phase (max.) (for plant only)	KVA	11	21	35	69	100	41	81	61	101
Water at 20^0 C - 30^0 C	Ltr./min.	15	20	25	30	35	25	30	30	40
Compressed Air										
- Pressure	kg/cm2	6	6	6	6	6	6	6	6	6
- Quantity	Lit/charge	25	25	25	30	35	25	30	30	35
Working Floor area (plant/pumps)	Sq. Mtr.	8	10	15	18	25	18	25	18	25
Height (Approx.)	mtr.	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Weight (plant/pumps)	kgs.	1500	2500	4000	5000	6000	5000	6000	5000	6000

N.B.: These figures are an approximate only.

Optional Accessories (At Extra Cost)

HTDC

GC - 322	5000 V (open circuit) 500 mA Max. 2.5 KVA Power
GC - 432 GC - 462	5000 V (open circuit) 1000 mA Max. 5 KVA Power
GC - 464 GC - 466 GC - 482 GC - 484 GC - 682 GC - 684	5000 V (open circuit) 2000 mA Max. 10 KVA Power

This facility is required for cleaning glass sheets prior to Vacuum Metallising. It removes surface impurities from glass surfaces and heats it up to 100 ^{0}C and thus provides better adherent coatings.

Suitable discharge electrodes, safety devices, feed-throughs etc. are provided along with HT transformer.

Mild steel Plant

The complete plant made of mild-steel can also be provided on specific request. This saves the investment cost of the customer.

Automatic Coating Process

Automatic coating process helps in evaporating aluminum by preset timing of the L.T. dimmer/variac and getting same quality of coating, everytime. A manual over-ride is also provided.

Sequence Controller

This controller helps to run the plant automatically. The function of controller is based on vacuum level reading. Once the cycle-ON button is pressed, the sequence controller operates all the valves automatically to achieve the desired coating vacuum and then coating will also be done automatically. A manual over-ride is also provided to operate the valves/coating manually.

Computer Set-up

The installation of computer in the plant facilitate complete automatic operation of the plant including the coating process. A colour mimic diagram displays the status of the plant's operation on colour monitor. Any number of different types of coatings can be programmed and stored in the memory of the computer. If there is any fault in the plant, it is flashed on the screen of colour monitor.

The scope of supply Includes complete computer system including a PC, 14" V.G.A. colour monitor, key board, related hardware, programme cards and customized software.

Safety Devices/Features

Following are the safety devices/extra features normally incorporated in the design-

D. P. Temperature Controller

A temperature indicator-cum-controller is provided to control the heating of the diffusion pump oil. This prevents the back-streaming and fall in vacuum level due to over heating of the diffusion pump oil.

Rotary Pump Vent Valve

A Vent-Valve is provided at the mouth of the rotary pump which prevents out-flow of rotary pump oil by introducing the air in the pump, automatically in case of stopping of the pump or sudden power failure.

Roots Pump Auto Switch

A vacuum sensor is provided over the Roots Pump which facilitate automatic start of the Roots Pump after achieving desired Rough Vacuum. Also in case of sudden pressure rise, it automatically stops the Roots Pump and prevents pump/motor damage.

Filter, Regulator, Lubricator Unit

A F.R.L. unit is provided at the compressed air inlet port to the valves of the system. This unit filters the air and regulates the pressure of air to the valves. It also lubricates the cylinder of valves for smooth operation.

Isolation Valves

In case of plant with two Rotary Pumps or two Roots Pumps combination, we provide two Isolation Valves over each Rotary Pumps/Roots Pumps to provide choice of operating any of the system or both, any time.

Air Filter

Suitable filter is provided at Rotary Pump to prevent entrance of any foreign particles in it.

Vacuum Switch

This is intended as a safety device for the operator of the unit. This isolates the HT supply to the unit when chamber is open to atmosphere. This is incorporated if HTDC facility is included in the plant.

General Interlocks

- Plant's functions will not start if any Rotary Pump is not ON.
- Baffle Valve will not OPEN if D.P. is OFF.
- HTDC will ON only when roughing is ON and LT is OFF.
- Panel switches supply OFF in AUTO-mode except RE-RUN switch.
- Sequence controller/CPU supply OFF in Manual-mode.
- Air Vent Valve will not OPEN if Roughing/Baffle Value is OPEN

LT Evaporation

- LT will be ON only when HTDC is OFF and Baffle Valve is OPEN.
- LT supply to the evaporation sources cut off immediately and Variac comes to zero position, automatically, when LT-OFF switch is pressed.
- LT will ON again only when Variac is at zero position.

Spares

The scope of supply includes a first set of spares which consists of :

- All the O'rings and gaskets (fitted in plant).
- One charge of (filled in pumps)-
  - COSMIC Rotary Pump Oil, ROTOMAX
  - COSMIC Booster Pump Oil, Gear Oil Grade 90
  - COSMIC Diffusion Pump Oil, DURAOIL

Facilities To Be Provided By The Purchaser

The following are excluded in the offer and are to be provided by the purchaser at his own cost.

1. Electrical power supply for the plant (normally 3 phase, 440 volts) including provision for:
   a) Proper grounding of equipment.
   b) Mains isolator (switch) to disconnect the plant from the mains.

2. Compressed air and water supply (with Filters) necessary to operate the plant.

3. The purchaser should also make provision for pipe-work to
   a) Convey compressed air to the plant.
   b) Convey water to and from the various components of the plant.
   c) Carry the exhaust of the mechanical pump, away from the process area.

4. The customer should also ensure that suitable job and process materials is available at the time of plant installation so that COSMIC engineers are able to demonstrate the operation of the plant with respect to its vacuum performance and correct working of its evaporation process. This demonstration however does not cover the complete process know-how for a particular application.

Acceptance Test

Following are the acceptance test for the unit:

1. Verification of all major items mentioned in the specification for their physical presence.

2. Check the vacuum performance i.e. 5 x 10-4 torr, within the specified time and conditions on recycling, in clean, empty, degassed chamber.

3. Check the operation of the system and of the accessories supplied with the system.

   The acceptance tests do not include demonstration of production of actual final product.

On account of continuous R & D activities, COSMIC reserves the right to modify the specifications any time without prior notice.

Unit to suit specific applications are possible. Please contact us for details.

Our Products

- Horizontal Vacuum Metallising Plants
- Vertical Vacuum Metallising Plants
- Titanium Nitride Coating Plants
- Chromium Coating Plants
- Optical Coating Plants
- Roll Metallising Plants
- Vacuum Furnaces
- Vacuum Ovens
- Space Simulation Systems
- UHV Systems and Chambers
- Sputtering Systems
- Inert Gas Storage Chambers
- Laboratory Coating Units
- High Vacuum Stands
- Electron Beam Sources
- Film Thickness Monitors
- Diffusion Pumps
- Rotary Pumps
- Booster Pumps
- Tungsten, Molybdenum, Tantalum-boats, filaments
- Valves, Gauges, Components, Consumables etc.
- Custom Built Systems.

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