



MADHU SILICA PVT. LTD.
Manufacturers of Precipitated Silicas



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CERTIFICATE

This is to certify that the Ms. Vishwa Darshak Shah has successfully completed training from 1st June, 2017 to 11th June, 2017 in Precipitated Silica Manufacturing Unit at Madhu Silica Pvt. Ltd. Vartej, Bhavnagar.

During this period of training she was found to be hardworking, ambitious and sincere.

We wish her every success in life.

Mr. Vikram Thakker

(Sr. GM Operations)

A TRAINING REPORT

AT



MADHU SILICA
BHAVNAGAR

Prepared By:

Vishwa Darshak Shah

Time Period:

1st June, 2017 to 11th June, 2017

MADHU SILICA PVT. LTD, BHAVNAGAR

[Plot No.147, G.I.D.C., Vartej, Bhavnagar-364060. Gujarat, India]

ACKNOWLEDGEMENT

The successful completion of any training requires guidance & help from a number of people. I take my immense pleasure in expressing a whole hearted thanks to all the officials who guided me all the way through my training in the organization. I therefore take this opportunity to express my profound sense of gratitude to all those who extended their whole hearted help & support in carrying out the project work.

I would like to thank Madhu Silica Pvt Ltd. Bhavnagar which gave me a great opportunity to deeply understand about the chemical industry.

I express my gratitude to Mr. Vikram Thakker (Sr. GM - Operation) & Mr. Samir Mehta (Central Plant Coordinator) who guided me and provided the opportunity to get acquainted & helped me to know the various operations of the organization.

I even express my sincere acknowledgement to all the personnel of different departments whose informative guidance motivated me to understand various dynamics of the company.

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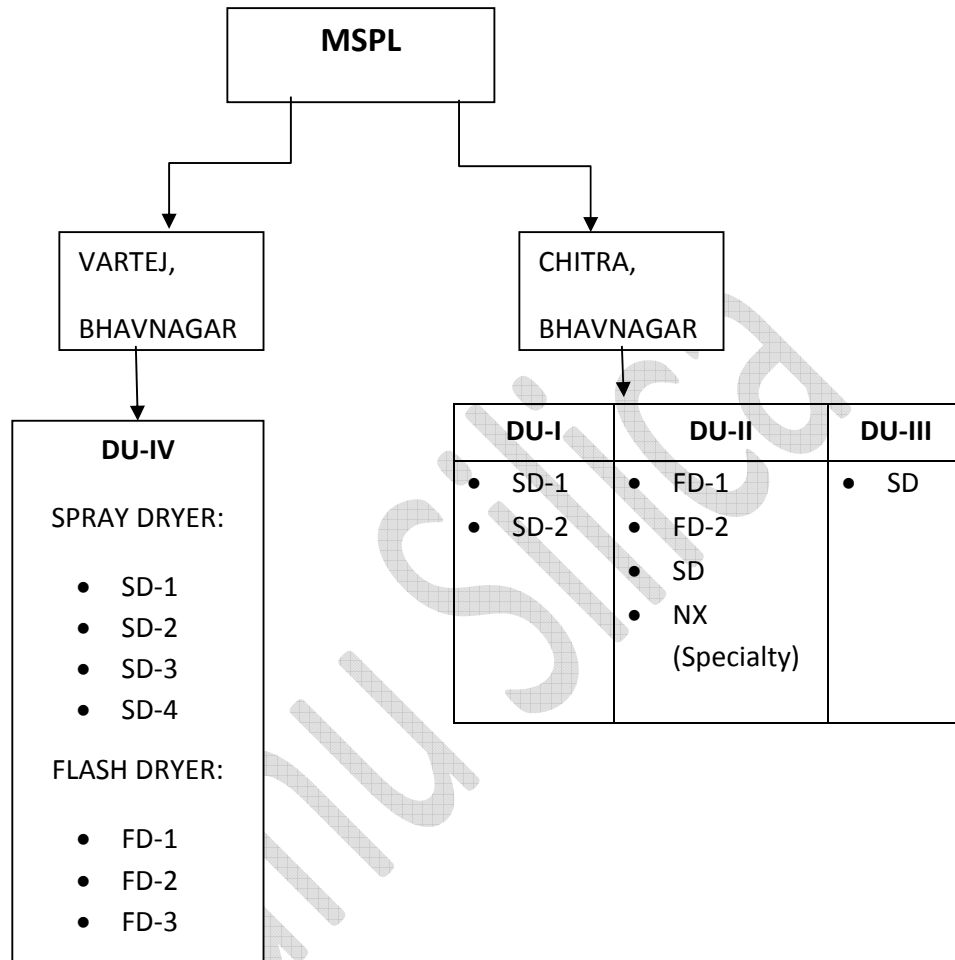
1. INTRODUCTION

- Madhu Silica Pvt. Ltd. (MSPL) is the largest manufacturer of Precipitated Silica's in India. The MFIL range of Spray and Flash dried Precipitated silica's today find usage in end applications in various industries. The company today manufactures more than 50 different grades of silica's for various end applications .The company has 4 established plants capable of manufacturing **2,00,000.00 MT** Precipitated Silica per annum.
- The Company today is ISO 9001:2015, ISO 14001:2015, OHSAS 18001:2007, ISO 22000:2005, FAMI-QS, FDA Certified and Registered for REACH & Certified by EcoVadis.

1.1 HISTORY:

- 1978: Diversified into Manufacturing Precipitated Silica from Calcium Carbonate.
- 1992: Establishment of Sister Concern, Aqua gel Chemicals (Bhavnagar) Pvt. Ltd. For manufacturing Precipitated Silica.
- 1996: Establishment of R&D Centre (DSIR, Government of India recognized centre) & commissioned new plant of Spray Dryer.
- 2006: Capacity of expansion of Flash Dryer & Spray Dryer units: DU-2 plants.
- 2009: Capacity expansion of spray dryer y establishing DU-3 plant. Becoming leading manufacturer of silica in India with 50,000 TPA capacity.
- 2010: Establishment of specialty plant.
- 2011: Establishment of New Green Field project DU-4 expanding silica manufacturing capacity by 45,000 MT/annum.
- 2013: Further expansion in DU-4 by 1, 00,000 MT/annum.
- The Company has therefore four established plants capable of manufacturing 2,00,000 MT/annum. And has also planned expansion of another 70000 MT/annum taking overall installed capacity to 270000 MT/annum by H1-2019.

1.2 Overview of Madhu Silica Pvt Ltd.



1.3 Products

Madhu manufactures around 50 different grades of precipitated silica. The end applications are:

PRECIPITATED SILICA:

- Tyres
- Oral health applications / cream
- Footwear/Railway pads
- Rubber rice rollers/conveyor belts
- Free flow salt/powdered mixes/food premixes/talcum powder
- Pesticides
- Detergents
- Paints & coatings
- Cosmetics
- Pharmaceuticals
- Silicone rubber
- Plastics
- Animal feed / poultry feed
- Dry bonding agents

ALUMINO SILICATES:

- Paint
- Paper
- Conditioning/anti caking & free flow

2. INDUSTRIAL SAFETY

2.1 List of Equipment

- Safety helmet
- Hand Gloves
- Goggles
- Safety Shoes
- Ear plugs
- Life jacket
- Fire buckets
- Electrical Gloves
- Gum Boots
- Mask
- Acid Proof Suit
- First Aid Kit



3. OVERVIEW

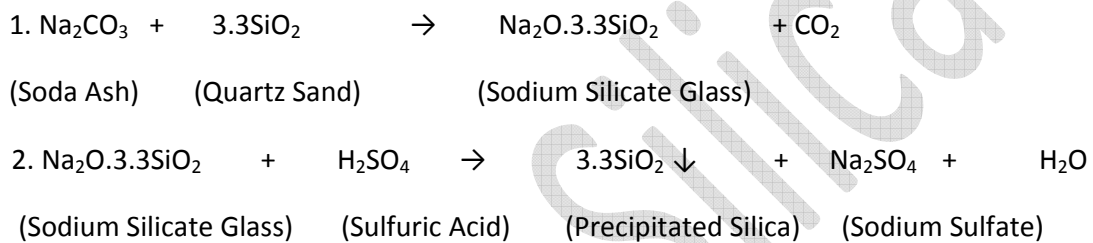
3.1 RAW MATERIAL :

1. Sodium Silicate Glass – Na_2SiO_3
2. Sulfuric Acid – H_2SO_4

3.2 FINISHED PRODUCT :

1. Precipitated Silica

3.3 CHEMICAL REACTIONS :



3.4 METHODS OF PREPARATION :

1. Spray Dryer
2. Flash Dryer
3. Pearl Dryer

3.5 PROCESS DESCRIPTION :

Inspected Raw material Sodium Silicate Glass, Process Hot Water from the RWTP (Raw Water Treatment Plant) and Steam at a pressure of 4-5 kg/cm^2 is charged into Melter (Pressure Vessel) and Liquid Silicate is obtained at 30 Baume. The liquid silicate obtained is sent to the Unloading tank. From the unloading tank it goes to the Settling Tank where settling of large and heavy particles takes place. Settling of the liquid silicate in the tank is for approx 18-22 hours. The liquid silicate is then transferred to the process holding tank. From here it goes to the respective reactors.

3.5.1 FLASH DRYER:

Sodium silicate, hot water, steam and Sulphuric Acid (diluted with cold water using static mixture) is charged to the reactor by maintaining the required parameters. The slurry obtained (8% solid) is transferred to the slurry holding tank after quality parameters check is done right. From the holding tank it is transferred to the Hydraulic Filter press unit. Here, filtration and washing of the reacted mass takes place using De-Chlorinated water coming from the De-Chlorination tank. The cake

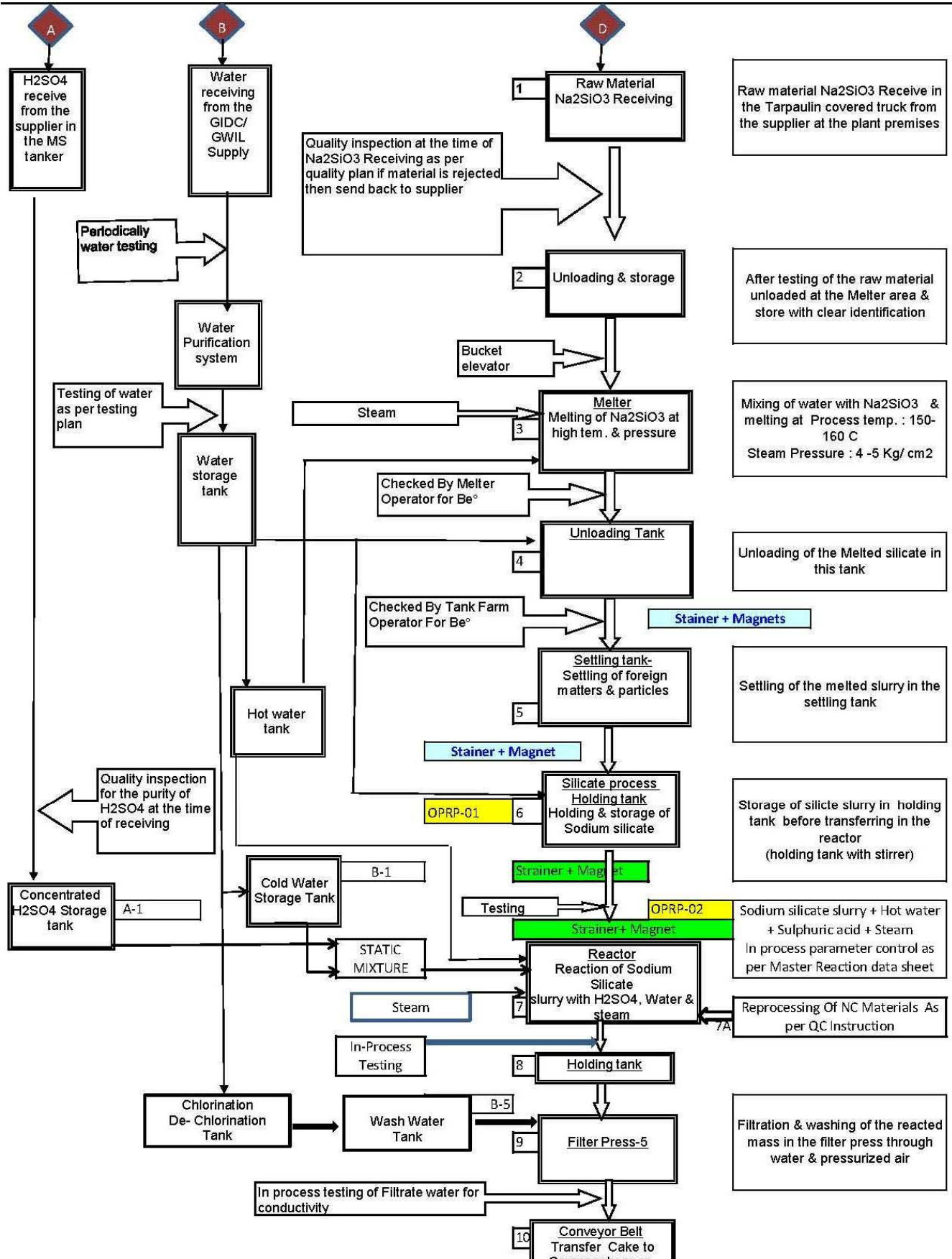
obtained is 20% solid. The filtrate of the permissible range is sent to the ETP. The cake via the conveyor belt is transferred to the Scrapper Hopper. From the hopper it travels to the paddle mixer which mixes the content of cake well.

Now, it goes to the cage mill – A High Speed Rotating Equipment with numerous pins which lowers down the size of the cake and simultaneously Hot Air (high temperature) from Coal Fired Hot Air Generator (CFHAG) dries the same. Cyclone is in close loop with the paddle mixer and the cage mill. It takes the heavy particles and recycles it back to the paddle mixer while the rest goes to the Bag Filter by ID fan. Here de-aeration of the particles takes place where compressed air is used for purging. Now the material is passed through vibrator shifter. From there it is sent to Intermediate Product Silo. Now the parameters of the finished goods are checked. Now from here it either goes to manual packing or silo transfer is given. Automatic packing is done. The packed goods are kept in the respective warehouse and dispatch is done accordingly.

Below is the Process Flow Chart for Flash Dryer Plant.

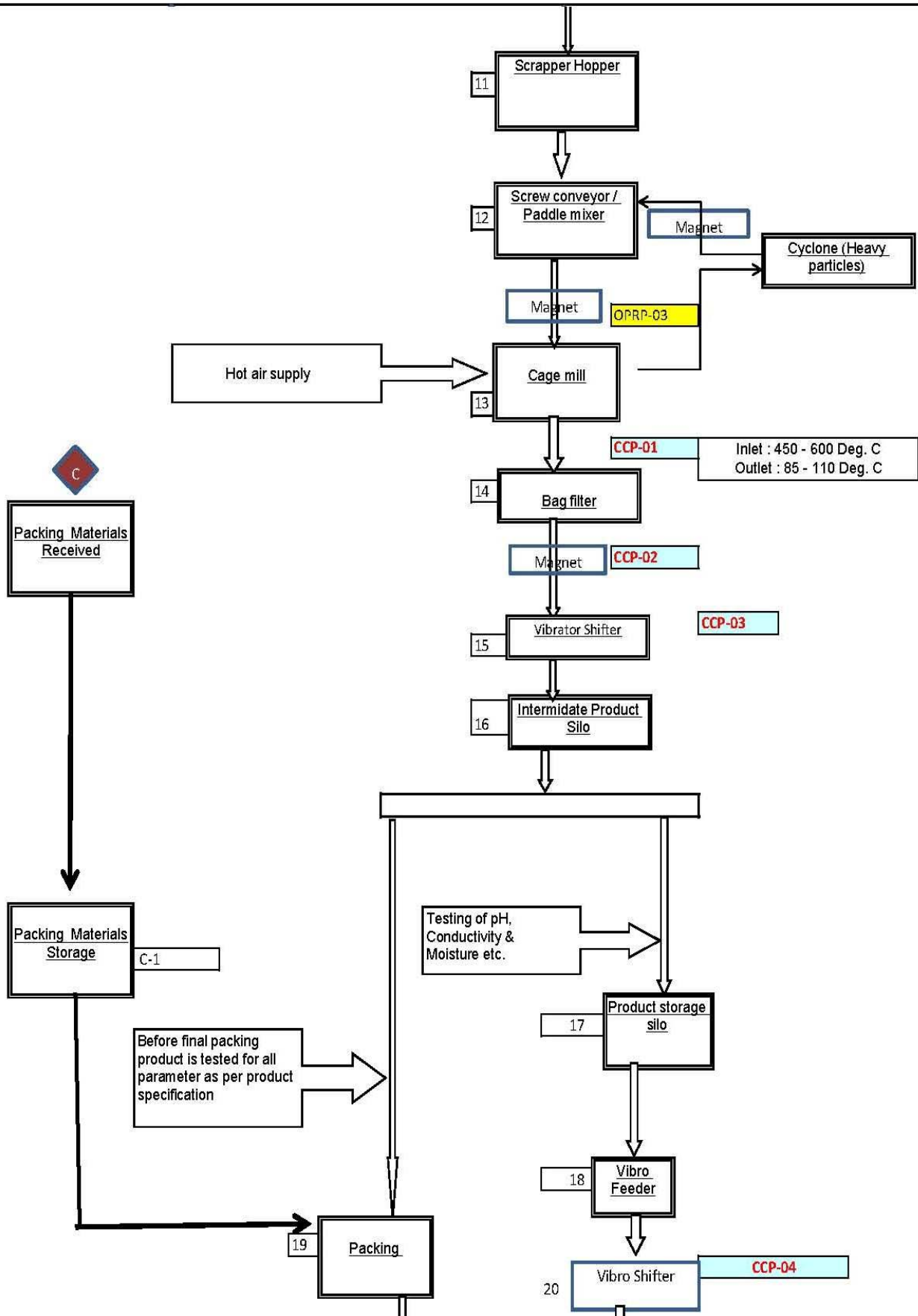
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PROCESS FLOW CHART OF SILICA FLASH DRYER -1 DU-IV VARTEJ



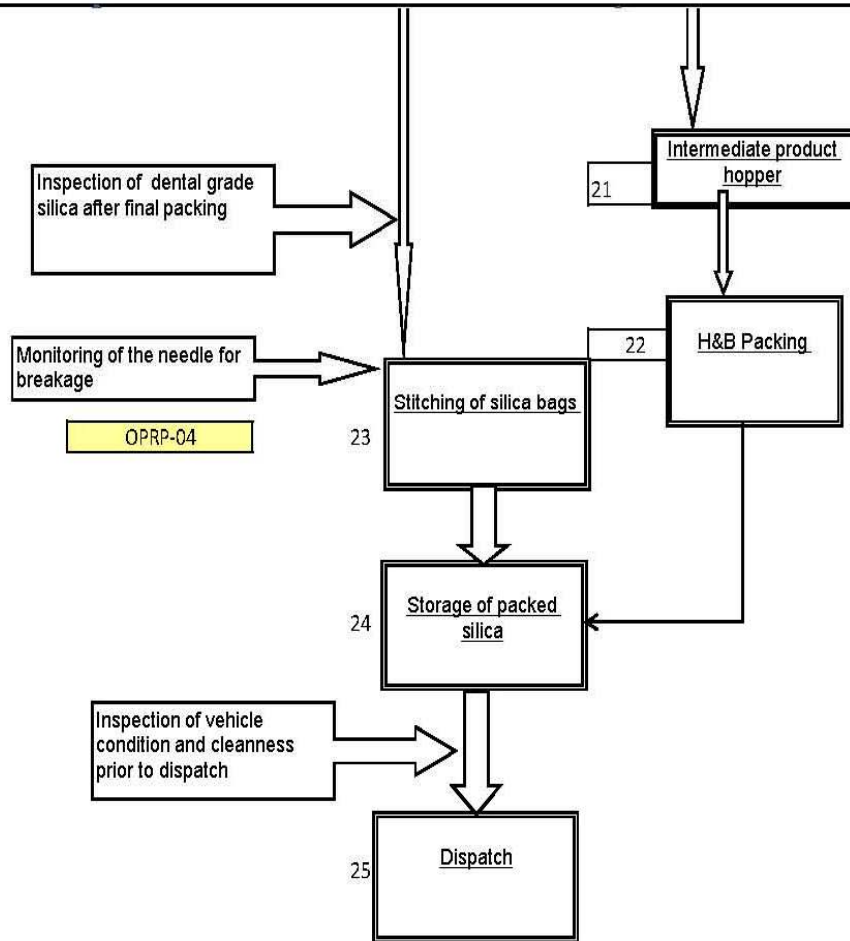
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PROCESS FLOW CHART OF SILICA FLASH DRYER -1 DU-IV VARTEJ



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PROCESS FLOW CHART OF SILICA FLASH DRYER -1 DU-IV VARTEJ



3.5.2 SPRAY DRYER:

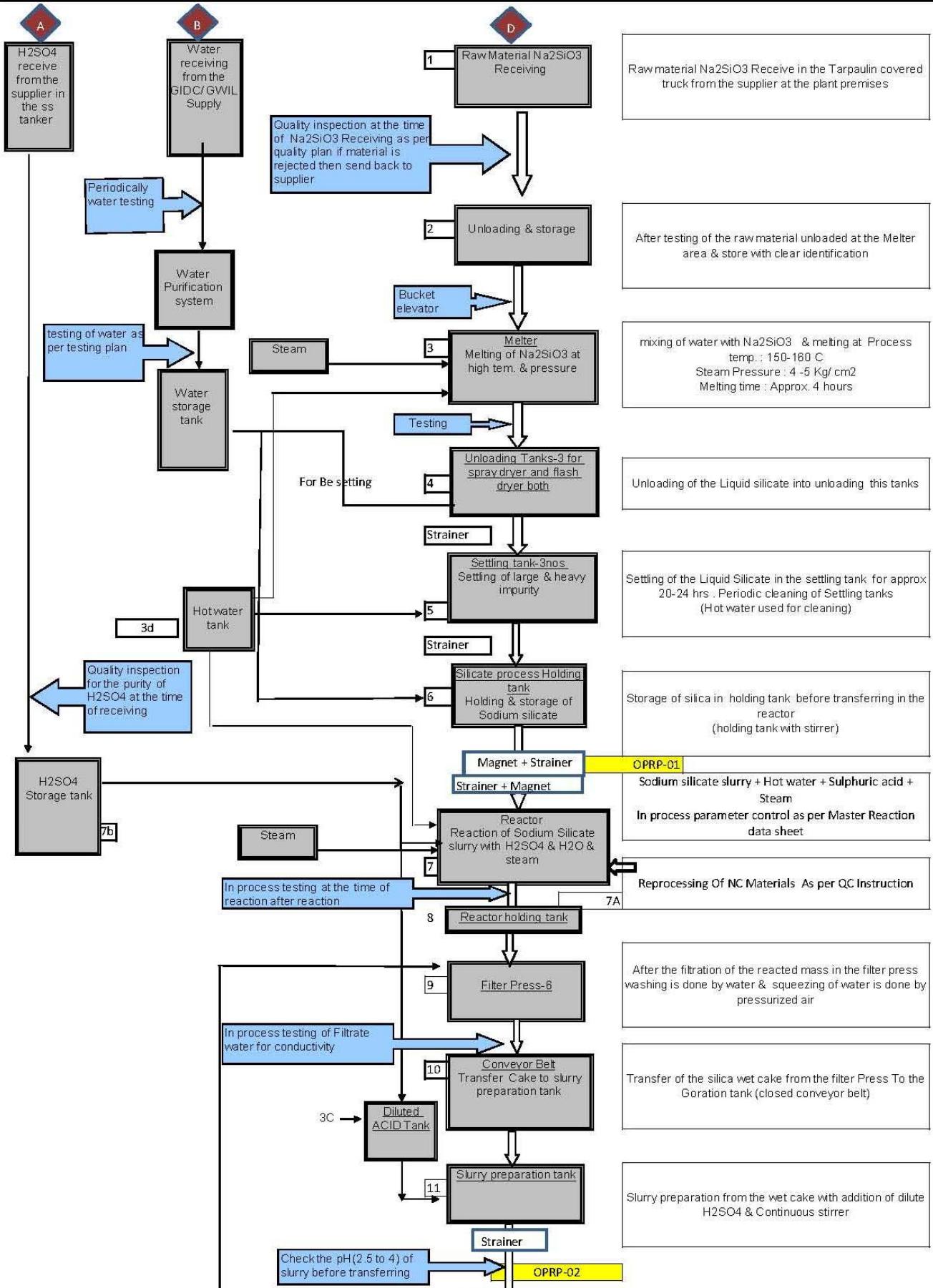
Sodium silicate, hot water, steam and Conc. Acid (98.1%) is charged to the reactor by maintaining the required parameters. The slurry obtained (8% solid) is transferred to the slurry holding tank after quality parameters check is done right. From the holding tank it is transferred to the Hydraulic Filter press unit. Here, filtration and washing of the reacted mass takes place using Fresh water. The cake obtained is 20% solid. The filtrate of the permissible range is sent to the ETP. The cake via the conveyor belt is transferred to the slurry preparation tank. The wet cake coming from the filter press is mixed with dilute acid by stirrer. This tank is known as the Goration tank. The Baume of the acid is maintained according to the required specifications. The slurry formed is then transferred to the slurry holding tank.

This pump able slurry then goes to the spray dryer and is sprayed using Atomizer Wheel. Hot air from CFHAG at a high temperature dries the sprayed slurry in a co-current manner. ID Blower takes the lighter particles from the chamber and de-aeration takes place in the Bag Filters. Compressed air is purged into the bag filters which remove the de-aerated particles from the bags and then through the vibro-shifters it goes to the product hopper. Ammonia dosing is done according to the required pH to be maintained. Packing of the product is done and shifted to the warehouse.

Below is the Process Flow Chart for Spray Dryer Plant.

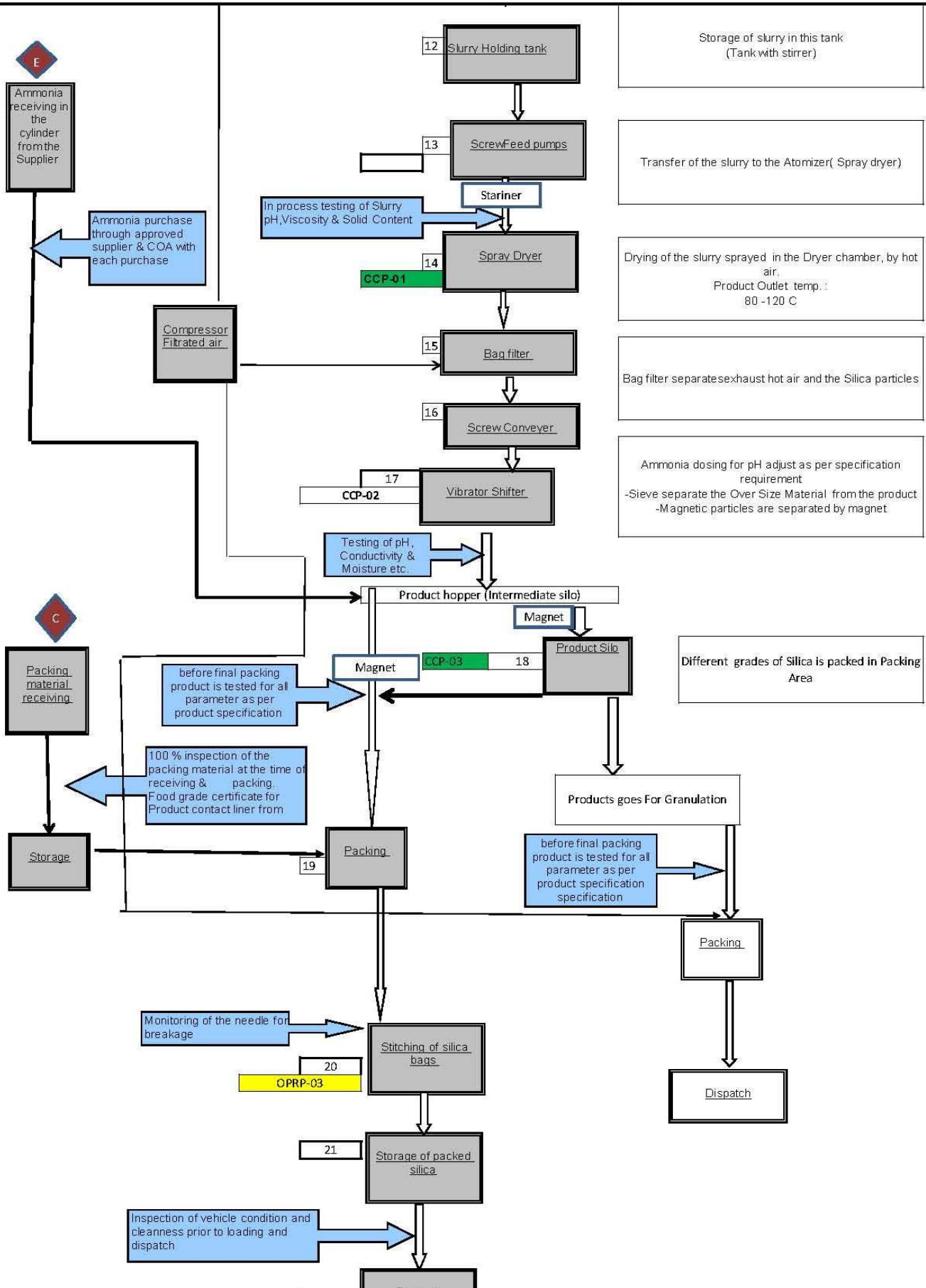
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PROCESS FLOW CHART OF SILICA SPRAY DRYER-1 DU- IV Vartej



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PROCESS FLOW CHART OF SILICA SPRAY DRYER-1 DU- IV Vartej



3.6 PACKAGING SECTION:

1. AHU has to be started in the packing area.
2. Material is coming into the product hopper from where the packing is done manually or silo transfer takes place.
3. Before packing critical parameters are to be checked by Q.C.
4. Before silo transfer, availability of compressed air @6kg/cm² through BRF filter should be there.
5. Regular packing is done in HDPE bags (woven with LDDP+LDPE liners). Also as per customer requirement paper bags, jumbo bags, EVA liners are used.
6. Material is packed under different Net Packing.
7. Bags are continuously monitored for no foreign matter and no print mistake.
8. Also labels are made according to the lots.
9. Packing is done both manually by stitching the bags and using cable ties for liners. Also automatic packing is done through automatic filling machines & automatic palletizing the same.
10. IPA & Virex spray is done on the hands of packer and also in the atmosphere in order to maintain the fresh air and no contamination goes to the finished product.
11. All the packed production is stored in the warehouse according to the lot number.
12. Also all the packed bags are stacked up on pallets. There are 3 types of pallets used according to customer specifications.
13. Pallets type : Jungle wood
 - : Pine wood
 - : Recycles plastic pallet
14. According to the norms the moisture content in the pallets has to be monitored for prevention of microbial growth as it is in direct contact with the finished goods bags.
Moisture content : Jungle wood : <30%
 - : Pine Wood : <20%.
15. Fumigation is done in the pallet storage room using Methyl Bromide.

4. UTILITY

Any Chemical plant requires raw materials in order to produce final products. It also requires various other services called utilities for smoothly carrying out the processes. Utility is neither a reactant nor product, but are required for maintaining adequate conditions of a manufacturing unit.

Utility includes:

1. **Raw Water Treatment Plant (RWTP) :**

- Raw water from various streams manifolds into the raw water tank. This raw water is treated via pre-treatments such as clarifier settling which helps in removing the suspended solids from the raw water.
- This Clarifier treated water is then passed through Dual Media Filter which further removes the suspended solids along with organics & traces of Chlorine.
- After this is the advance treatment using U/F (Ultra filtration) membrane process. The treated water is called as Permeate and is sent to the plants for Consumption.
- Also this permeate is sent to the Softener plant, which removes the hardness i.e. Mg & Ca salts.

2. **Coal Crusher & Boiler :**

- Raw Coal is crushed through size reduction equipment known as Hammer Mill using the principle of impact and collision with the wall of the milling chamber which thereby reduces the size of the coal to the desired specification.
- Boiler: It is used to create steam by applying heat energy (from a source of fuel say coal) to water.

3. **CFHAG (Coal fired Hot Air Generator):**

- Crushed coal (0-12 mm) from the Coal crusher is received. Through the bucket elevators it is transferred to the Coal Bunkers.
- Fuel particles are suspended in a bed of particulate materials such as sand.
- FD (Forced Draft) fan forces outside Air into the heating system. This provides the required oxygen for combustion. Hence causing fluidization. Heat is generated. Coal conveying Fan pushes the coal in the furnace.

- Process Air fan takes the cold air from the atmosphere into the tubes. Heat transfer takes place & the hot air is generated by Heat exchange. ID (Induced Draft) fan draws the flue gases from the system out into the atmosphere. The required temperature is obtained and is sent to the plant operations.

4. Air Compressor

5. Power Plant

Madhu Silica

5. Annexure

Sr No	Abbreviation	Full form
1	RWTP	Raw Water Treatment Plant
2	CFHAG	Coal Fire Hot Air Generator
3	FD	Flash Dryer
4	SD	Spray Dryer
5	FD fan	Forced Draft fan
6	ID fan	Induced Draft fan
7	PA fan	Process Air fan
8	UF	Ultra Filtration
9	ETP	Effluent Treatment Plant

CONCLUSION

It is well known that experience is the best guide. I understood the importance of training program during this period. During this time, I have come across a lot of new things along with understanding the complex process of manufacturing.

But apart from studies, I have also experienced the working atmosphere, how everyone is continuously trying to expand the capacity, maintaining the quality, fulfilling customer's satisfaction, process efficiencies, etc...

The basic fundamentals, how all the departments are integrated with one another and how all the departments are working together towards a single vision. I am very glad that I have such a good organization to learn from.

This project was a Golden opportunity for learning and self-development.