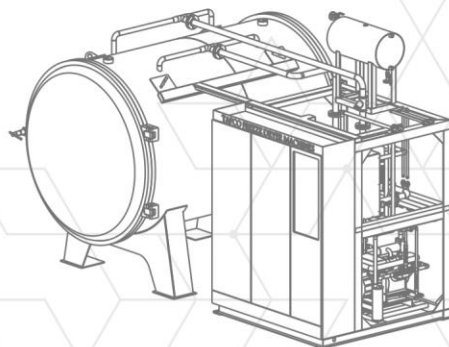
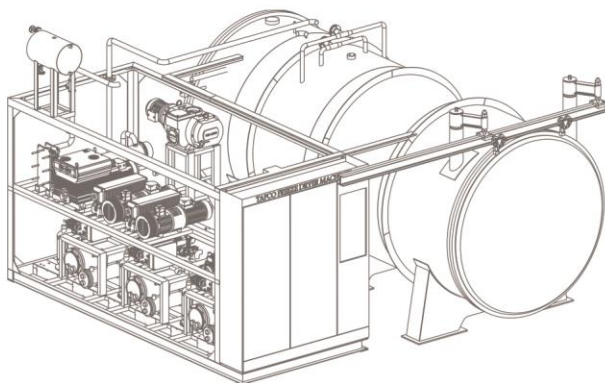




## Food Freeze Dryers



Parseh Freeze Dry  
Made In Iran



Takvin Azmayesh Parseh Company (Parseh Freeze dry) is the only designer and manufacturer of advanced food and pharmaceutical industrial freeze-dryers in the Middle East and West Asia. It was established in 2008 and works with the cooperation of experts and specialists in field of designing and manufacturing various advanced freeze dryer machines. Lyophilization or freeze drying is the most suitable, best and most advanced method for drying all kinds of food, pharmaceutical and chemical products.

**the most important features of this method are the following:**

- The possibility of keeping products at ambient temperature without the need for a cooling system, eliminating the cold chain and its costs.
- Bringing the moisture level of the materials to below 5% and deactivating the bacteria and enzymes which spoil the products, thus eliminating the risk of spoilage and product destruction.
- The aroma of products processed in this method is very similar to the raw material due to the vacuum sublimation process.
- Vitamins and other useful substances maintenance in foodstuff after drying.
- Maintaining the appearance of the product and not changing the noticeable volume of the dry material compared to the fresh one.
- The possibility of keeping and storing dry products along with balancing supply and demand in the market. (Such as egg powder, milk, etc.)
- Reduced shipping costs due to reduced weight.

Takvin Azmayesh Parseh Company, designs and manufactures freeze dryer machines in the food, pharmaceutical, biotechnology and research industries from half to two hundred and seven square meters of shelf area.

**Freeze dryers manufactured by Takvin Azmayesh Parseh are divided into 4 series:**

Food freeze dryers machine:

FD 20, FD 100, FD 200, FD 300, FD 500, FD 1000, FD 2000

Biotechnology freeze dryers:

BIO 12, BIO 120, BIO 240, BIO 360, BIO 600, BIO 1000

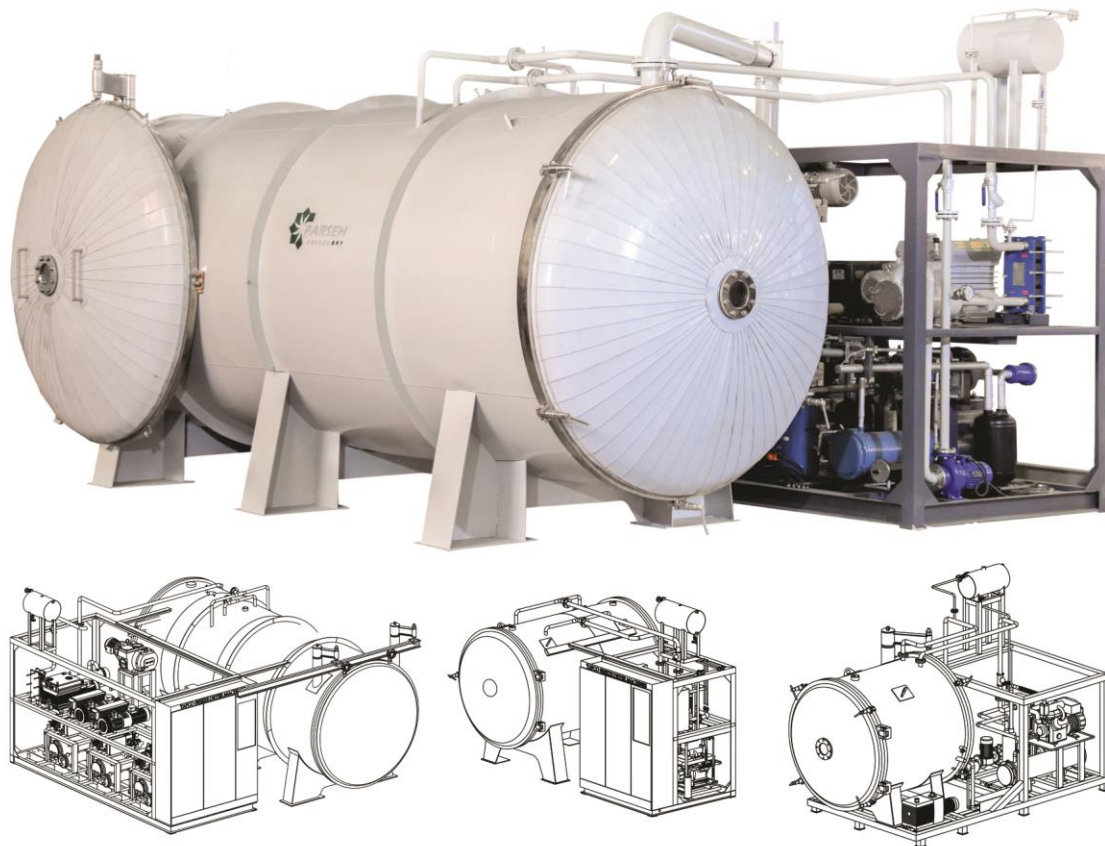
Pharmaceutical freeze dryers:

PHS1 (2 Type), PHS2 (2 Type), PHS3 (4 Type), PHS4 (2 Type), PHS5 (3 Type)

Pilot freeze dryers machines:

PFD -S1, PFD-S2, PFS-S3, PFD-S4

Our cooperation strategy focuses on the requirements and needs of customers. This company designs and manufactures freeze dryers by analyzing the customer's needs and the latest GMP requirements of CFRPART1121. All the requirements of the ISO 9001-2015 quality management system have been established on the design and production processes, and the export license to Europe (CE) has been obtained, and all the required technical and quality documents are provided to the customers. The quality of all components, systems and sub-systems and products is managed and controlled in an integrated process, and the products of this company are of very good quality as certified by customers and experts. All the products of this company have a one-year warranty and ten years of after-sales service, also professional and specialized training for machine usage is provided to the customers. necessary consultations are provided to customers in processing methods and the company is with its customers from the beginning of the project to its final result. The aim is to create complete confidence and meet the quantitative and qualitative demands of customers based on the latest requirements and achievements of technology and innovation.



## What is freeze drying process?

### History:

During World War II, Americans used vacuum freeze-drying method to dry blood serum for the first time. In the years after the World War, the use of this technology in pharmaceutical industry was remarkably developed, and the first recorded industrial use of vacuum freeze-drying in food industry was carried out by the Brazilian government for drying coffee in 1937. Nowadays, there are more than 400 types of dried food.

### Stages of the process: Preliminary stage: preparing the product for drying

Preliminary steps mean all the preparation processes of the product before entering to the freeze dryer machine. These steps include washing, coring, peeling, chopping, steaming, cooking, etc. Based on the product to be dried, different preliminary processes may be performed on it.

### The main step: drying the product

The main stages mean the three steps of drying the product in freeze dryer machine, which includes these stages:

**Freezing:** This stage usually takes 4 to 6 hours. For most common fruits, the freezing temperature is  $-30$  to  $-35$  °C. In small machines, product freezing is done on the heating cooling plates (Shelves) and in large machines, freezing is done in the Quick-Freezing Room.

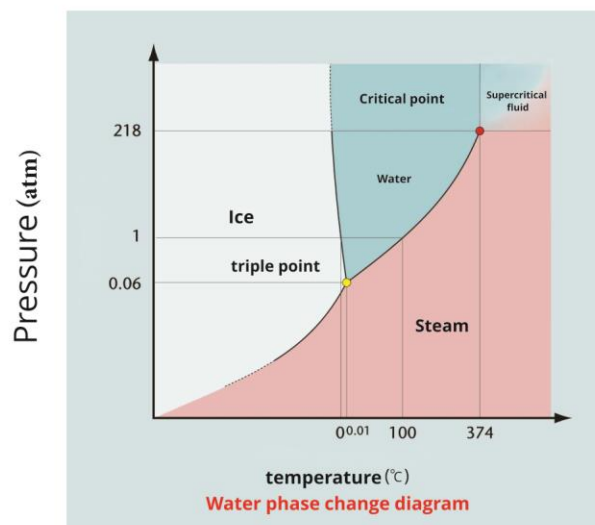


### Primary drying (main one):

In case of foodstuff, this process usually takes 10 to 16 hours. At this stage, the interstitial moisture of product is separated through the process of sublimation (turning ice into steam) and sticks to the steam condensing tubes (Ice Condenser). In order to carry out the sublimation process, the chamber of the machine must be placed in a very low vacuum pressure and the latent heat of sublimation is also transferred to the product through the cooling and heating plates. At this stage, about 90% of the product's moisture will be removed.

### Secondary drying:

After the primary (main one) drying process is completed, secondary drying will be done. In this stage, based on the elimination process that occurs through the maximum decrease in vacuum pressure (usually less than 0.05 mbar) and the maximum increase in temperature (usually between 45 to 60°C). The moisture inside the tissue of the product will be removed and the process takes 2 to 4 hours for foodstuff. After this process, the residual moisture of the product is usually between 3 and 5%.



### Final steps: product inspection, packaging and storage:

The final stage means the process of unloading the product from the machine, quality inspection, separation, packaging and storage. Inspections include visual inspection (appearance, color and taste), product moisture percentage test, nutrient testing, microbial controls, etc. In case of packaging, manual methods or semi-automatic or automatic packaging machines (depending on the capacity of the product) are usually used. Packaging of freeze-dried products is usually done in three-layer packets. The storage warehouse of the final product should be cool and the packages should not be exposed to direct sunlight.

## **Familiarization to the quality of Takvin Azmayesh Parseh freeze dryers:**

### **1- The quality of machine production:**

The best quality of L304 stainless steel materials is used in the construction of the chamber, doors, heating and cooling plates, steam condenser, hinges and clamps. All internal surfaces of the chamber, heating-cooling plates and steam condenser are polished by automatic mechanical polishing devices to about 0.8mm for the sake of health requirements, and electro-polishing is done on all welds. The side body of the chamber and the external surface of the doors are insulated using polymer and elastomeric insulation and covered with a high-quality and very elegant steel cover.

### **2- Refrigeration system of the machine:**

The compressors used in the device are selected from the best and most up-to-date brands in the world, and also the latest technologies in the field of refrigeration are used in this sector. FD20 to FD300L machines use piston cylinder compressors and FD300 to FD2000 ones use screw compressors. The expansion valves in all devices are of electronic type, which are the latest technology in the world. In the design of the refrigeration system, it is possible to use the cooling part of the refrigerant as water-cooled or air-cooled (depending on the customer's choice).

### **3- Heating transfer system of the machine:**

In this section, an intervening fluid is used to transfer cold from the refrigeration system (heat from the heating system) to the heating-cooling plates. Heating transfer between the refrigerant gas and the intervening fluid is done in an exchanger plate. The intervening fluid is rotated in the circuit by a circulator pump with the best quality and brand, and all lines and piping in this section are made of L304 steel.

### **4- Machine vacuum system:**

The process of vacuuming the chamber is done by using the combination of Rotary and Roots vacuum pumps with high quality. The amount of vacuuming in the chamber is measured instantly using a Pirani sensor. The thing which is important in this section is the allowed vacuum leakage rate in the chamber, the proper suction capacity of the pumps, and the optimal performance of the steam condenser system to prevent steam from entering the vacuum pumps. The remaining moisture in the product is dependent on the final amount of vacuum that can be achieved, and the final vacuum of the machine is related to the complete and correct functioning of the effective parts in the vacuum section.

### 5- Machine control system:

The control of the machine is done using PLC and the user of the machine monitors the operation and drying process through an industrial monitor (HMI). The control system executes the processes automatically along with stores and displays the data. In fact, the process of drying a product is retrieved and executed automatically every time in the form of a saved program (written and saved easily by the user). All the warnings that have been occurred are displayed in the alarm window, and in a critical situation, measures are automatically taken to prevent product damage and failure, and the process continues after the cause of the error is fixed. The ability to display and control through the software installed on mobile phones or web pages is also provided so that the user can monitor and control the performance of the machine from everywhere.

### Products that can be dried with a freeze dryer:

Today, all kinds of fruits, vegetables, meat, fish and seafood, dairy products, medicinal plants, natural colors and flavorings, all kinds of soups and ready-meals, etc. can be found in the market in a freeze-dried form. These products can be used in various industries such as fruit snacks, breakfast cereals, soups and ready-meals, chocolate making, ice cream making, natural syrup powders, various flavored dairy products, as well as natural colors and flavorings.





### Freeze-dried fruits and vegetables:

Fruits and vegetables can be dried by freeze drying process. In this method, vitamins, antioxidants, enzymes and all kinds of nutrients present in fresh fruits and vegetables remain in the dried ones. These products can be stored at room temperature for at least two years. There will be not too much changes in the structure, color, aroma and flavor of the primary fruit and vegetable. Freeze-dried fruits and vegetables do not have any additives or preservatives and are very popular in the world, and the number of consumers of these products increases every year. Fruits such as strawberries, peaches, apricots, figs, pears, apples, bananas, mangoes, pineapples, nectarines, etc. Vegetables such as peas, bell peppers, broccoli, carrots, beans, corn, etc. can be freeze-dried and marketed with very light weight in suitable packaging. Dried fruits enter the market in the form of fruit snacks or are used in various food industries such as the production of breakfast cereals (bulky breakfast cereals), chocolate industries, cookies, sweets, natural juices and various fruit teas. Dried vegetables with the properties of fresh vegetables with wonderful aroma and taste are used in the production of soups, fast foods, sauces and seasonings.



### Benefits of freeze-drying method:

- Preservation of the primary physical and chemical structure of food.
- Preservation of vitamins and antioxidants and other biomolecules in food.
- Storing food at room temperature without the need for refrigeration for at least 2 years.
- Persistence of aroma and taste of products.
- Removal of preservatives and additives.
- Very lightweight of the products and easy transportation without the need for a cold circuit.

### Freeze-dried dairy products:

All kinds of yogurt with fruity and simple flavors in the form of powder or lumps, all kinds of cow, camel and goat milk, all kinds of ice cream, cheese, curd, etc., freeze-dried in different packages for food and supplements are produced and offered in the market. These products are free of any additives and preservatives. Freeze-dried products have a lifetime of at least 10 years with a unique aroma and taste. Due to the removal of water, these products do not need a refrigerator and can be stored at ambient temperature without the growth of any microbes. By consuming freeze-dried dairy products, all the body's need for dairy products and calcium will be provided and it will bring a pleasant and special experience.



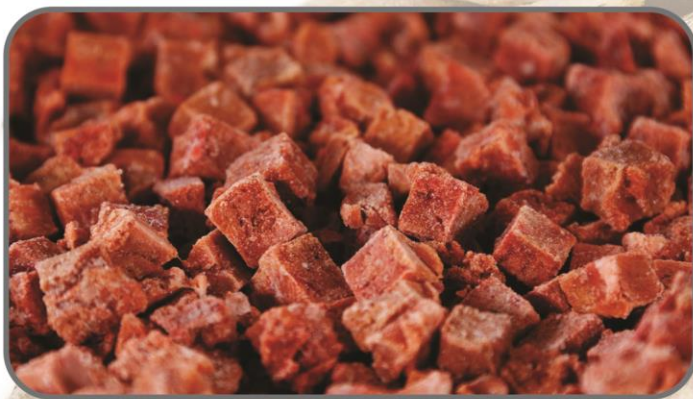
### Medicinal herbs and freeze-dried saffron:

Freeze drying is one of the best processes among the methods of drying aromatic vegetables and medicinal herbs such as oregano, saffron, thyme, rosemary, mint, garlic, celery, basil, lemon, spices, saffron, tea, coffee, etc. Compared to traditional drying methods, in this way, the effective ingredients of the plant remain unchanged and the durability of the product's aroma and flavor is much higher and also it is free from any microbial contamination. All types of sprouts can also be dried with a freeze dryer. The sprouts of plants such as wheat, alfalfa, lentils, broccoli, etc., which are dried with this machine, contain live enzymes and have all kinds of nutrients needed by the body and antioxidants, which are used in the production of supplements. Also, the sprouts will be presented to the consumers in powdered forms. Freeze-dried saffron has a very wonderful aroma and its fragrance lasts longer, because the water inside the tissue is dried with this method, and since the water in saffron turns crocin (the aromatic substance of saffron) into an odorless substance. As a result, the durability of saffron aroma is much higher than the thermal method. The volume of dried flower's stamen in this method is more than drying with heat, which is important from a commercial point of view.



### Freeze-dried protein products:

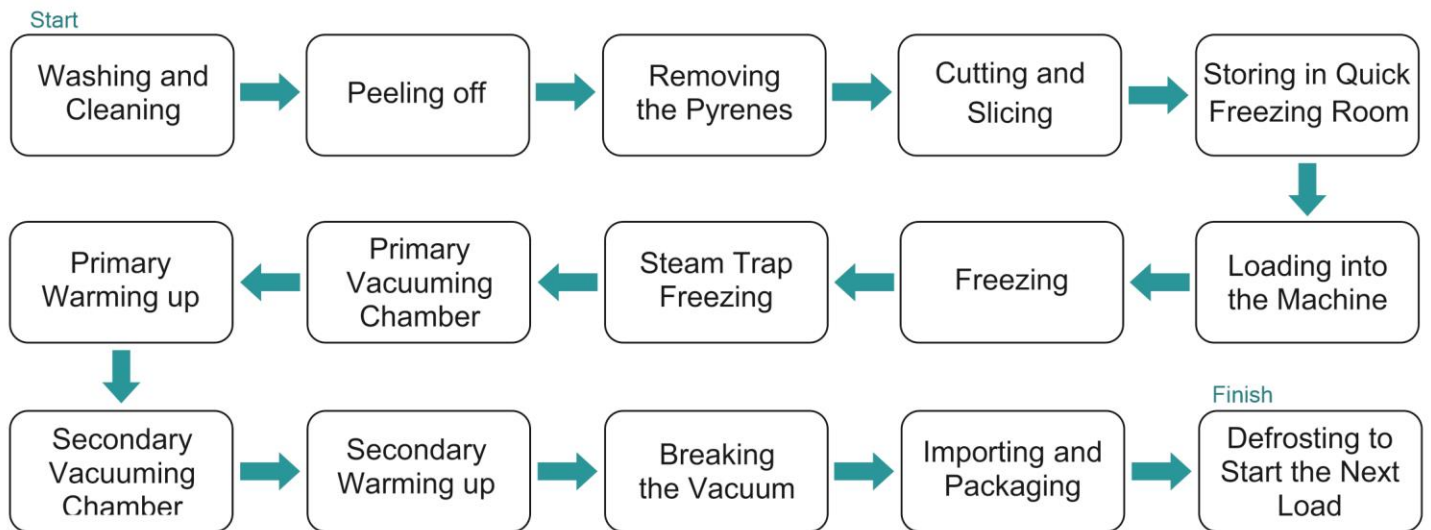
Freeze-drying is one of the advanced methods for processing protein products. In this method, all kinds of protein products can be dried without the need of any additives and the maintenance of the product can be increased. As you know, the additives and preservatives present in all kinds of canned foods are harmful to human health, and freeze-dried products are free of such substances. This point has caused the increasing popularity of these products in the world. Among other advantages of freeze-dried products, it is possible to mention the long-term preservation of nutrients, taste, color and basic structure of these products, storage at ambient temperature without the need for refrigeration, reducing costs and transportation risks. All kinds of red meat, chicken, fish, raw or cooked and ready to eat, will be freeze-dried and offered to the market in different packages for food consumption. Also, shrimp as a very nutritious food, freeze-dried with high maintenance, low moisture, unique aroma and taste, and preserving all nutrients and vitamins, is available in all places far from the sea.



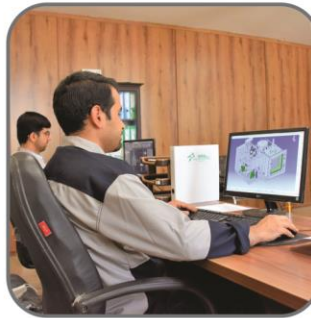
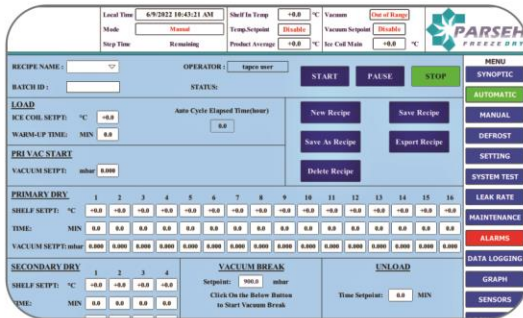
### Freezer dryer specification table ( Food series)

| Food Freeze Dryer                 |  |                          |                          |                          |                          |
|-----------------------------------|--|--------------------------|--------------------------|--------------------------|--------------------------|
| Model                             | FD20   | FD50                     | FD100                    | FD200                    | FD300LT                  |
| (Approximate Dimensions)          | 1.2W*1.6H*1.6L (m)   | 1.5W*2.7H*2L (m)         | 2W*2.7H*3.5L (m)         | 2W*5L*2.7H               | 4.5W*3.2H*4.5L (m)       |
| (Chamber Material)                | AISI 304L Stainless Steel  |                          |                          |                          |                          |
| Selves Materials                  | AISI 304L Stainless Steel  |                          |                          |                          |                          |
| (Ice Condenser Coils Material)    | AISI 304L Stainless Steel  |                          |                          |                          |                          |
| (Number of Shelves )              | 5+1  | 7+1                      | 8+1                      | 9+1                      | 24+2                     |
| Shelf Dimension                   | 390*1030 mm  | 585*1220 mm              | 1200*1200 mm             | 1000*2400 mm             | 1200*1200 mm             |
| (Shelf Spacing)                   | 45mm   |                          |                          |                          |                          |
| (Total Useable Sublimation Area)  | 2m <sup>2</sup>  | 5m <sup>2</sup>          | 11.5m <sup>2</sup>       | 21.6m <sup>2</sup>       | 34.5m <sup>2</sup>       |
| Shelf Temperature                 | -45 °C ~ +70°C   |                          |                          |                          |                          |
| (Product Freezing Method)         | Silicone Oil /In Place   |                          |                          |                          |                          |
| (Ice Condenser Capacity)          | 24kg/Batch   | 60kg/Batch               | 120kg/Batch              | 240kg/Batch              | 360kg/Batch              |
| (Final Ice Condenser Temperature) | -70 °C   |                          |                          |                          |                          |
| (Refrigeration Cycle Type)        | 2 Stage Compressors, Electronics EXV, Water Cooled Condensers/ Air Cooled (Option) |                          |                          |                          |                          |
| (Ultimate Pressure in Chamber)    | ≤ 0.02mbar   |                          |                          |                          |                          |
| (Chamber Vacuum Rate)             | Atm. to 0.5 mbar ≤ 30min   |                          |                          |                          |                          |
| (Control of Machine)              | PLC&HMI  |                          |                          |                          |                          |
| (Power Requirement)               | 6 KW, 380V,<br>3Ph,50Hz  | 18 KW, 380V,<br>3Ph,50Hz | 24 KW, 380V,<br>3Ph,50Hz | 34 KW, 380V,<br>3Ph,50Hz | 54 KW, 380V,<br>3Ph,50Hz |
| (Defrost System)                  | By Hot Water/Automatic (Option)  |                          |                          |                          |                          |
| (Approximate Weight)              | 850kg  | 2200kg                   | 4200 kg                  | 6500kg                   | 9500kg                   |

| Food Freeze Dryer                 |  |                       |                        |                        |
|-----------------------------------|--|-----------------------|------------------------|------------------------|
| Model                             | FD300  | FD600                 | FD1000                 | FD2000                 |
| (Approximate Dimensions)          | 4.5W*3.2H*4.5L (m)   | 5W*4H*6L (m)          | 5W*4H*12L (m)          | 6W*4H*16L (m)          |
| (Chamber Material)                | AISI 304L Stainless Steel  |                       |                        |                        |
| Selves Materials                  | AISI 304L Stainless Steel  |                       |                        |                        |
| (Ice Condenser Coils Material)    | AISI 304L Stainless Steel  |                       |                        |                        |
| (Number of Shelves)               | 24+2   | (14+1)*2 Module       | (15+1)*3 Module        | (23+1)*4 Module        |
| Shelf Dimension                   | 1200*1200 mm   | 1500*1500 mm          |                        |                        |
| (Shelf Spacing)                   | 40mm   |                       |                        |                        |
| (Total Useable Sublimation Area)  | 34.5m <sup>2</sup>   | 63m <sup>2</sup>      | 101m <sup>2</sup>      | 207m <sup>2</sup>      |
| Shelf Temperature                 | -30 °C ~ +70°C   |                       |                        |                        |
| (Product Freezing Method)         | Quick Freezing Room  |                       |                        |                        |
| (Ice Condenser Capacity)          | 360kg/Batch  | 720kg/Batch           | 1200kg/Batch           | 2400kg/Batch           |
| (Final Ice Condenser Temperature) | -55 °C   |                       |                        |                        |
| (Refrigeration Cycle Type)        | Screw Compressors, Electronics EXV, Water Cooled Condensers/ Air Cooled (Option) |                       |                        |                        |
| (Ultimate Pressure in Chamber)    | 0.05mbar (5Pa)   |                       |                        |                        |
| (Chamber Vacuum Rate)             | Atm. to 1mbar ≤ 30min  |                       |                        |                        |
| (Control of Machine)              | PLC & HMI  |                       |                        |                        |
| (Power Requirement)               | 48 KW, 380V, 3Ph,50Hz  | 96 KW, 380V, 3Ph,50Hz | 145 KW, 380V, 3Ph,50Hz | 220 KW, 380V, 3Ph,50Hz |
| (Defrost System)                  | By Hot Water/Automatic (Option)  |                       |                        |                        |
| (Approximate Weight)              | 9500kg   | 12000kg               | 18000kg                | 34000kg                |



| Stages Of Freeze-Drying Strawberries                         |                                 |
|--|---------------------------------|
| The Target Time  | The Process                     |
| 30 mins  | Wiping and Cleaning the product |
| 60 mins, For Some Fruits                                     | Peeling off the product         |
| 30 mins, For Some Fruits                                     | Removing the pyrene of product  |
| 30 mins, Cutting raw materials into Pieces smaller than 10mm | Cutting and Slicing of product  |
| 4 hours, the initial Freezing                                | Storing in Quick-Freezing room  |
| 20 mins, Putting the slices on the shelves                   | Loading into the Machine        |
| 3 hours of complete Freezing                                 | Freezing the product            |
| 30 mins to absorb vapors obtained from sublimation           | Steam trap Freezing             |
| 30 mins, Reaching low Pressure                               | Primary Vacuuming Chamber       |
| 10 to 16 hours, initial acceleration of sublimation          | Primary Warming up              |
| 20 mins to reach a complete vacuum                           | Secondary vacuuming Chamber     |
| 3 hours, secondary acceleration of sublimation               | Secondary Warming up            |
| 10 mins  | Breaking the Vacuum             |
| 30 mins  | Importing and Packaging         |
| 30 mins to 1 hour to start the next load                     | Defrosting                      |
| The information is general and is different for each product |                                 |



# Honesty, commitment, quality

The science-based Takvin Azmayesh Parseh company (Tapco Arak), was established in 2008. In September 2013, it was included among the country's science-based companies right after the evaluations by the Vice President of Science and Technology, on the subject of designing and manufacturing industrial freeze-dryer machines. Currently, it has been evaluated as a high national level science-based company in production. In 2015, this company presented the country's first industrial freeze-dryer machine, which took about 32 months to design and manufacture. As a result, the country became one of the owners of the technology to design and manufacture food and pharmaceutical industrial freeze-dryer machines in the world. Also, relying on the technical ability and many years of experience of its managers and personnel, this company is trying to be one of the leaders in the industry of designing and manufacturing advanced food and pharmaceutical machines in the world. TAPCO company announces its preparation to serve in the field of pharmaceuticals and advanced food processing by designing, manufacturing and installing more than dozens of industrial freeze dryers with different capacities. And so far, it has succeeded in obtaining ISO9001-2015 standards, certificate of export license to Europe, CE, and ISO TS/18110 standard certificate in the field of designing and manufacturing of freeze dryer. Freeze dryer is a strategic product that is widely used in various industries, especially in pharmaceutical and food industries, which due to the existence of an expert and committed engineering team in TAPCO company, there is no need for any concerns in technical and processing issues for customers. So far, this company has been able to meet all types of freeze dryer machines in accordance with the needs of customers and GMP requirements and the latest international production standards and all the needs of pharmaceutical, food, chemical, etc. companies for freeze dryer machines in any type of industrial capacity and requirement.

The company's goals include the followings, which are always followed by the company's managers:

- Providing the quantitative and qualitative demands of customers and improving the quality level of manufactured products.
- Research development and up to date technology achievements.
- Expanding domestic sales markets as long as reaching foreign and export markets.

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