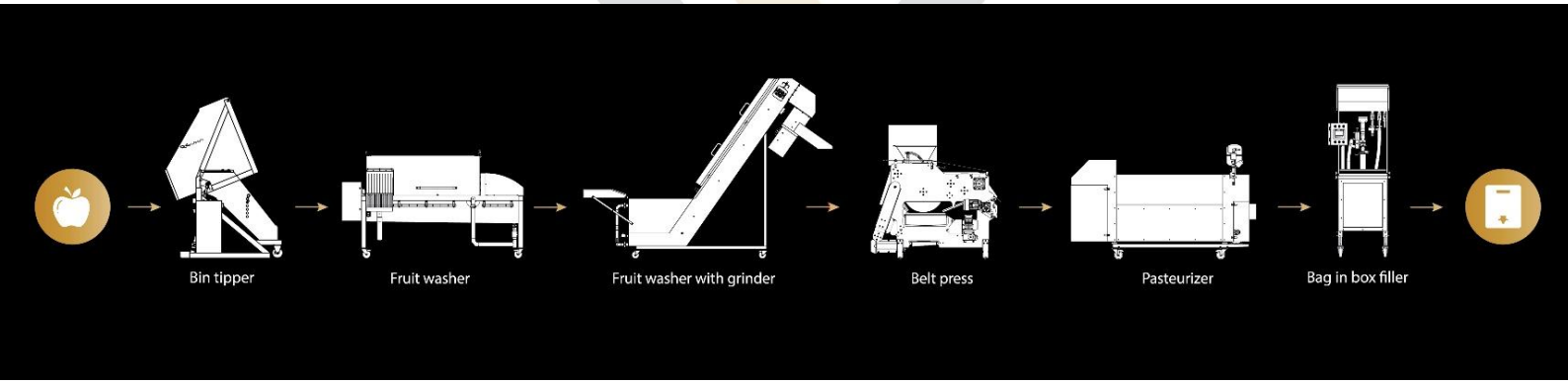
FRUIT DRYER

Original Instruction Document



JSC/UAB PROFRUIT MACHINERY

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INFORMATION ABOUT MANUFACTURER

Manufacturer: UAB ProFruit Machinery

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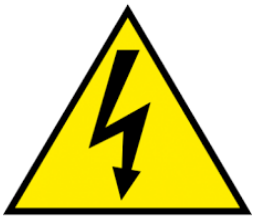
1.1. Warning signs

There are special warning and prohibition signs put on the machines which are meant to inform the user about danger and keep everyone – people and machinery – safe at all situations. The meaning of each sign is described below.



Control console.

High voltage

Safety glasses required

Work shoes required

Work gloves are required

Hot surface.
Risk of getting burned.

2. GENERAL REQUIREMENTS

General instructions:

- Ambient air temperature +8...+35º C.
- Relative humidity (when temperature +25 ºC) up to 70%.
- Atmospheric pressure, kPa 84-107.
- The Law on Occupational Safety and Health of the Republic of Lithuania, the General Provisions and Safety Instructions for the Use of Work Equipment and the Laws on Occupational Safety and Health of the European Union must be observed while using the machine.

FRUIT DRYER

Fruit dryer option is the perfect solution for to dry fruits, vegetables, and all agricultural products harvested. Also medicinal herbs, tobacco, wood.

Features:

- Mounted on pivoting wheels.
- Insulated heating chamber to save the energy and temperature.
- Works with different food products.
- Automatic temperature and time control.
- Water overflow and water collection protection.
- Fast and easy loading and unloading drying shelves.
- Made of stainless steel.

With closed-loop dehydration, we place the material to be dried inside a heat-preserved insulated drying chamber. The circulating hot and dry air first absorbs the moisture inside the material and passes through a cold panel in the dryer.

Then the moisture is condensed into water and released from the drying chamber. Because no hot vapor is lost during the drying process, no energy is wasted.

Therefore, the closed-loop heat pump dehydration dryer is highly efiicient with low energy consumption. With one kilowatt of electricity, it can remove 3.5 kilograms of water from the material, compared to only 1.2 kilograms of water using the traditional open-loop drying method.

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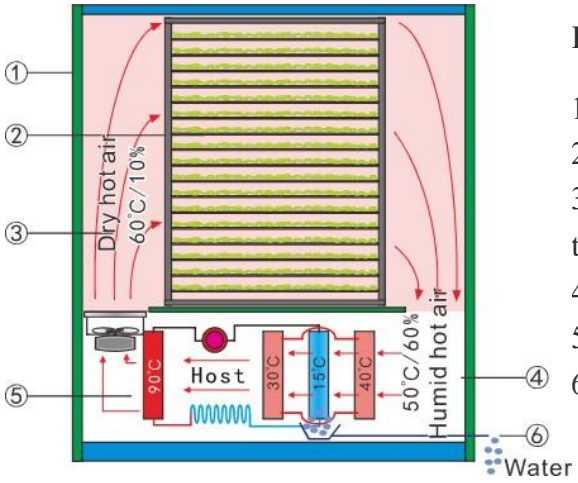

Description of Parts:

1. Drying house;
2. Material to be dried;
3. Hot and dry air (do not block the space 800mm from the bottom of the drying house);
4. Hot and humid air;
5. Core body of the dryer;
6. Condensed water (released from the drying chamber).

As illustrated by the above figure, the compressor inside the heat pump dehydration dryer forms a 15°C cold panel and a 90°C hot panel. Circulated by a fan, the air inside the drying chamber first passes through the hot panel to become 65°C hot air. The hot air then heats the material to be dried, absorbs its moisture, and becomes 55°C hot and humid air. When it passes through the cold panel, the moisture in the air is condensed into water and released from the chamber. After dehydration, the air passes through the 90°C hot panel again to become 65°C hot air, and the whole process starts again. As the process repeats, more and more moisture in the material is removed and eventually the material becomes dried.

The closed-loop heat pump dehydration drier eradicates all problems associated with the traditional open-loop drying method. It has the following unique features:

- Only water is released from the drying house; no energy is wasted (100% energy recycled). High efficiency (several times more efficient than the traditional open-loop drying method).
- Outside pollutants cannot get into the drying chamber. This keeps the material extre- mely clean.
- The active ingredient in the material will not be lost. This greatly improves the quality and class of the dried material.

- The dryer can be programmed to perform fast drying in low temperatures, helping maintaining the good quality and appearance of the dried material.
- The material will not deteriorate during the drying process.
- Strong air circulation leaves no dead spot and guarantees uniform drying.
- Drying temperature, humidity and length can be programmed by stage.
- Layer-rack drying structure, together with different trays, makes the dryer adaptable and flexible.

Attention! It is mandatory to wash off the device before starting it for the first time.

It is important to eliminate any manufacturing residues and the dust which has built up on the surface, taking care not to wet the electrical parts and keeping the power supply cable disconnected.

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Machinery specification and drawings

Model	Fruit drayer
Designed power input	1.1 kw
Maxi mum power input	2.4 kw
Max temp of the hot air	65 °C/80°C
Best Drying Temp	50°C – 63°C /50°C – 75°C
Suitable surrounding temperature	+5°C – +40°C
Dehydration capacity	≥ 3.0 kg/h
Noise level	≤55dB
Ground connection requirement	0.1 Ω
Drying goods tray (LWH)mm	780 x 540 x 30
Drying house dimension(mm)	1280 x 700 x 1860
Insulation board	Foam sandwich insulation board
Power connection	16 A

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No.	Description of parts
1.	Drying house
2.	Controller
3.	Door lock
4.	Observation window
5.	Electrical Controller Box
6.	Air Pressure Balancing Valve
7.	Supporting wheels
8.	Outlet for hot and dry air
9.	Stainless Steel Insulation Door
10.	Drying goods trays
11.	Exhaust air inlet for overheating
12.	Power jack

Instruction for main control

Controller (System Control Panel)

Function of keys:

ON/OFF: Touch ON/OFF and follow the indication to turn on or turn off the system.

Main Menu: Select and touch to execute the corresponding function The initial password to enter " System setting" is "111111".

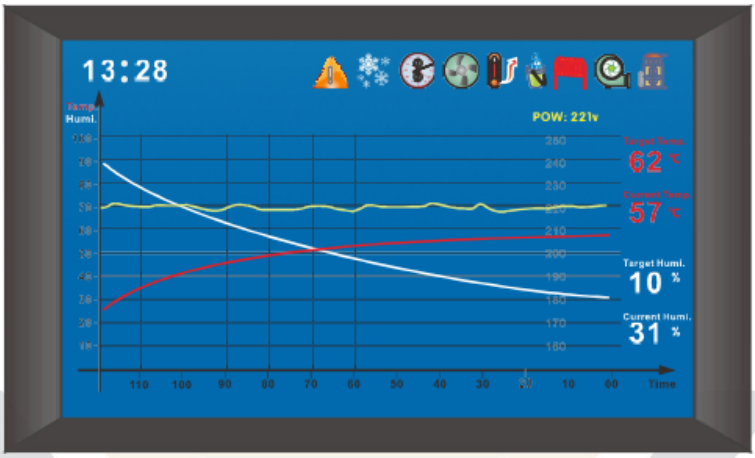
Time: The current time of the system.

Turning on and off the System

Touch OFF to enter the Interface to turn on or turn off the system. When the system Is under non-fixed time drying mode: you will see the interface as the right one, then follow the instruction to turn on or turn off the system.

When the system is under fixed time drying mode, you will see the interface as the right one, then follow the instruction to turn on or turn off the system.

Operation Monitor



Icons in operation curve interface:

Current Time: Displayed at the upper left corner. It is 13:28 in the figure.

Humidity history: The current humidity show as 31% RH, displayed at the right side.

Temperature history: The current temperature show as 57°C, displayed at the right side.

Current Progress & History Curve: White line for humidity curve, red line for temp curve.

Voltage curve: This curve is the current power supply voltage entering the machine. When the voltage exceeds or falls below the specified range, the system will automatically shut down for protection. Please ensure that the power supply is stable during use.

System symbols: Displayed at the upper right corner with the following meaning:

: Condition for the hot air circulating fan, indicated by a cartoon when in operation.

: Compressor Working.

: Defrost Or Fast-Heat Started.

: System malfunction. Detailed information can be obtained from "malfunction diagnosis" in the menu.

: Fixed time drying mode is selected.

: The system is heating.

: System NO need heating but for cooling (Ex. Low temperature dryer in cooling status).

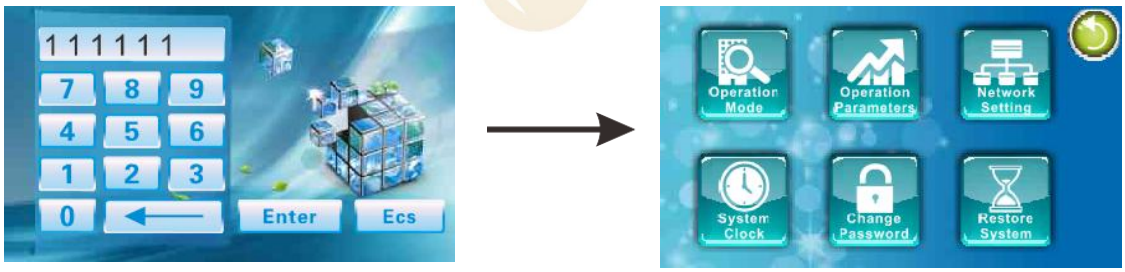
: The system is dehydrating.

: System NO need dehydration.

: Defrosting.

System Setting

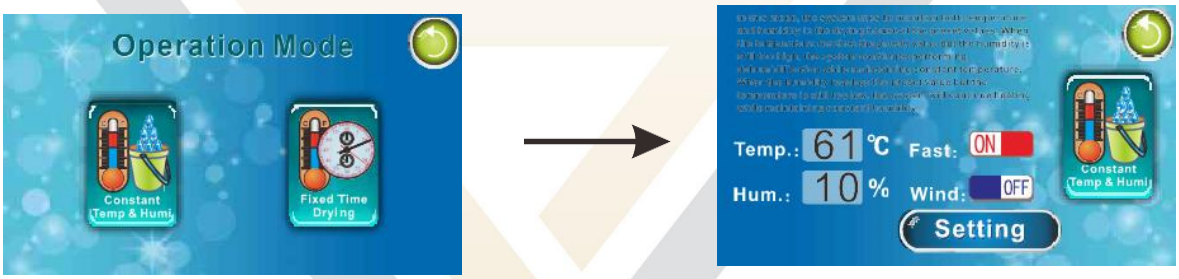
Set up password protection for the first time in System Setting, the password should be 6 digits long. **Initial password is 111111**.



Operation Mode

Constant Temperature & Humidity Mode

In this mode, the system tries to maintain both temperature and humidity in the drying house at the preset values. When the temperature reaches the preset value, but the humidity is still too high, the system continues performing deh humidification while maintaining constant temperature. When the humidity reaches the preset value, but the temperature is still too low, the system will continue heating while maintaining constant humidity.



Fast Dehumidification: Some special materials may not need fast dehumidification in some stages of the drying process. Instead, they may need rising temp and high humidity for some time. It can be achieved by selecting this feature.

When "Fast Dehumidification" is selected, the system performs humidification at its maximum capacity. When this feature is not selected, the system performs dehumidification slowly at a gradual rate. In this case. the dehumidification result depends more on the current temperature and humidity inside the drying chamber. Thus, it is recommended to inspect the drying periodically the first time.

Wind: When "Wind' is selected, the circulating fan is running continuously during the whole drying process. When "Fan On" is not selecte d, the fan will stop running once both the temperature and humidity reach the preset values. It will resume

running if there is a change in the temperature and/or humidity until the temp and humidity reach their preset values.

Fixed Time Drying

In Fixed Time Drying Mode, you can specify several stages with different time lengths and different target temperature and humidity values.

For example, if you would like the system to run for 2 hours with 30°C temperature and 70% humidity, then for 5 hours with 40°C temperature and 50% humidity, and finally with 60°C temperature and 20% humidity, you can enter these three sets of parameters to the system, and it will automatically run in order according to the set parameters. Therefore, no human on duty is necessary.

Note:

Time stage setting: Set parameter values for fixed time drying mode.

Current progress: Check the amount of time the system has run for the current stage and the whole Fixed Time drying mode.

Reset Timing: The system will repeat the current fixed drying mode, starting from stage 1.

For example, after the first batch of the material has been dried, place the second batch of the (same) material in the drying chamber, then press “Reset Timing". The system will repeat the current fixed time drying mode, starting from stage 1.

Current Parameters: List of all parameters the system is currently using; enter to check or modify running parameters for a stage.

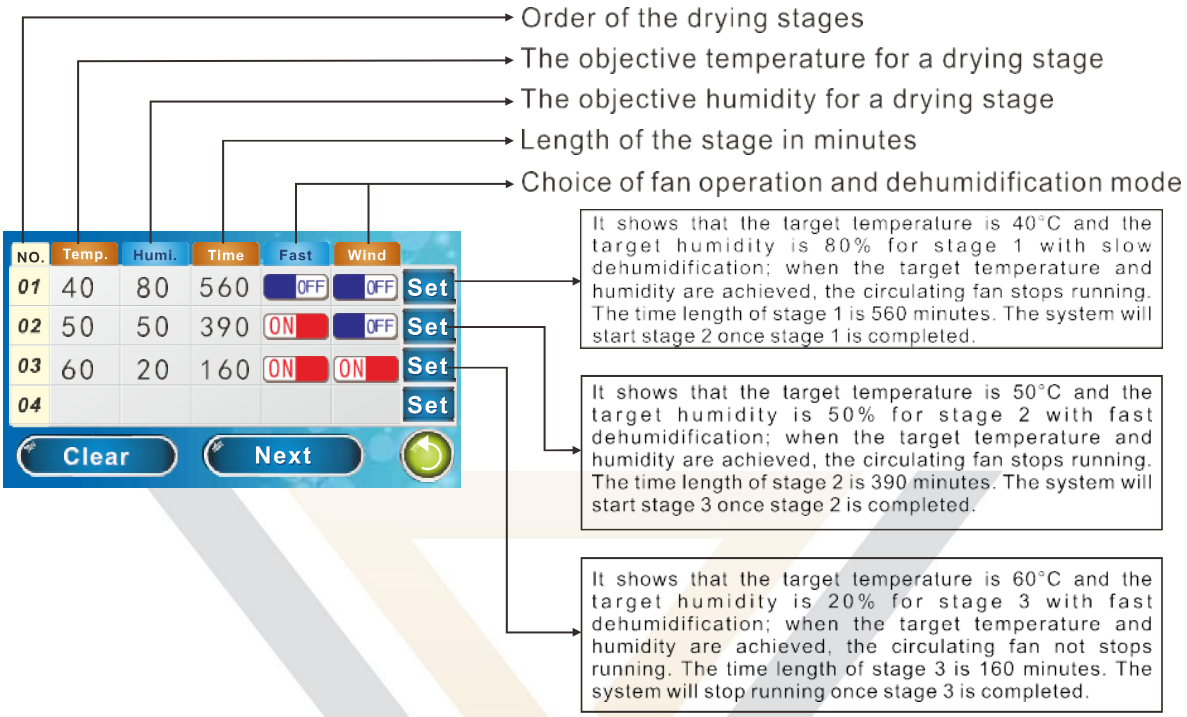
Preset Parameters: For sake of convenience, the system provides three presets that allow a customer to save up to three different fixed time drying modes for future repeated use.

Each time when a preset is selected, the system will automatically use the preset parameters as the current parameters (the previous “current parameters" will be replaced by the preset parameters).

Therefore, temporary fixed time drying mode needs to be set in “Current Parameters” while fixed time drying modes that will be repeatedly used for a long time need to be saved as “Preset Parameters” to avoid them being accidentally replaced.

Once the power supply is back after the system is interrupted by a power outage during the drying process, the system will resume running according to the operation parameters before the power outage.

Four operation modes: constant temperature, constant humidity, constant temperature and humidity, and fixed time drying, can be selected. The system will start working once the desired parameters for a selected mode are entered. The following is an illustration for the "fixed time drying" mode with 3 drying stages.



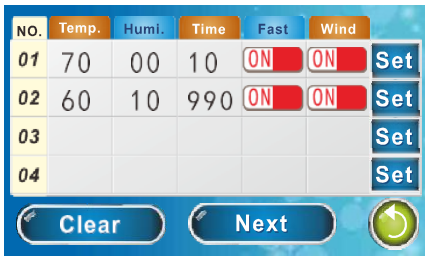
Note:

If the humidity parameter is set but the temperature parameter is blank with only two underlines, the stage is in constant humidity mode.

If the temperature parameter is set but the humidity parameter is blank with only two underlines, the stage is in constant temperature mode.

If the temperature parameter is set and the humidity parameter is set as 00, the stage is called “Sterilization”.

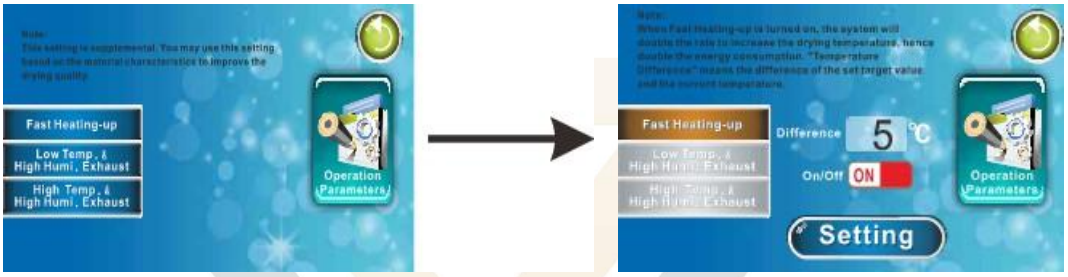
In the “Sterilization" stage, the temperature inside the drying house will increase rapidly to a high number and maintain the value for some period of time (the system's sterilization temp is 75°C).



For example, if a material needs to be

sterilized at 70°C for 10 minutes before being dried at 60°C, then this can be set as illustrated by the right figure (the time before the sterilization temp is achieved is not counted towards the sterilization time).

Fast heating: For some special products that require the temperature in the drying house to rise in a short time, this function can be activated to quickly reach the desired temperature (during fast heating, the total system energy consumption will increase by 1OOOW) .



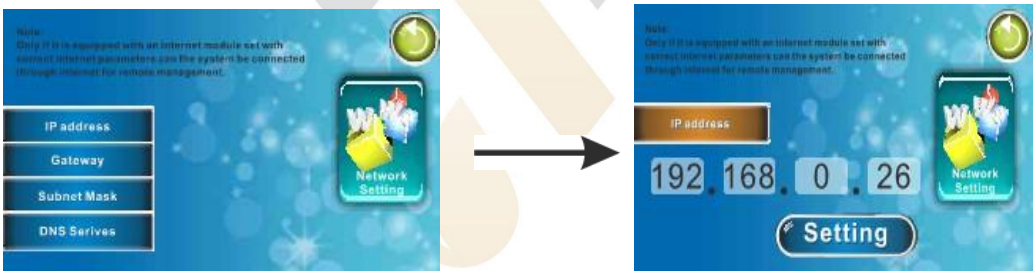
Exhaust fan on at low temperature and high humidity: If this function is activated, the exhaust fan will be automatically turned on when the current temperature is below the set temperature, and the current humidity is above the set humidity (appropriate for goods such as seafood).

Exhaust fan on at high temperature and high humidity: If this function is activated, the exhaust fan will be automatically turned on when the current temperature is above the set temperature, and the current humidity is also

above the set humidity. This function can speed up dehydration and improve efficiency.

Optionally, this system can be equipped with a "Cloud Management" module so that the system can be connected to the internet for the purpose of remote monitoring, management and maintenance. This feature is very useful for managing multiple drying machines.

IP address: Set the Local Area Network (LAN) IP address for the drying machine. This address is required for the management software to be available to the machine.



Subnet Mask: Set this network connection parameter based on the LAN parameters.

Gateway: If remote internet management is needed, this Gateway parameter has to be provided to the system.

Note: The current network connection for the machine can be checked in "Network Status" of the basic menu.

Remark: This "Network Setting" function is for user's choice, and base on the matching between this function and the user's local network system.

System Clock

The accuracy of the system clock is very important to its operation that requires the function of fixed time drying. The system clock should be correctly set up before operation and should be checked and adjusted if necessarily every month.

Change Password

Change the password for the system setting.

New password must be 6 digits long. If you forget your password, please consult with your agent or directly contact ProFruit.

It does not require a password to check operation parameters. However, it requires the password to set up parameters such as humidity and temperature, to prevent the system from being mistakenly interrupted.

Restore Factory Parameters

The system parameter be restored to the default factory parameters.

- Temperature: 60°C.
- Humidity: 10%
- Operation mode: constant temperature and constant humidity.

Operation Condition

The operation monitor displays the current working parameters and condition of the system, such as the current temperature, humidity, and whether a component is working or not. The information is very important to the diagnosis of any potential problem of the system.

Network Status

After equipped with a “Cloud Management" module, the network connection status of the system can be checked through this menu.

Current status: shows if the system is in the logged in status.

Connection status: shows if a remote management terminal is connected with the system.

Device ID: Each drying machine has a unique device identification number (Device ID). If remote internet management is needed, provide this ID as the identification proof. When using customer software, provide this number to the software so that the management terminal can connect to the machine normally.

Flow Chart of Basic Operation

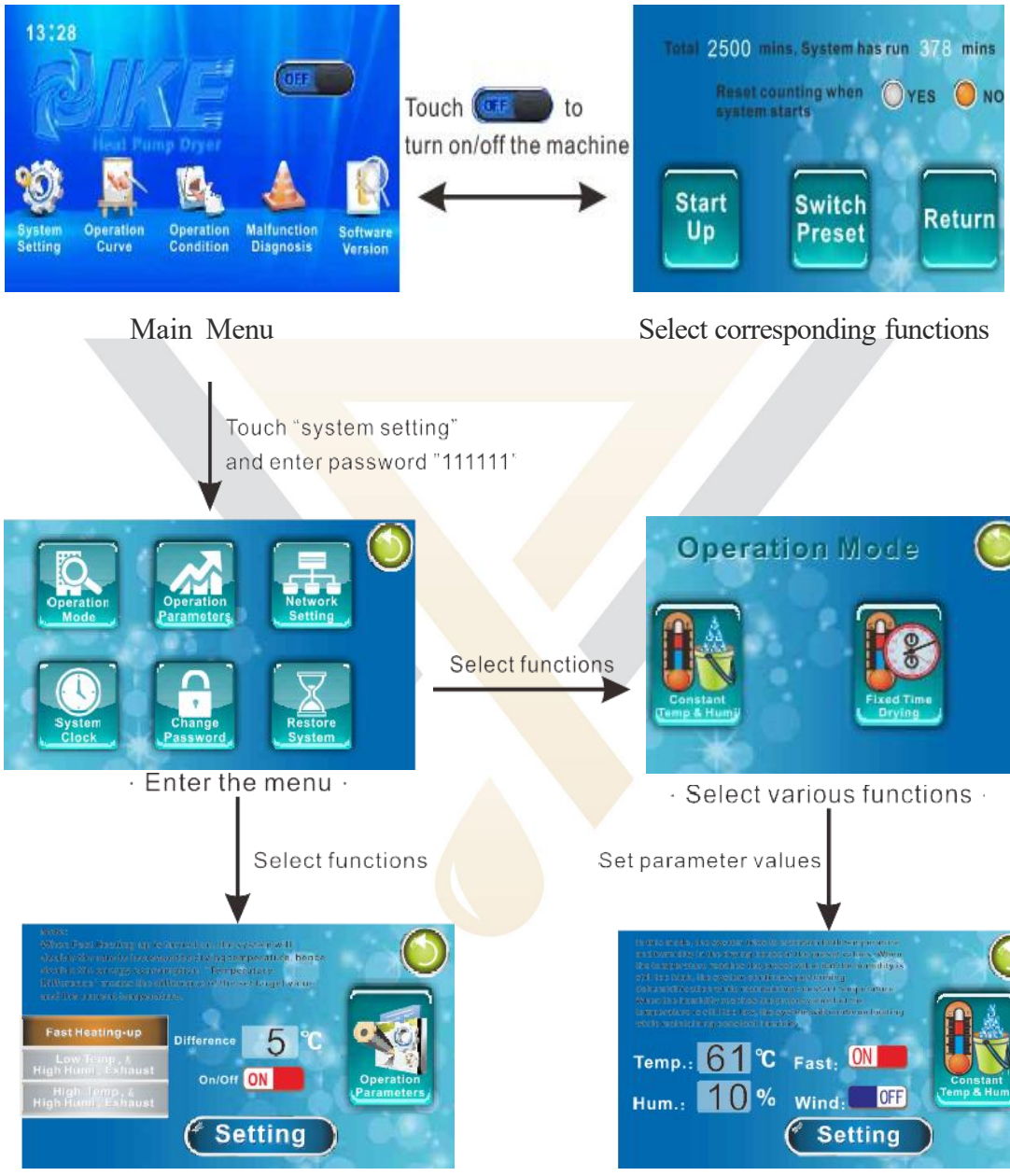
Step 1: Set target temperature and humidity parameters in “Operation Mode”

1. The initial password is “111111 "
2. Can adjust different parameters at any time, even if the system is running. The newly set para meters will be effective immediately.

Step 2: Selector un-select “Fast Heating” in “Operation Parameters”

1. “Fast Heating” can be selected any time when the system is running.
2. The target temperature for “Fast Heating” is usually set at 5°C below the final target temperature.

Step 3: Turn on/off the machine by touching the on-off key In the interface



Calculation of the amount of the material to be dried and the drying Time

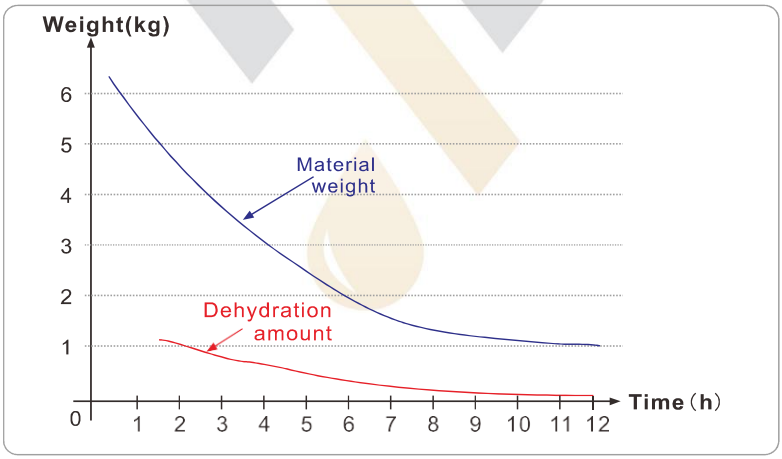
The amount of material a dryer can dry each time depends on the characteristics of the material and final drying quality. In general, it can be calculated in the following way:

1. **Determination of the characteristics of the material to be dried.**

Before launching a large-scale drying, we need to conduct a small experiment with small amount of the material (usually about 5 to 10 kilograms) to determine the drying characteristics of the material, including drying temperature, humidity, dehydration ratio and the minimum drying time required to achieve the desired result.

Dehydration ratio: (weight before drying - weight after drying) ÷ weight before drying, usually expressed in percentage.

Minimum drying time: The total drying time from the beginning of drying to the time point where desired drying result is achieved, usually expressed in hours.



Description: The drying curve for chayote at 60°C drying temperature. It can be seen from the figure that the dehydration ratios in the early and later 6 hours are about 70% and 17% respectively, with the overall dehydration ratio being about 87%. The figure also indicates that the minimum drying time for the chayote is 12 hours.

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2. Calculate the drying load of the material (the max dehydration per day)

Drying load: weight of the material to be dried per day x dehydration ratio.

3. Determine the number of dryers

With fruit dryer the dehydration capacity is 2 kilograms of water per hour, or approximately 50 kilograms of water per day.

Number of dryers needed:

Drying load ÷ dehydration capacity x safety coefficient (In the later drying stage, dehydration becomes more difficult. Therefore, we recommend considering a safety coefficient between 1.2 and 1.5.

Meanwhile, consider purchasing and installing at least 2 dryers so that a backup machine is ready to handle any emergency.)

4. Calculation of the amount of the material for each drying

Amount: dehydration capacity of the dryer per hour x expected drying time ÷ dehydration ratio of the material.

The expected drying time must be longer than the minimum drying of the material. For the material that is not easy to deteriorate, the expected drying time can be set much longer than the minimum drying time to reduce number of times to load and unload the goods.

In the later drying stage, the amount of moisture in the material, as well as its surface and volume have been greatly reduced. In this stage, dehydration becomes more and more difficult. If we keep the early drying pattern for this stage, we can't take full advantage of the efficiency of the machine. Therefore, we should adapt to multiple stage (at least 2 stage) drying. That is, when the drying reaches certain degree, we put the goods from several drying houses together to conduct second stage drying.

To increase the overall surface of the material so to increase the vaporization speed, it is acceptable to place more material (even several times more) in the drying

house. Of course, the drying time will also increase.

From the drying curve for chayote, its minimum drying time is 12 hours, with 70% dehydration ratio in the first 6 hours and 17% dehydration ratio in the second 6 hours respectively. Considering workers' schedule, one may double the drying time for chayote so that the dehydration ratio for the first and second 12 hours are 70% and 17% respectively.

Then at the beginning, a drying house can accommodate (12 hour x 2 kilograms / hour) ÷70% = 34 kilograms of chayote.

For example, you have 100 kilograms of the material to be dried, and its weight is only 30% of the original weight when it is completely dried.

Then Step 1: Calculate the number of dryers

- Dehydration ratio = (1-0.3) = 0.7, or 70%
- Drying load per day 100 x 0.7 = 70 kilograms
- Number of dryers needed = 70/50 = 1.4 (50 is machine's dehydration capacity per day)
- Suppose you use 1.2 as the safety coefficient. Final number of dryers actually needed = 1.4 x 1.2 = 1.7 ≈ 2

Step 2: Calculate the amount of the material to be placed in the dryer each time.

- Suppose the minimum drying time is estimated to be 4 hours.
- The amount = 2 kilograms/hour x 4 hour ÷ 0.7 = 11.4 kilograms.

That is, you can place 11.4 kilograms of the material each time. Repeat this for every 4 hours.

Safety mechanisms

- **Safety after in case of a sudden black-out –** when the power supply is suddenly cut off or a similar situation happens, the machine does not cause any dangerous situations like sudden start or improper operation.
- Automatically controlled process, at the end of which the machine switches off and doesn't cause any danger
- The whole frame (except cover) is painted with insulation, so there is less risk to burn.

The workplace of operator

- The fruit dryer is controlled by one person.
- The workplace of an operator is in front of the machine.

The washing of machine

- Clean the drying trays after drying the product.
- Check the machine's water drainage to see where the water collected from the product goes.

Drying process

- The product is drying inside the Chamber. Products are dried by hot air around it.

Conditions for using the machine

- The machine, its workplace and ground must be kept clean, neat and properly always lit when using it.
- A higher than 2 m room or using area is required.
- The area around the machine needs to be empty so machine would not be bothered with any interference.
- The machine is operated by one person who has passed his training with the machine and is familiar with all the instructions and risks.
- Flat, stable and solid ground is needed for machine, the ground must hold 600 kg weight. This stable ground is always obligatory: when using the machine, during transportation, assembly, dismantling, testing, foreseeable failure or non-usage periods.

- When transporting, lifting or storing the machinery the client is obligated to assure its safety and proper fastening.

Safety requirements

- If some machinery failure, obstacle, accident, emergency or any other dangerous situation happens it is obligatory to stop, shut down the machinery immediately or operate equipment depending on the situation in order to avoid or eliminate dangers.
- The machinery can be operated only by person who has passed his training for machinery and is familiar with all the machinery instructions and risks. The person must also be in proper physical and mental state and not be affected by any substances that could interfere with normal functioning (such as pharmaceuticals, drugs, alcohol etc.).
- It is prohibited to do any activity with the machine during its working process (such as washing, transporting etc.).
- It is prohibited to wet or pour any liquids onto the central control box and engines.
- Every time before using the machine the operator must carefully inspect the machine, check if all the parts and electronical buttons are in place and working properly as well as examine if the equipment meets all the safety requirements and is prepared for normal work.
- The main control panel and engines can be fixed, repaired or changed only by the manufacturer or its approved repairing company. All the engineering and electronical works must also be performed by the manufacturer or its approved repairing company.

Warnings

- All the materials that the client wants to dry with this machine must be previously discussed with the manufacturer. If manufacturer advises not to dry some materials and the client still uses it, all the machinery warranty service is automatically terminated and the client takes all the responsibility for the actions and consequences.

- It is forbidden for any people to touch, lean on or have contact in any way with the working machine, its parts, the products that are being processed or other dangerous parts because of the risk of injury. Only actions that are necessary for a proper work with the machine are allowed.
- All machinery parts, buttons and operational details must be used according to their purpose.
- Any arbitrary adjustment, repair or other mechanical modification of the machine by a non-manufacturer will result in termination of the warranty service.
- It is prohibited to climb or put things on the machine at all times.
- The machine can only be washed, lifted, transported or otherwise operated after it was switched off completely.
- The machine only works properly when all its parts are properly attached.
- The manufacturer produces and prepares the machine based on all machinery requirements and client's needs. Changing and mechanically adjusting any machinery settings without manufacturer or its approval is prohibited.

Residual risks

- The risk of sound and hearing damage due to the noise made by the device still remains even in compliance with all safety requirements.

Precautionary directions

- Before using the machine, the operator must inspect the machine for defects and meet all safety requirements. If discrepancies are found, do not use the machine until they have been eliminated.
- It is recommended to remain attentive around the machine and to keep a distance from the machine and its parts when it is not necessary.
- If the situation requires contact with parts of machinery that are hazardous to health or dangerous to environment, additional precautions must be taken: consultation with the manufacturer, usage of other equipment or tools, wearing protective gloves and other actions depending on the situation.

- It is recommended to wear clothing and footwear that is non-slip, water resistant and is appropriate for work. To reduce the risk of sound during work, it is recommended to use sound-insulating headphones.
- It is recommended to follow all additional safety requirements in order to stay safe and prevent any injuries.

Transportation of machine

- The machine is transported by truck.
- The machine is transported in one piece without separating its parts.
- During transportation the machine must be secured in such a way that its components are not damaged and the machine itself remains stable during transport.
- When transporting and otherwise moving or changing the position of the machine it must be done after it had been completely switched off, emptied and securely fastened.
- The machine must be put straight on the horizontal ground during transportation.

Machine operation in case of risk

- In the event of accident or emergency operate the machine depending on the situation: stop, shut it down, return to a safe or less dangerous position immediately and eliminate the danger.
- If the machine breaks down, switch off the machine and evaluate the failure. If the failure cannot be eliminated by yourself (such as removing the dirt, other obstacles) or it is dangerous, contact the manufacturer for warranty service, if the warranty service has expired, apply for repair.
- In case of jammed machine assess the situation, inspect the jammed part of the machine and try to solve it if there is no danger. Depending on the situation try restarting the machine or contacting the manufacturer for warranty service or repair.

Adjustment and maintenance of machine

- Inspect machine parts before every use, regularly check machinery.
- Wash the machine regularly (after drying each product).

Troubleshooting

Troubleshooting must only be carried out by an authorized and qualified person, with the right and appropriate skills and training for the job.

Malfunction	Suggested Solution
Temperature sensing error	Check the sensor connection or replace the temperature sensor
Humidity sensing error	Check the sensor connection or replace the humidity sensor
Returned air temperature sensing error	Check the sensor connection or replace the returned air temperature sensor
Compressor temperature sen9ing error	Check the sensor connection or replace the compressor temperature sensor
Evaporator temperature sensing error	Check the sensor connection or replace the evaporator temperature sensor
Compressor high pressure protection	Restart the machine
Compressor low pressure protection	Restart the machine
Abnormal system communication	Check to see if panel circuit is too close to high voltage source
Compressor output temperature is too high	Poor circulation. Adjust the density of the material or clean the heat exchanger