Safety Instruction

Our company insist “safety first”. In order to guarantee plant personnel’s safety, all of us need abide this safety rules.

1. General safety instructions

1) Each personnel who are charged with work on the machine must have read the operating manuals. Any question, please contact with our company.

2) Before beginning work ensure that the electrical connection and fire protection equipment effective and complete.

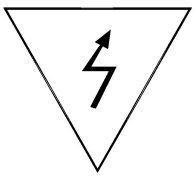
3) Pay attention to warnings and symbols. It is forbidden for personnel to stay near the moving mold and pressure frame and the heating oven.

4) Servicing, repair and setting work may be performed by trained skilled personnel only. Prior to all servicing work the main switch switches off the machine.

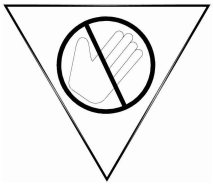
2. Warnings and symbols



1. Earthing!



2. Danger of electric shock!



3. Danger of scald!



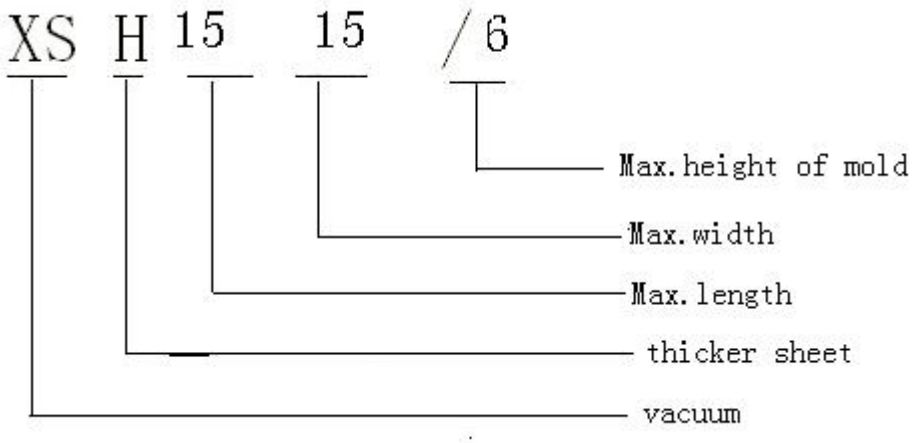
4. Danger of pressing!

General Introduction

1. Machine Model and Meaning

Model: XSH1515/6

The meaning of XSH1515/6：



2. Machine character

The machine is creatively designed on the base of adopting international equipments and advanced technology, according to both the home and aboard customers' production requirements.

The machine has the functions of feeding material (by hands), clamping, heating, prevent sag, blowing, limited blowing, forming, cooling, mold-ejecting automatic, can finish the whole sheet vacuum forming process.

This machine features high efficiency, reasonable structure, easy operation and stable performance.

The machine is designed by the principle of mechanical-electrical-pneumatic integrate, the working width can be adjusted, controlled by the PLC. Without automatic alarm function, the machine adopts import photoelectricity induction to indicate the error position, adopts light contact relay to control the moving time, fast and convenient, steady and reliable, can finish the sheet vacuum forming process automatically and continually after setting the parameter on the PLC.

3. Main usage and application area:

This machine is suitable for thermoforming ABS，HDPE, LDPE, PP, PVC, PS, PMMA plastic board and

plastic sheet, which can produce the automotive upholstery, ice box cabinet, the parts of bathroom, lantern, AD decoration and so on..

The thickness of the sheet is between 1-10mm.

Main Technical Parameter

No.	parameter	unit	data
1	Forming area（length^width）	mm^mm	1500^1500
2	Max.height of mold	mm	650
3	Sheet thickness	mm	1-10
4	Production speed	Cycle/h	5-30
5	Max. heating power	kw	151.2
6	Total power	kw	157.52
7	Capacity	m^3/h	100
8	Voltage	V/HZ	380V/50HZ 220V/50HZ
9	Air pressure	Mpa	0.5-0.8
10	Vacuum	Mpa	-0.05-0.1
11	Overall Dimensions	mm	2400^4300^3800
12	Weight	KG	8200

Installation and Test-run

1. The environment requirement of installation

High air cleanness degree, for dust will pollute the products, no inflammable and explosive substances, flat floor, clean and dry.

2. Installation

The machine consists of forming area, heating area, up-mold, electrical cabinet, air compressor and other parts.

First fix the forming area, take the half landing as standard, adjust the machine feet till it's horizontal.

After fixing the forming area, take it as standard, put the heating area next to the forming area, adjust the feet screw still there is no room between these two areas, and align the joints of the oven orbits, then connect the two areas with the screws.

Then install the up-mold, put the up-mold in the middle of the forming area.

There are four aviation plugs with different specifications, connect with different electric appliance parts separately. Respective description as follow:

Three core – Vacuum Pump

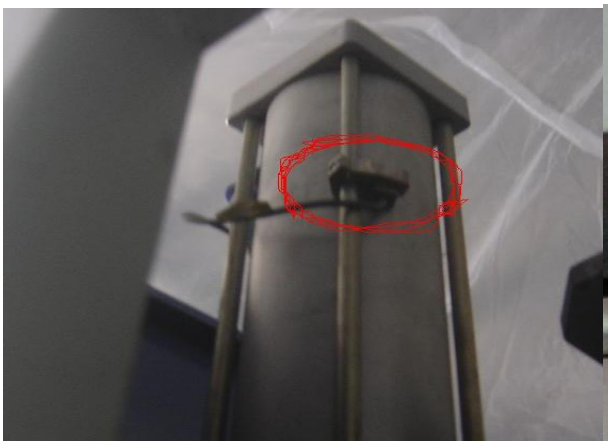
Forty-seven core – Upper Oven

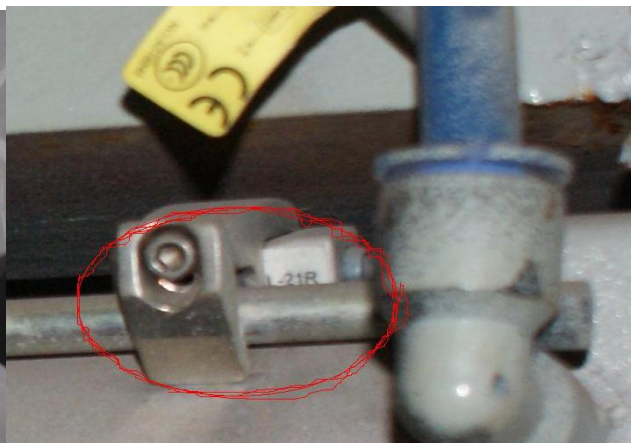
Forty-Seven core – Lower Oven

Sixty-one core – Electrical Chamber control line, such as solenoid value, power -on and power-off

Other parts: such as two frames, four low-mold cylinders, eight air fans, synchronization rack of frames.

Notes: when install the cylinders, identify the cylinders are with magnetic switch functions, the marks are:





The air is provided from two ways: F.R.L. Combination with air tank, air compressor with the reducing value.

The air tank is self-provided, the volume is 2.5 m^3

The machine should be earthed, there is mark of earth position.

3. test- run

First check and make sure that there is no installation error, switch on the power, open the air, make sure no air leakage, no water leakage, no creepage, switch the PLC on, switch on the lighting, the touch screen start work ,and the light is bright, after the touch screen work normally, the up-mold should be on the "up" position, the up – oven and the lower oven should be on the backward position, the signal light of the fully backward magnetic switch of the cylinder should be bright, the frame should be on the "low"

position, the light of the magnetic switch of the frame cylinder should be bright, the lower mold should be on the “low” position, and the light of the magnetic of the lower mold cylinder should be bright, operate the following movement one by one manually: air fan, direction of the vacuum pump, gun spray, vacuum, mold ejecting, load the mold, press the frame, unload the mold, Mold cylinder, the oven, if there is no error of the movement, change manual operation into automatic operation, set the move parameter before the automatic operation(see the method of setting parameter on 8 page), press the start button, if the machine run normally, the test-run is over.

The electrical control box instruction

The electrical consists of power switch, touch screen, urgent stop button, lighting button, mold-ejecting button, blowing button, up oven temperature controller, lower oven temperature controller and thermocouple.

When the machine switches on, turn the “power switch”, the PLC starts work, the whole movement instruction of the machine is completed by the touch screen.

Urgent button: if there appears unmoral state during working, need to press the urgent stop button to stop working immediately, at this moment, the up mold rise to the set position, the oven move bock fully, other movements stop.

Lighting button: turn on lighting button, the machine light id bright.

Mold-ejecting button: it’s convenient when operate manually.

Blown button: when test-run manually, if the height of the blowing is not enough, it can be used to supply air to make a suitable height.

PLC operation instruction

After switching on the machine, turn the “power switch”, and turn the “lighting button” if it is needed.

Note: the “power switch” and the “lighting button” are showed on the operation control panel.

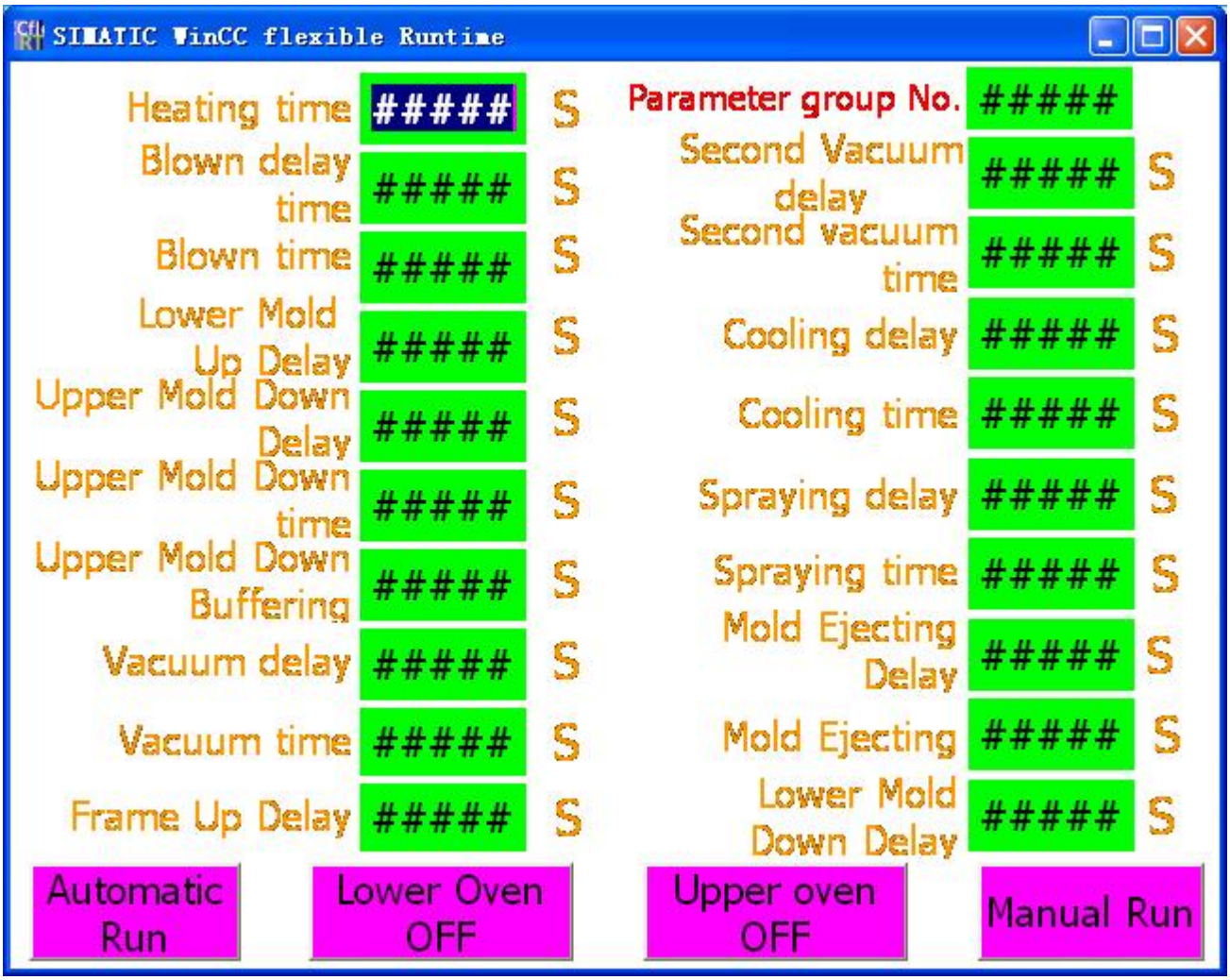
Then the panel will show:



Please touch “English”, then the panel will show:



Then touch “Data Setting”, the panel will show:



According to different material and forming requirement and mold, set the parameter. After setting, point “manual run” first, when the temperature of the oven get to the set temperature, press “ automatic run”, change the control way form “manual run” into“ automatic run”, select “temperature” to set the temperature of different areas.

Parameter names instruction:

“Parameter Group No.”: You can input number 1, number 2 or other number to choose that you stocked parameters at last time.

“Heating time”: The time for plastic sheet heating.

“Blown time”: The time for forming globularity its height the same as the mold before forming.

“Lower Mold up Delay”: Means how long a time should delayed that lower mold up after blowing.

“Upper Mold Down Buffering”: Means how long time should delayed before upper mold dropping speed slower when upper mold nearly down to position.

“Upper Mold Down Delay”: Means how long time should delayed that up mold down.

“Upper mold up time” How long a time should remain when the up mold down to the position

“Vacuum Delay”: Means how long time should delayed to vacuum after the down mold up to assigned position.

“Vacuum Time”: the time for first vacuum to finished forming time.

“Frame Up Delay”: Frame up delay time.

“Second vacuum delay”: the time from first vacuum to second vacuum delay time.

“Second vacuum time”: the time for second vacuum.

“Cooling delay”: the delay time between begin vacuum to start blower.

“Cooling time”: the time for blower cooling product after cooling delay.

“Spraying Delay”: the delay time between begin vacuum to spray water.

“Spraying time”: the time for spray water after spraying delay.

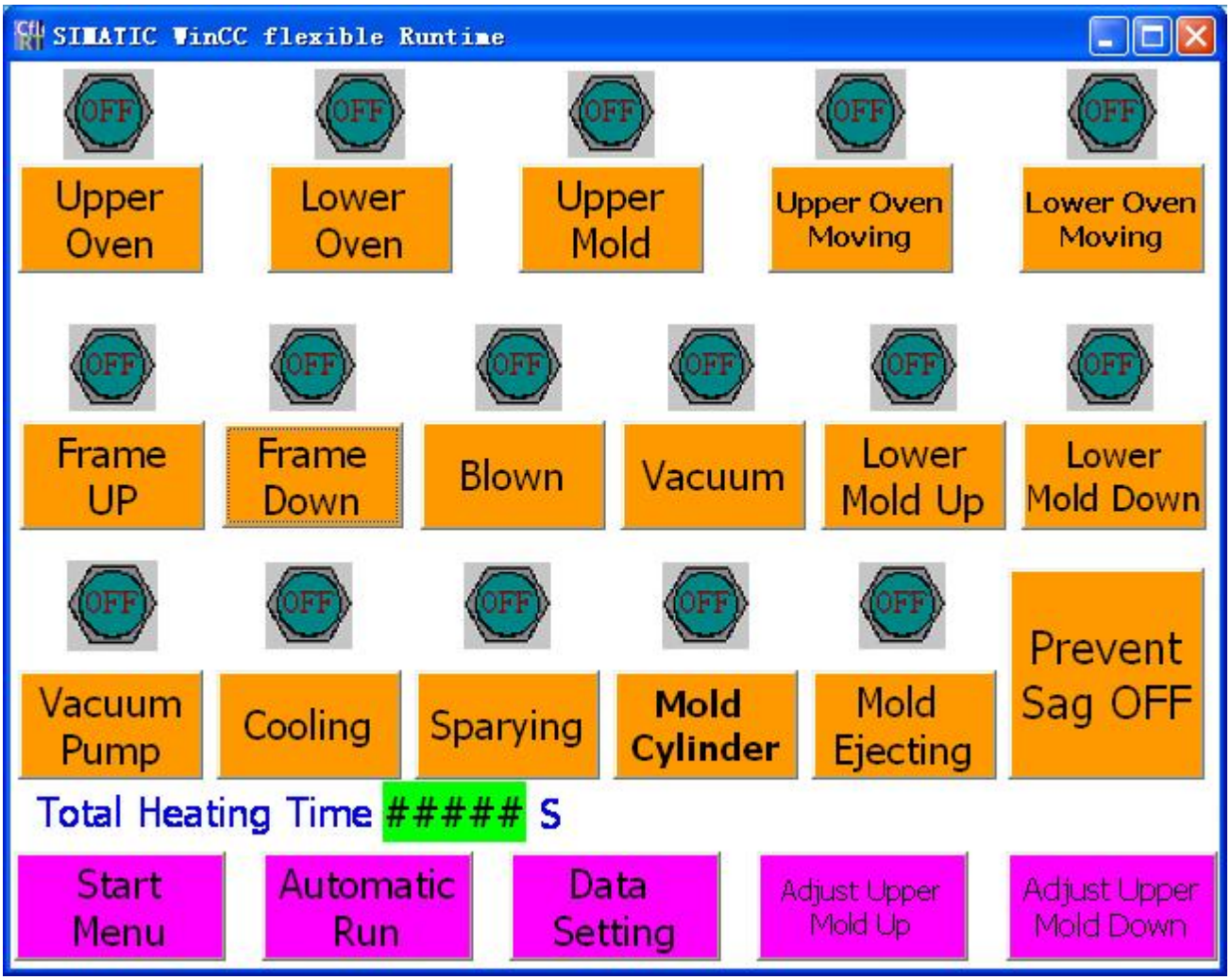
“Mold Ejecting time”: the time for degassing before mold ejecting after cooling.

“Mold Cylinder Delay”: How long time will be delayed from automatic degassing to the cylinder inside mold working.

“Lower Mold Down Delay”: How long time will be delayed when lower mold down

“Upper Oven On or Off”: When choose “Upper Oven On”, the upper oven will be heating; when choose “Upper Oven Off”, the upper oven heating will be close.

“Lower Oven On or Off”: When choose “Lower Oven On”, the lower oven will be heating, when choose “Lower Oven Off”, the lower oven heating will be close.



“Manual Run” Screen

On this screen, every button can control its own function. “Start Menu” “Automatic Run”, “Data Setting” “Main Menu” can be used to shift to its screen.

“Adjust upper mold up”: Added the upper mold stroking.

“Adjust upper mold down”: Reduce the upper mold stroking.

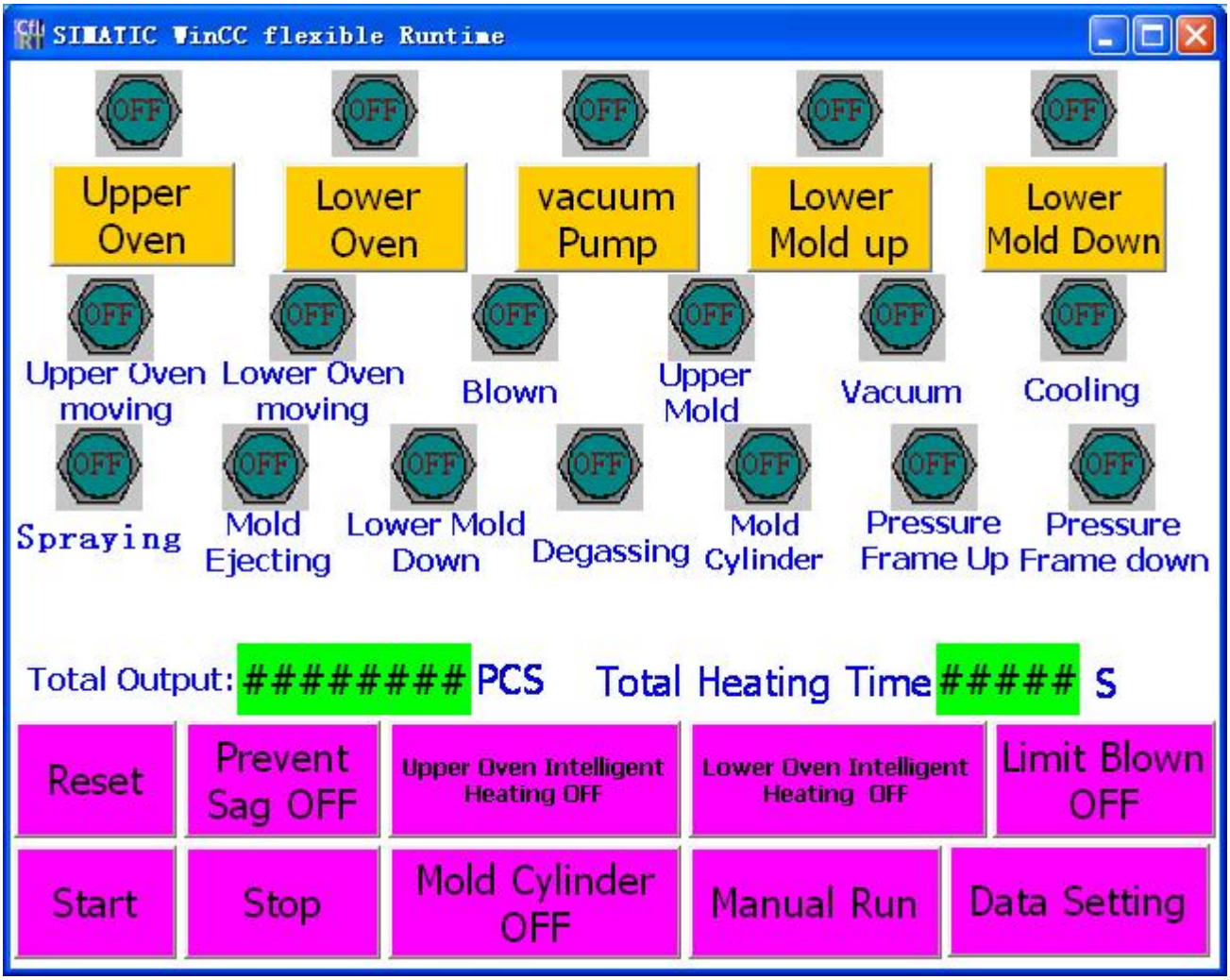
“Upper Oven”: Start or close upper oven heating.

“Lower Oven”: Start or close lower oven heating.

“Upper Oven Moving”: Control upper oven moving.

“Lower Oven Moving”: Control lower oven moving.

“Prevent Sag”: If choose “On”, it will be blown the air to control the sheet sag after heating. If choose “Off”, it will be not have this function.



Operation instruction for the machine

The machine consists of the following systems:

1. Clamping system

Clamping system is very important for a vacuum forming equipment, it needs to prevent the clamped sheet from slipping, reliable air tightness, and at the same time, it should be convenient and flexible.

The clamping equipments of the machine are: frame, frame cylinder, frame guide post and gear wheel axle groupware. When the frame does down by the cylinder, it will make a group of synchronic rack and synchronic gear work, by means of the synchronic gear axle's running, make another group of synchronic

rack and synchronic gear work, thus cause the cylinder to push the frame synchronically, the frame will be placid, press the sheet evenly, the air tightness is reliable.

The clamping system is adjustable cording to the sheet size.

2. Sheet heating system

It mainly consists of Upper Oven, Lower Oven, , Oven Hanger and Drive Cylinder.

The machine adopts Infrared Ceramic Heating Brick which is widely used in the world. The infrared ceramic heating brick has the advantages: heat quickly, less energy expense, penetrate strongly, short heating time, which makes the sheet heat uniformly, improve the products quality.

It consists of upper oven and lower oven. Use upper oven alone if the sheet is thin, and use both ovens when the sheet is thick, it can heat the sheet equably, heating up quickly, improve the efficiency and quality.

The machine has intelligent heating function, when the oven move back, it can stop heating automatically, when the oven move to the heating area ,it can heat automatically, save the energy.

The construct of the oven: the upper oven and the lower oven are about the same, the upper oven is made of 72 infrared ceramic heating brick with 650w, and the lower oven is made of 72 infrared ceramic heating brick with 400w. The drawing of heater area:

Diagram for the heating area：

Every two infrared ceramic heating bricks connect to one solid state relay, AC Voltage meter, potentiometer, safety switch form as a circuit, use voltage meter to adjust the heating temperature, it's visualized, flexible and easy maintain.

3. Vacuum and compressor system

The vacuum system consists of vacuum pump, vacuum tank, pipeline and solenoid value（the machine adopts German brand solenoid value）.

The air compressor is self-provided, the work pressure is 0.5-0.8MP, and the air displacement should be more than 2m32/14min

4. Forming system:

The system consists of frame, sealing room, lower mold, mold guide pole, cylinder and synchronous gear. It's convenient, stable, durable and easy for maintain.

5. cooling system

In order to improve the productive efficiency and ensure the quality, It needs cooling process before mold-ejecting, Cooling should be moderate, insufficient cooling will cause warpage, and excessive cooling will reduce the efficiency. For the positive mold with small rake, it will cause difficulty in mold-ejecting.

The machine adopts air cooling and water cooling, there are 4 fans with 0.55kw and 8 spray guns (the spray angle can be adjusted randomly). Water cooling and air cooling works synchronously.

There should be cooling pipe inside the mold for some special required products. The machine provide interface device.

6. Control system

The machine is controlled by computer, after finishing setting the parameter, feed the material by hand, the following plastic sheet forming process will be finished automatically and continuously.

Rules for safety operation:

1) .Check all parts connection firm or no before starting the machine, especially check the infrared ceramic heating brick(in oven) is tight or not.

2). Check if the drive parts loose

3). Check the air compressor oil level, pay attention to cooling system equipment as well as ventilate environment is good and supply the machine oil and draining water promptly

4). Check the vacuum pump oil level periodically, if the oil is not in the permission scope, more

special-purpose vacuum pump oil should be added. If the oil is mixed with water in the pump, open the oil drain switch to exclude it.。

5). Pour the appropriate lubricant and the lubricating oil into the lubrication parts before start machine to keep in good lubrication condition between kinematic pair.

6). after start the power of oven, check whether all AC voltage meter all in the normal range. After period of heating time, observe temperature control in designed scope.

7). Start the air compressor, vacuum pump and observe the barometer, the vacuum gauge, in appropriate time if they have already arrived the normal use scope. If any abnormity, please check divulged reason or other failure. After eliminated then move until the normal range.

8). Before automatic movement, should be test run machine on manual running. Switch on the all functional buttons do observe if every action is flexible. Pay attention that the oven must exited forming area before pressure frame drive; otherwise the parts such as heating brick will be damaged when the pressure frame up.

9) Close down machine: First, replace the implementing agency (every drive parts) such as pressure frame,

Oven and then close the total power. (Pressure frame close to wind-plate, oven back to heating area, down mold

& down mold table down close to machine base, up mold & up mold device on the top position)

7. Test and running

1). Check if the vacuum pump and air compressor oil in the standard scope? Add appropriate lubricating oil on the whole kinematic pair of machine that before opening the machine.

2). Closes the total power switch blade, turns on the use power which are on the control panel, air compressor power. Observe air pressure does meet the stated requirements (0.5~0.8Mpa).

3). Observe the drive of all air cylinders, if the drive not smooth, please adjust the throttle valve of air passage. Meanwhile, please check the speed of down mold and pressure frame up &down that controlled by throttle valve.

4). Adjust the magnetic switch of each cylinder to a proper place

5). Check if something else on the mold table, keep it clean. Check if the seal of mold table is good?

6). First set the temperature on the upper oven temperature controller, lower oven temperature controller and sheet temperature on temperature controller, then adjust the AC voltage meter by knob. Usually,

we adjust the voltage from 80 to 160V. The principle of adjusting is: the voltage that marginal parts of oven should be higher than in the middle parts. If add voltage, it will quicken the heating time. Set the reasonable temperature according to the thickness of different materials.

7). Start the power of vacuum pump, then switch on and off several times of the “vacuum” button that on “Manual Run” page of panel, if the hands of vacuum meter swing obviously, it shows the vacuum valve is ok. Otherwise, continue check if the seal of vacuum pipeline tie-in is good?

8) if there is no more unusual situation after test-run, in other words, the machine is under normal working situation, Put the plastic sheet on the window plate by hand symmetrically, then start the pressure frame air cylinder to clamp the plastic sheet, the oven move to the forming area.

9). count heating time when the sensor induces it.

10) .The oven will automatic exit after finish heating plastic sheet, then the solenoid electric valve for blown will working to fill air into sealed chamber. After that, the plastic sheet will form a globularity its height the same as the mold. If the globularity is too small, the tension parts of product will too thin after forming; if the globularity is too big, the product will appear trace; So need adjust the suitable blown time to get a suitable height. (Normally, the height is about 1/3, 3/4 of the mold height, it’s always varies with the shape of the mold)

11). The lower mold rise to the assigned position after blowing, the vacuum value open, vacuum and forming the products.

.After forming, the cooling system opens automatically. Please note that some materials only can be cooled by air, they shouldn’t be cooled by water

13). The solenoid valve for ejecting will automatic degassing before mold ejecting, then the down mold will down. The degassing time about is 1-2S. (Varies with the size of the products)

14). frame up, unload the finished product by hand.

15). Please continue observe the forming quality and check if every action ties in & have exact time. Sometimes, need test run the machine again and again. The technical parameters (Such as “Heating Time”, “Blown Time”, “Upper Mold Down Time”) vary with the plastic sheet and mold. Please note the details of parameters avoid the waste.

Note: check the products quality on time when the machine operates automatically to avoid waste. . In the ordinary circumstances, take 3mm ABS as the example:

60-120s → → → →0.3-2s → → → →3 -5 s → → → →0.5-2s

Heating Time blown time Upper mold time Vacuum Delay

1- 20s → → → →2-8 s → → → →2 -8 s → → → → 5- 10s

Vacuum Time Spraying Delay Cooling Delay Spraying Time

5- 120s → → → → 0.5-8s → → → →Take out the finished product by hand

Cooling Time Mold Ejecting Time

8. The measure for different thickness and width of sheet as well as depth of mold:

1). sheet thickness increases, the heater voltage may suitably increase, or suitably lengthen heating time. Otherwise, reduce the heater voltage, or the suitably shorter heating time.

(2). Different size of mold: When mold length and width changed, it needs change window plate and adjust the frame. Moreover, please close the unwanted heating area to reduce consumption of electricity.

3). Different mold with different operating process: sometimes it needs up mold for assistant forming. The mold is divided into positive mold and negative mold, and their working ways are different.

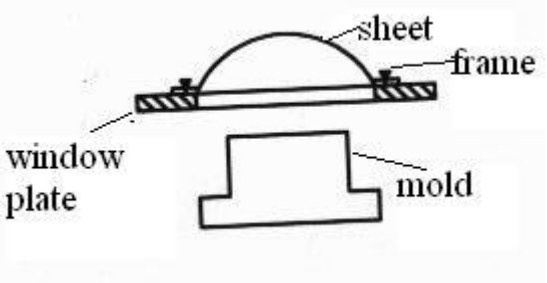
The diagram of the working cycle:

Carry materials by hand →Frame Down → Oven Enter → Oven Exit → Blown →Blown limited→ Vacuum →→Cooling→ Spraying→ Mold cylinder exit→ Mold Ejecting → Lower Mold Down →Frame Up → Take out the finished product by hand.

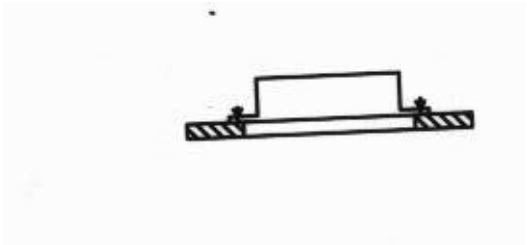
Diagram of main forming methods

There are two kinds of molds: negative mold and positive mold

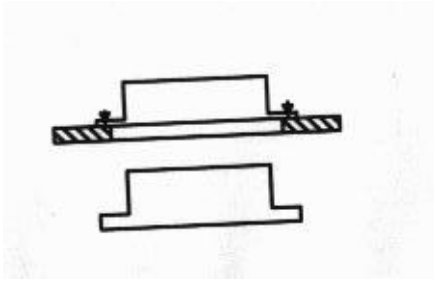
1).positive mold



（a）blown process

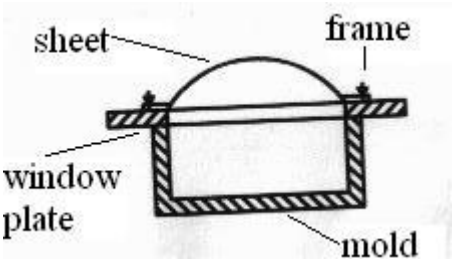


（b）lower mold up, vacuum, cooling

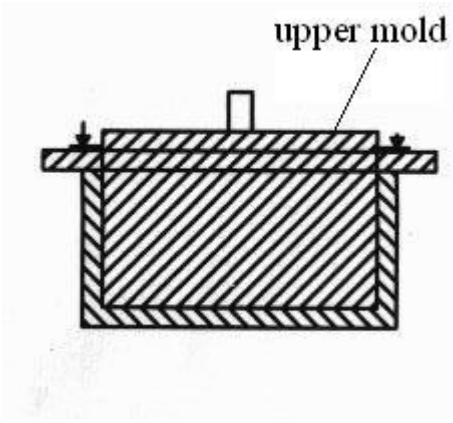


（c）mold-ejecting，mold down

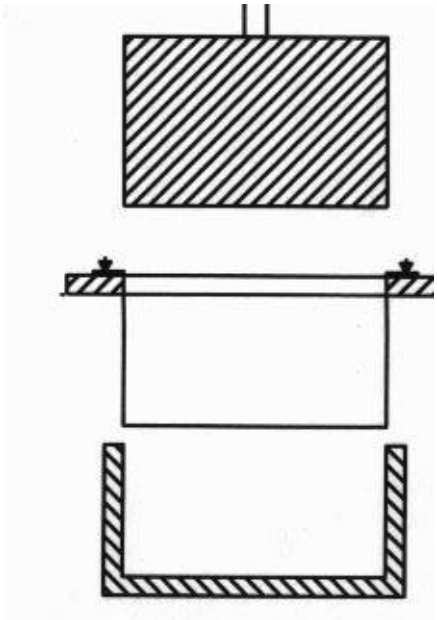
2).positive mold



（a）blown process



（b）upper mold down, vacuum, cooling



（c）mold-ejecting，mold up

The Measures for Common Problems in Operation

The following is for reference that the product forming not in the good condition and the corresponding improvement.

problem	reason	measure
Bad forming	1. The vacuum is not enough. 2. The sealed chamber seal is not good. 3. The actions not suited between them. 4. The heating temperature is not enough.	1. Test the vacuum by hand operation and check the tie-in of vacuum tube, if the seal is not good, please seal the tie-in by adhesive tape. 2. Seal the sealed chamber again. 3. Adjust the action. 4. Adjust heating temperature & heating time.
Some parts too thin	uneven sheet	Control the sheet temperature
	imbalance in setting heating area	Divide the heating area, modify the heating setting
	improper blown height	use photoelectricity eyes to control after the blown height is confirmed
	interaction of the forming operation is not good	lower mold up, vacuum, upper mold down should be in harmony
	the mold temperature is too low	60℃--80℃set the mold temperature between 60℃ and 80℃.
	unreasonable mold design	Design the quantity of the hole and the diameter.
		The semidiameter of the negative mold corner too small, increase suitably
The forming line is not smooth or obvious	1.The air pressure is not enough 2. The position that upper mold down not enough. 3. The parallel of the mold is not enough.	1. Adjust the assigned pressure of air compressor. 2. Adjust lower mold down position. 3. Repair or block up the mold.
Wrinkled or pucker	temperature is too high	Less the heating time and lower the set temperature of the sheet
	the blown height is too high	adjust the blown height
	the interaction of the lower mold up and upper mold down are inconsonant	Control the speed and the time of every movements, adjust the air displacement of the solenoid value, adjust the time setting

The detail is not clear	the sheet temperature is too low	increase the sheet temperature
	the mold temperature is too low	increase the mold temperature
	lack vacuum	Check the sealing, pipeline and vacuum pump
Uneven Shrink	the mold temperature is too high	lower the mold temperature
	insufficient cooling	Reinforce cooling
	uneven thickness distributing	Adjust the thickness distributing
warpage	mold-ejecting at wrong time	The workpiece must be cooled down lower than the deformed temperature
	the mold temperature is too high	Lower the temperature
	The pressure for blowing is too heavy	Adjust the pressure and the time
Break of product	1. The heating temperature is not enough. 2. The heating time is not enough	1. Adjust heater voltage. 2. Adjust the heating time.

Influence factors for products quality

1. The size and the quality of the sheet

The performance index of the raw material meets the required standard is the necessary precondition and guarantee.

The size of the sheet means the length, width and the thickness. General speaking, add some edge properly can improve the equality of the side thickness of the products effectively, of course it will add recycle rate of the waste material.

2. heating method: heating effect will affect the side distributing equality largely, it's related to the sheet thickness, heating speed and heating area control, the thickness the sheet, the faster it heat, the lager difference in temperature of the surface and the inner part, and the distributing equality of the finished products is not good, the heating speed is related to : the total power of the heater, the total temperature setting, the heating area setting, the distance between the heater and the sheet. The heating area setting should make the stretching of the sheet match the structure of the finished products, to avoid the sheet to be too thin or too thick.

3. Forming technology: working operation control is another key factor to affect the thickness distributing of finished products during the forming process, which includes blown, lower mold up, upper mold down, forming, cooling and mold-ejecting. The sheet temperature, the size of the globularity, stretching height,

the speed of the lower mold up, the speed of upper mold moving, vacuum speed, and the interaction of the above factors will do effect on the distributing quality of the finished products.

According to the feature of the finished products structure, normally, the blown height should be 1/2-3/4 of positive mold, or 70%--90% of positive mold. Adjust the blown height by controlling the pressure, adjusting the size of the value mouth and the effect time. After fixing the reasonable blown height, control it by photoelectricity eyes.

Mold temperature is another factor to affect the products' quality. Normally, the side which touches the mold will cool down first, when the lower mold up and vacuum, this part will stretch least, thus it's thicker than other parts, hard to form. Suitable mols temperature will lower the stress of the products, reduce the crimple, and improve the glossiness and the fineness of the products. There is connect equipment provided to so as to convenient the customers. The longer it vacuum, the better. The upper mold should be 70%-90% of chamber. The concrete size only can get after several times' test. Normally, use wood to make upper mold and wrapped with charpie.

There are two types of cooling: water cooling and air cooling. The workpiece must be cooled down lower than the deformed temperature, to avoid distortion because of uneven heating for each side of the sheet. Besides, it needs to make sure the size is steady.

Control the best time for blowing when mold-ejecting, adjust the blown and time, the speed of lower mold down should be slow.

The Appendix

Packing list

name	specification	quantity
Ceramic Heating Bricks	650w 400w	10 10
Solid State Relay		10
Magnetic Switch		2
Inner-hexagon Spanner	3-14	1
Adjustable Wrench	12”	1
Leatherhead Wrench	17-19	1
Oil Gun		1
Sharp Nose Plier		1
Wire-cutter		1
± Bolt Driver	8”	1
Mini ± Bolt Driver		1
8’, 10’, 12’, 16’ Plastic Tube		3m

Maintenance Spare Parts List

The list just used as reference for the customers when they buy the spare parts, don't forget to write down the name, model, piece NO. release date, identification NO. when order.

NO.	model	name	quantity	note
1	Sc125^1100(m27^2)	cylinder		Upper mold
2	Sc125^700(m27^2)	cylinder		Frame
3	Sc125^1100(m27^2)	cylinder		Lower mold
4	Sc63^1850(m16^1.5)	cylinder		Upper oven
5	Sc63^1750(m16^1.5)	cylinder		Lower oven
6	DcAc5-240v 100mA 10w	Magnetic switch		
7	120^120 650 w	Upper oven ceramic heating bricks		260v
8	120^120 400w	lower oven ceramic heating bricks		260v
9	G2"	direct action solenoid valve	2	Vacuum +degrassing
10	G1"	direct action solenoid valve	2	Prevent sag，blown + mold-ejecting
11	G3/4"	direct action solenoid valve	2	spraying
12	G3/8"	direct action solenoid valve	3	Oven delay + upper mold delay
13	G3/8"	5/2 single solenoid valve	3	Oven + mold cylinder
14	G1/2"	5/2 single solenoid valve	1	Upper mold
15	G1"	5/3 double solenoid valve (centre closed)	2	Lower mold，frame