TECHNICAL DATA SHEET

SK1OV

Composite curing ovens

► DESCRIPTION

Ovens for polymerization represent industrial ovens, which correspond to general design standards: CE, UL, AQSIQ, as well as to aircraft industry standards such as NADCAP, AMS2750, BAC5621.

That type of equipment allows realizing the following types of heat treatment: drying, polymerization, vulcanization, preheating, stabilization etc. at temperatures up to 550°C for all kinds of composite materials, including aggressive media. Oven body is a modular construction, made of welded frame with internal welded skins. External skins are made of portable panels, connected with screws to the structure. To minimize heat losses the gap between skins is filled with ecologically clean nonflammable thermal insulation from mineral fiber. The floor and roof as well as sidewalls, are filled with thermal insulating material.

Oven: 2,1×1,1×1,3м, volume 3,00m³,
Operating T=250°C

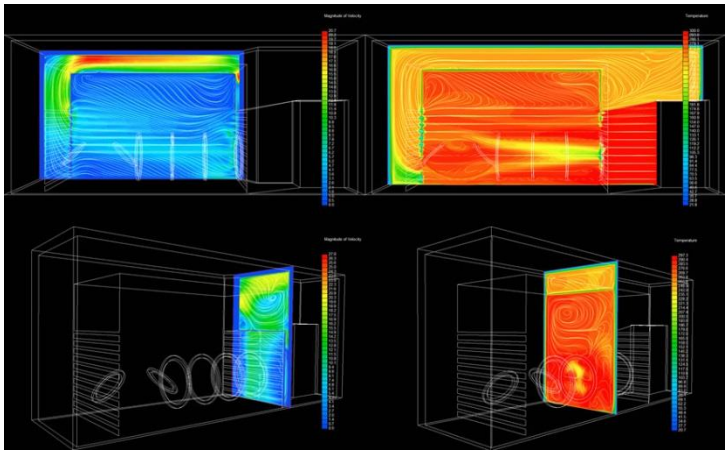
Oven: 3×4×2m, volume 24m³,
Operating T=220°C

Oven: 5,5×6×3m, volume 99m³,
Operating T=220°C

Oven: 6×22×4m, volume 528m³,
Operating T=220°C

► HEATING SYSTEM

The heating of working volume is achieved by electrical heating elements sheathed in stainless steel protective housing. The heating elements are accessible and can be replaced from the outside of the oven. Speed of heating and cooling is regulated by thermistor according to cycle recipe.



Heat flow simulation during oven design

Heating elements are specifically located to provide maximum thermal homogeneity. Maximum temperature gradient in ovens is defined by the customer during oven development and can be equal to ±1°C. (For standard oven version the gradient is equal to ±3°C).
The position of heaters of forced convection is determined according to size and shape of an oven by simulation method.

► FORCED COOLING SYSTEM

Quantity and location of suction fans is defined according to the oven volume and cycle recipe. Suction fan is installed on the oven's body. There is a gate on exhaust dust, which is opening when a fan is switched on. Suction fan is used to remove hot air after the finish of heat treatment process and to accelerate cooling of parts. Air cooling is realized by transmission shaft with the help of a turbine fixed on it. Shaft rotation is controlled by heating stop and by alarm in the case of breakage. Adjustment of the temperature homogeneity in the oven is made by changing the position of air baffles panels. That exhaust gate serves as an explosion protecting valve.

► TECHNICAL DATA

- Useful size of the oven: is defined by customer. All oven useful volumes are possible.
- Three-phase supply line voltage: 380 Volts.
- Maximum use temperature: 550°C.
- Minimal heating speed: 0,2°C/min.
- Maximum heating speed: 8 °C/min.
- Possible operating temperature range 40-550 °C.
- Heating speed of working area is defined by operator.
- Cooling speed of working area is defined by operator.

- Possible doors: hanging doors on hinges (double shutter /single shutter), guillotine type door.
- Door actuation: manually / motorized opening.
- Possible design: pusher oven /box oven.
- Oven can be demounted after manufacturing.
- Oven has interior light
- Possible installation of observation windows in a door.
- Possible installation of camera.

► VACUUM SYSTEM

The vacuum in the system is created by a vacuum pump. To avoid rarefying pulsation vacuum system is equipped with air receiver. According to customer technical specification the system is provided with different number of air suction lines, each vacuum line is equipped with solenoid-operated valve, which is closed in the case of vacuum leakage, manual independent valve, vacuum gauge and quick-disconnect plug for connection of vacuum hoses.

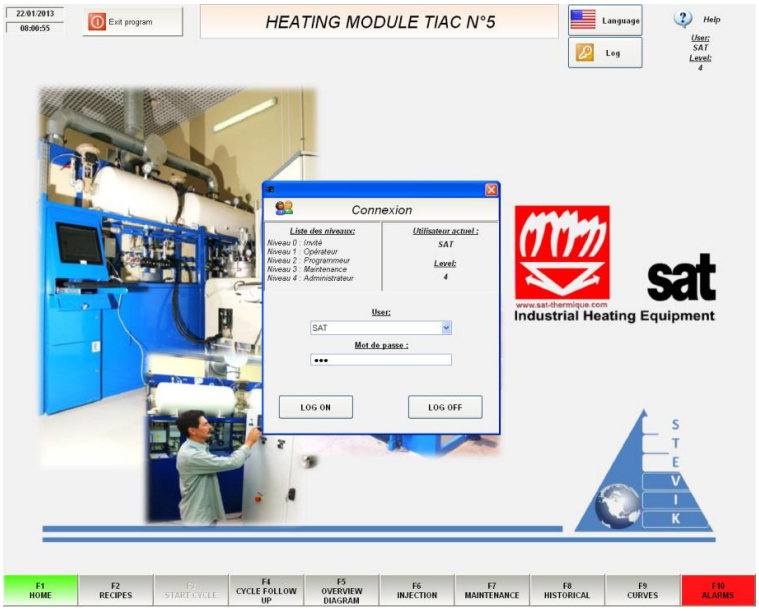
Example of assembled vacuum system

► SOFTWARE

Oven is provided with computer-aided control system, which allows setting and controlling process parameters of thermal treatment. Software is integrated for stuff of 5 different levels:

0: Visitor
1: Operator
2: Engineer
3: Maintenance
4: Administrator

Access level defines the amount of different operations and decreases the number of errors, which can appear during programming of process objective values by non-authorized stuff. Specialized pre-installed software provides oven control in one of 3 languages in the menu: French, English and Russian.



The first page of software: menu

The system can be connected to Ethernet of customer enterprise and can be remote-controlled.

Software function «RECIPE» makes possible creating of a program cycle by choosing of the following sections:

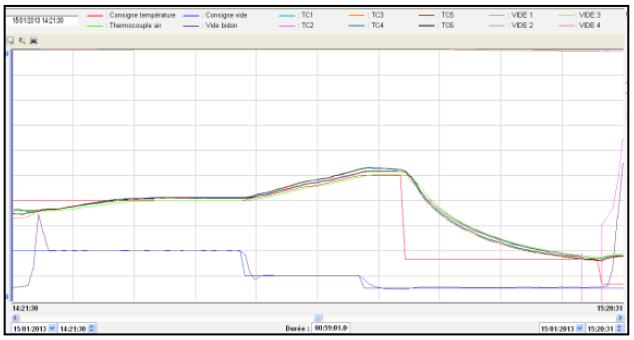
- Velocity linear measurement: Setting of target temperature and step. That segment indicates time interval for achieving of predetermined temperature.
- Time linear measurement: Setting of target temperature and time. That segment indicates time interval for achieving of predetermined point.
- Delay: Setting of delay time. That segment keeps the target temperature of previous segment, temperature value can be changed.
- Step: Setting of target temperature. That segment allows setting of target temperature with automatic transition to the next segment.

Segment	Air gap type	Air gap	Piece/air gap	Piece gap	Cooling	Operator validation	Segment type	Target	Speed	Duration	Vacuum
1	Without		2.0 °C	3.0 °C	☐	☐	Ramp by speed	100.0 °C	3.0 °C/mn		- 980 mb
2	Bottom	3.0 °C	2.0 °C	3.0 °C	☐	☐	Ramp by time	150.0 °C		10 mn	- 980 mb
3	Top	4.0 °C	2.0 °C	3.0 °C	☐	☐	Steady line			0 mn	- 980 mb
4	Band	4.0 °C	2.0 °C	3.0 °C	☐	☐	Step	200.0 °C			- 980 mb
5	Without		5.0 °C	3.0 °C	☐	☐	Ramp by speed	200.0 °C	5.0 °C/mn		- 980 mb
6	Bottom	0.0 °C	0.0 °C	3.0 °C	☐	☐	Ramp by time	100.0 °C		10 mn	- 980 mb
7	Top	2.0 °C	2.0 °C	3.0 °C	☐	☐	Steady line			0 mn	- 980 mb
8	Band	0.0 °C	0.0 °C	0.0 °C	☐	☐	Step	100.0 °C			- 980 mb
9	Without		0.0 °C	0.0 °C	☐	☐	Ramp by speed	50.0 °C	0.0 °C/mn		- 980 mb
10	Without		0.0 °C	0.0 °C	☐	☐	End				- 0 mb

Example of creating of cycle recipe

The function «CURVES» allows entire visualization of realized cycle and creating a report of accomplished process, with the further printing.
That data is automatically saved on a computer hard disk each 30 seconds:

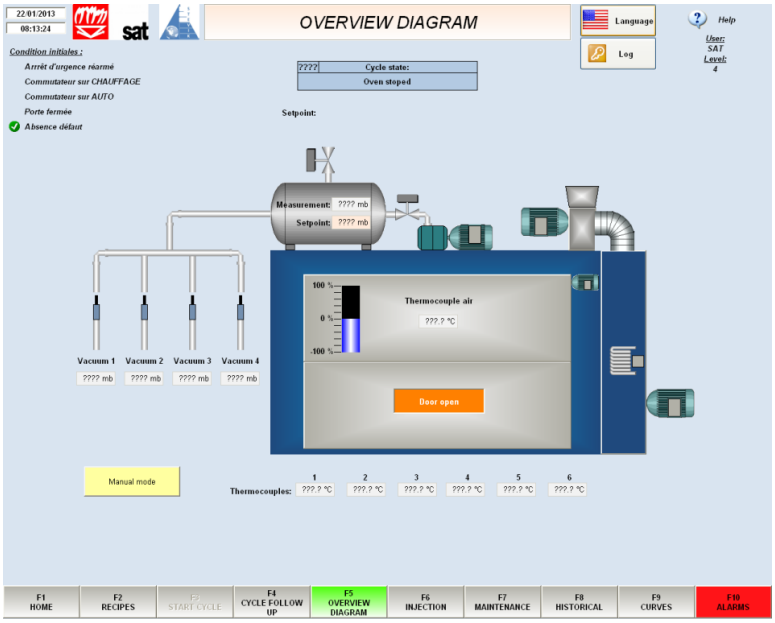
- Set temperature value
- Value of air thermocouple
- Set vacuum value
- Vacuum value in storage tank
- Value of selected thermocouple of each part
- Values of selected vacuum lines



Example of obtained curves

State survey of actuating and construction units is displayed in animated diagram of heating module and vacuum lines.

Software function «HISTORY» permits to overlook the information on the performed cycle at any time. At the end of each cycle the batch information (batch n °, recipe name, …) is saved in database, and following files are automatically saved on computer hard disk:



Animated diagram

- File «Date» (contains entire cycle data)
- File «Alarm » (contains alarms and cycle events)
- File «Report» (shows the link and cycle diagram).

► NOTE

Please contact us for more detailed information as well as for system development according to your technical specification.
Standard warranty period: 12 months.