VACUUM HOT FORMING MACHINE

Fig1. Vacuum Hot Forming Machine TMHF.

Vaccum Hot Forming Machine TMHF.

Size range machine :

1,5 x 1,5m
1,5 x 3m
1,5 x 5m
1,5 x 7m

For parts manufacturing by conforming thermoplastic or composite sheet applying heat by means of heathers, and forming piece between molding utile and a membrane forcing the sheet to get the utile form by making vacuum below the Silicon or Latex membrane. When reached fluent sheet material temperature, is applied vacuum in a progressive way between membrane and table forcing this way the membrane and material sheet to take the form of forming utile, after conformed takes place a cooling cycle by blowing external air through Heather Box and then finishing the full cycle.

Main Characteristics

- For use with Silicon or Latex membrane depending on objective material temperature

- Heather System based in ceramic infrared blocks Elstein type, mounted on reflective supports for efficiency improvement. Power 6 kw/m2.

- Motorized Heather Box with 20 s actuation time full movement. 0,8m full movement.

- Forming table made in Aluminum plate over an squared steel tube structure on wheels to be moved in and out and install forming utils below a hoist if necessary and ease general installation all around.

- Table with 3mm holes each 50mm for vacuum communication to the upper forming utils side from below camera covering all the table surface, and communicating this camera with vacuum line through an electric valve.

- Tighten flexible springs to forcé apply to membrane on table peripheria and get a good leakless membrane forming camera.

- Vacuum generated by external Factory vacuum line or by external vacuum pump.

- Membrane support on an squared steel mark covering all the forming area with manual independent movement running in same balls guide than Heather Box. To compensate its weight is supported by Spring to main structure.

- Digital vacuum sensor, can control vacuum ramp.

- Sectorized power in three areas.

- Controlled power with SSR phase control.

- Computer controlled with temperature and vacuum pressure data acquisition

Hardware

Machine has several components.

- **Main Structure** with table guides, and vertical guide (2) for lineal Ball bearings for Heater Box and Membrane Frame.

- **Moving wheeled utile table,** structure over wheels supporting Aluminum table with vacuum camera under table connected to Vacuum line, table is connected to below vacuum volume through 3mm holes distanced 50mm in a squared network covering all table area.

It has a utile plate with thermocouple connectors connected through table for temperature measuring under membrane, also has vacuum line inlet connected to vacuum camera under table.

Fig 2.Connecting plate for Thermocouples and Vacuum line

- **Heather Box** has similar size to table and covers it fully, and internal heigh about 700mm to get a distance of 300mm to the upper part of the conforming utile of a maximum height of 300mm. This Heater Box has an all around surface isolated with Fiberglass for safety matter., Heaters are Elstein ceramic type 60mm x1,30m in parallel at a distance of 330mm between centers, getting about 6kw /m2.

- **Membrane frame** is made by a Steel profile with a simple system to support the membrane below it to be pressed against Table. This frame is supported to ball guides (Same than Heater Box) and has manual movement up and down over same guides; it is also supported by vertical springs for no weight sensation.

It can be also held by the Heather Box with some degree of liberty of movement in X and Y direction to adapt perfectly to Table and make a good contact to get a very low vacuum leakage level.
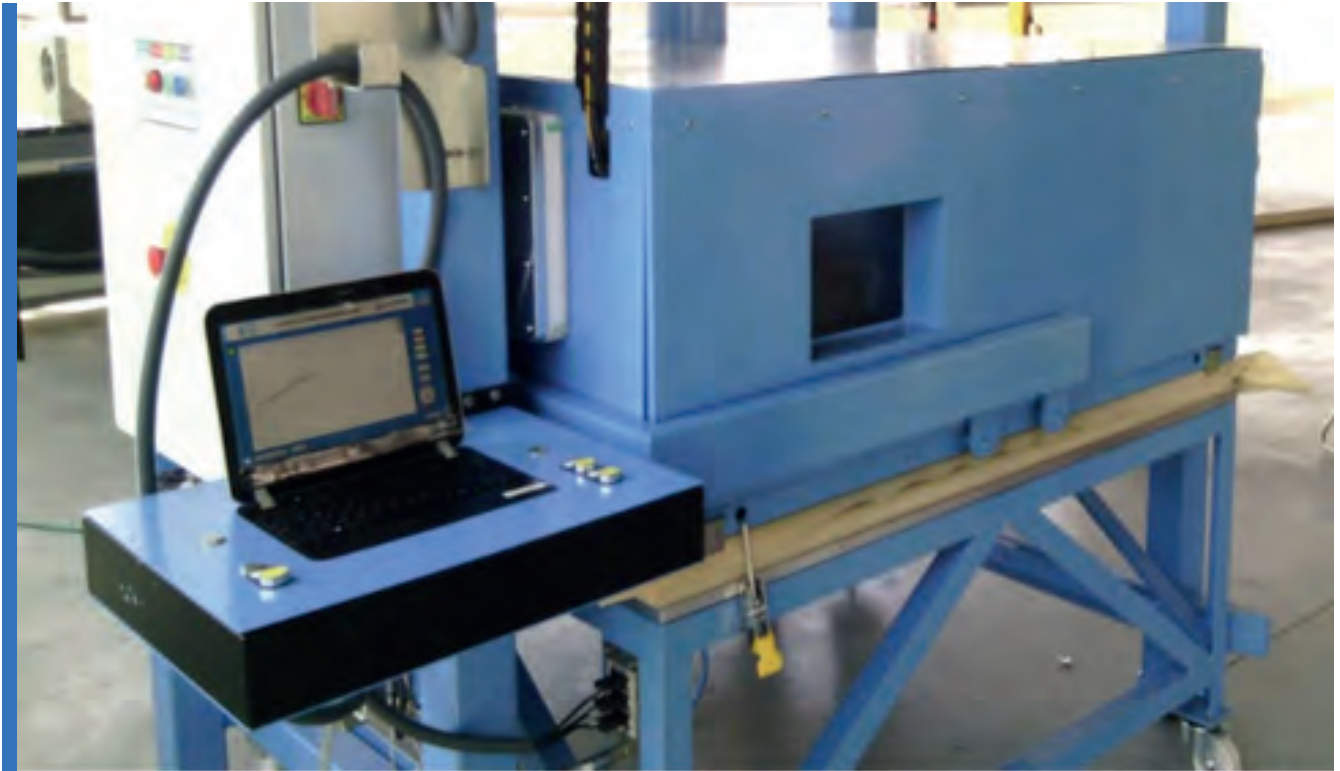
Fig 3.Control Console

- **Control and Console,** it has a cabinet with all connections to both fixed and moving parts through a cable guide. SSR controlled by Phase angle to get 0 to 100% Power, and a SIEMENS PLC to interface with every element.

Console has a computer as human interface and to program and run cycles and recording of data

- Velocidad de calentamiento.
- Tiempo de calentamiento.
- Temperatura de estabilización.
- Tiempo de estabilización.
- V acío.
- V elocidad de enfriamiento.

El equipo posee dos modos de funcionamiento: Automático y manual.

El modo automático permite realizar la reparación seleccionada por el usuario de forma automática. Si durante el ciclo se superan alguno de los límites de temperatura (máximo o mínimo), vacío, falla un termopar o algún componente , el equipo informará de forma gráfica y acústica del límite superado o causa de error.

Control Software is most advanced component and is designed to be ease of use and permits to easily program and run Conforming cycles by introducing data of:

- Rate of temperature rising and objective
- Steady state of temperature and time for the step
- Band of limits of temperature
- Vacuum and rate during cycle

Automatic mode

Runs cycles following selected cycle.

In case of overrunning any limit, makes graphic and acoustic advice, this can be silenced, and the cycle can be stopped, held at the actual temperature or continued as desired by operator or as being programmed, when no attention by operator.

Manual mode

It is to check the Specimen installation, to test Thermocouples and heaters before beginning cycle.

• **Users**

The program has a hierarchy of users.

Administrator has all capabilities and also can create other low level users as:

Technicians: can create and run Cycles and recorded forming cycles retrieving
Operators: can run cycles and retrieve data of recorded conforming cycles.

• **Calibration.**

Each analog channel can be corrected with an Offset and Gain to calibration purpose..

• **Data retrieving.**

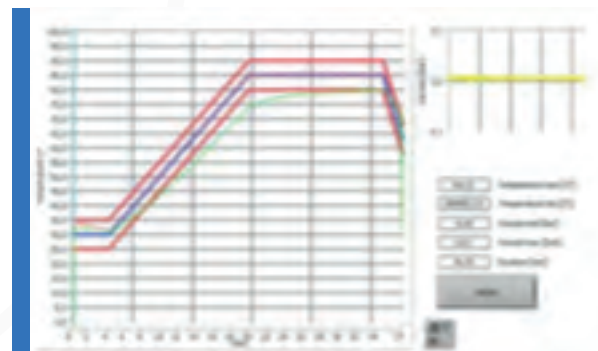This is to recover dats from old runned cycles for camparison or to make reports.

Fig 4.xxxxxxxxxxxx