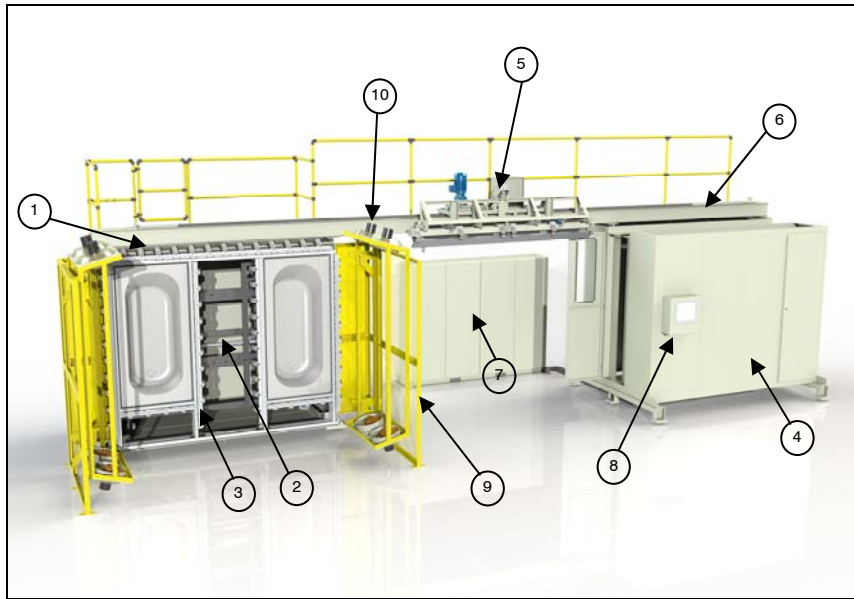


VT-3-1 VERTICAL THERMOFORMER

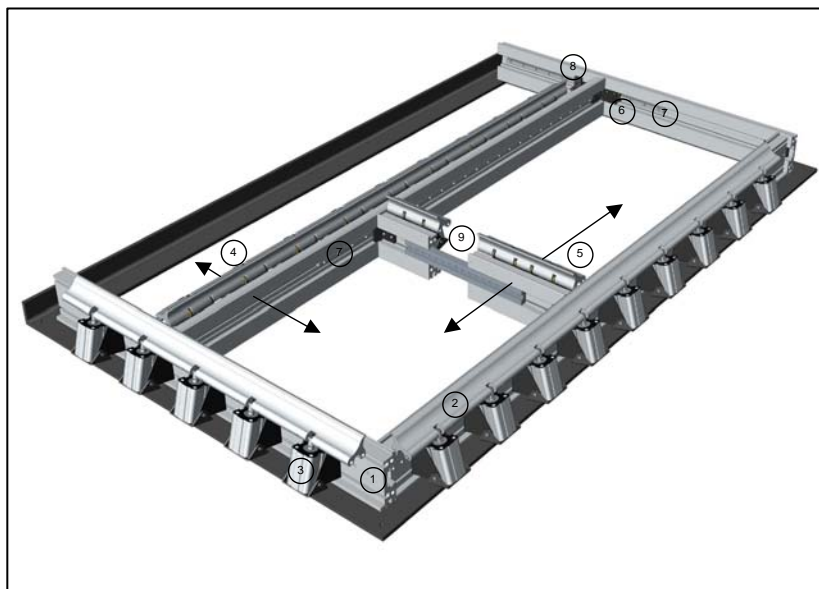


The VT-3-1 Vertical Thermoforming System is designed to give the fastest possible cycle times available with vacuum forming machinery. This is achieved by operating the heating process and the forming process simultaneously. An optional second station allows continuous production as mould set-up can be carried out on one station whilst forming is running on the other. Option extras include water heaters for mould temperature control, automatic sheet cleaning bars, and sealed cabinet for pressurised moulding.



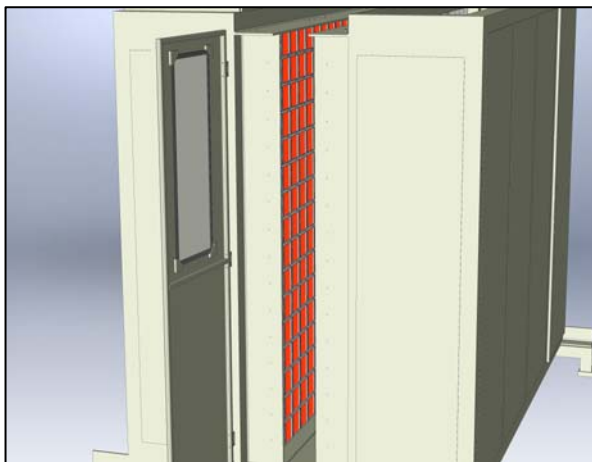
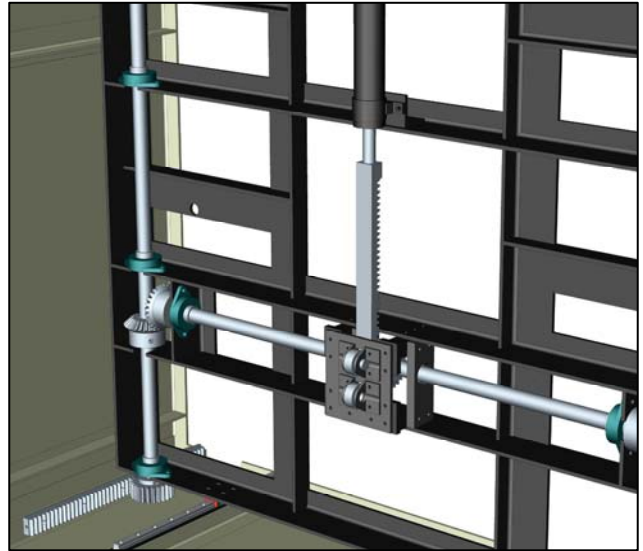
- | | |
|--------------------|------------------|
| 1. Forming station | 7. Control panel |
| 2. Table | 8. Touch screen |
| 3. Clamping bars | 9. Light guard |
| 4. Heater banks | 10. Cooling fans |
| 5. Sheet carrier | |
| 6. Beam | |

Sheets are loaded into the sheet carrier (5) that moves the sheet between the different parts of the machine. The beam (6) provides the track that the sheet carrier travels on, and it runs the full length of the machine. This enables the sheet to travel from the load position, into the heaters, and then to the forming station. The heaters (4) are mounted in two banks, front and back, for dual sided heating. Two pyrometers are fitted to the machine that monitor the actual sheet temperature in the heaters. When the sheet has reached its forming temperature it is carried to the selected forming station (2), where the sheet is released and held in the clamping bars (3) for the forming process. At this point the sheet carrier returns to the loading position where the next cycle can begin immediately. Moulds are fixed to the table (2), which controls the penetration into the plastic sheet. The cooling fans (10) are mounted to frames that hinge back to allow for unrestricted product removal and mould changing.



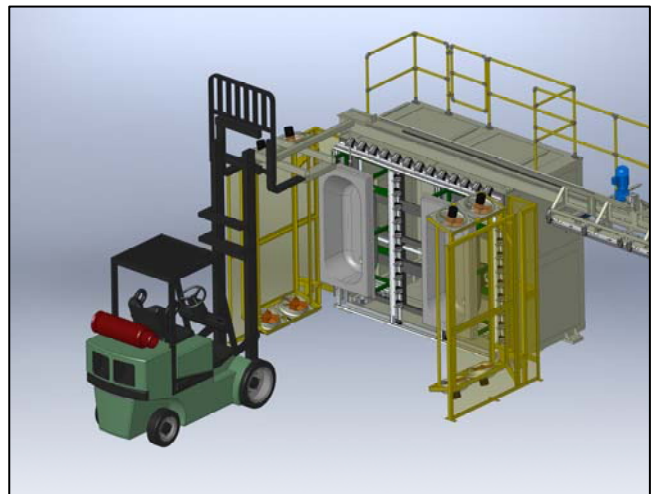
The Armour clamping bars have been specially designed for ease of set-up and fast tool changes. Each clamping bar is comprised of two high precision aluminium extrusions, a fixed bar (1) and a hinging clamping bar (2), which is actuated via a series of pneumatic cylinders (3). The size of the forming aperture can be varied by moving the main sliding bar (4) and the adjustable bar (5). Both of these are mounted on linear guides (6), and slide on high precision rails (7), and are locked in position with a locking handle (8). The forming length is infinitely adjustable along the slide. The forming width requires loose pieces to make up any gap (9) between the two adjustable bars. These can be easily fitted and are bolted in place using a steel brace.

It is critical to the forming process that the progression of the mould into the sheet is smooth and controlled. The mould table runs on precision linear guides and rails, and are driven with hydraulic cylinders through large rack and pinion drive gears. Variable table speed allows the product to be carefully released. Linear encodes

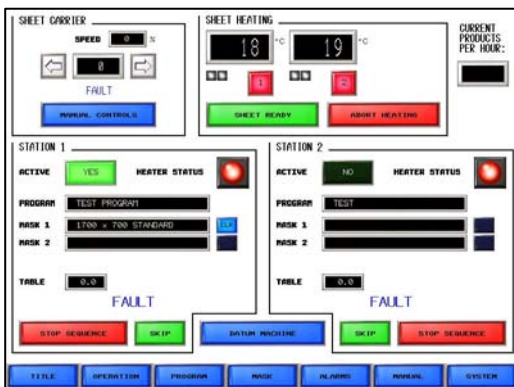
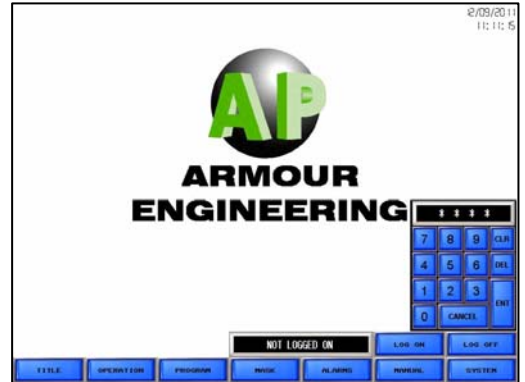


The heater banks consist of a series of quartz infrared heating elements, adjustable in pairs (one front heater and one back heater) to allow complex heating patterns to be used. These heaters have a rapid response time and therefore energy is saved between cycles when the heaters drop to a very low standby power. The acrylic sheet is only held by the top edge during the heating process, thus ensuring that no stress is induced (a common problem when clamping cold sheet), and therefore straighter products can be produced without warping.

The fan frames hinge back to allow access for product removal and mould changing. Moulds can be easily lifted into the forming station using a standard fork truck

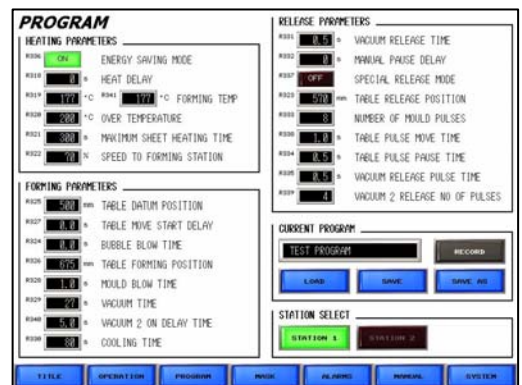


Armour control systems use a Mitsubishi PLC to control the sequencing of the machine, and have a Proface touch screen as the user interface. Up to 500 programs can be created and are stored on a SD card, allowing easy backup. Reporting facilities are available and .csv files can be exported for offline production analysis. The system can be connected to the internet to allow remote access by Armour Engineers for diagnostic checks and software upgrades. All machine software is written by Armour and therefore new versions and additional features can be developed to meet customer's specific requirements.

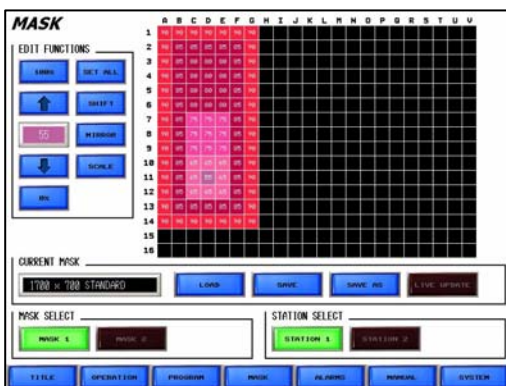


When double forming, the temperature of each sheet is controlled independently, ensuring that even when different sheet thicknesses or temperatures are used both sheets will always reach their programmed forming temperature at the same time. The machine software achieves this by automatically regulating the heaters.

Sequence parameters can be adjusted to suite individual products and saved for up to 500 different products. These parameters include accurate table positioning that once programmed works using a linear encoder. Other features are options for single or double vacuum.



Each mask is for a single product only and these can be combined when double or treble forming.



VERTICAL FORMING MACHINE BENEFITS

Performance:

The speed of the Vertical machine gives a higher output than any other machine available - 18 cycles per hour (4mm cast acrylic & aluminium moulds) which gives up to 36 products per hour when double moulding. These outputs can be achieved with only one operator.

Product Quality:

The product quality is the highest possible due to the following:-

- The vertical position of the moulds ensures that they stay clean and therefore no marks will be present in the formed part
- The acrylic sheet is only held by the top edge during the heating process and therefore no stress will be induced by clamping cold sheet, and this gives a straighter product with no warping

Man-power & Skill level:

The Vertical machine is extremely easy to use, and can be operated with only 1 man to achieve up to 36 products per hour. This is a significant saving in labour costs compared to horizontal equipment.

Tool change time:

Mould changes can often be accomplished in less than 10 minutes.

Machine Cost:

The price of a Vertical machine is not much higher than an Armour Horizontal machine and much lower than the cost of our major European competitors.

Conclusion:

For a sanitary ware producer, no other machine available offers such an incredible level of performance, and the price ensures that it is affordable.

MACHINE SPECIFICATION

ELEMENT	SPECIFICATION	
Machine Capabilities	Maximum product size: Maximum forming aperture: Minimum forming aperture: Maximum tool height: Maximum tool push through: Maximum sheet thickness: Cycles per hour (4mm cast acrylic): Output (2 aluminium moulds & 4mm cast acrylic):	1900 x 1600mm 1914 x 1614mm 711 x 500mm 840mm 600mm 8mm up to 18 cycles up to 36 products per hour
Machine Construction	Main frame: Casing: Paint finish:	Rolled steel sections – BS EN 10025 material Sheet steel – BS EN 10025 material 7035 powder coating
Clamping Bars	Material: Adjustment: Sheet clamping:	Extruded aluminium profile – Armour design By precision linear slides & make up pieces Pneumatically operated
Heating System	Front & rear banks of quartz infra-red heating elements Element size: Element power: Total elements per heater bank: Element distribution: Number of heating zones: Zone control: Maximum power rating:	122 x 122mm 450W 255 17 wide x 15 high 255 (each containing 1 front & 1 rear element) Software controlled Power: 0 – 100% in 1% increments 230 kW
Sheet Carrier	Drive: Control: Sheet clamping:	AC motor & gearbox with rack & pinion Inverter Pneumatically operated by footswitch
Mould Table Movement	By hydraulic power through mechanical gearing Power-pack motor rating: Maximum pressure:	3kW 3000psi
Vacuum System	Vacuum pump motor rating (when supplied): Vacuum pump flow rate:	5.5kW 250m ³ /hr
Product cooling	By cooling fans with directional adjustment Number of fans per station: Fan motor rating: Fan flow rate: Total airflow per moulding position:	8 650W 6020m ³ /hr 24080m ³ /hr
Mould Heating Facility	Power rating (when supplied): On/Off timer from control system	9kW

Control System	PLC controlled sequence. Touch screen user interface. Remote diagnostic interrogation.
Compressed Air	Minimum pressure: 6 Bar Dry filtered supply
Electricity	3 Phase supply + Neutral + Earth: 380/415V @ 50Hz
<p style="text-align: center;"><i>example specification only - specification may be subject to change without notice</i></p>	

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