HEAT PIPES

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for rotational moulding

In general rotational moulding is well known as the plastics conversion technology that, unlike others (injection and blow moulding, thermoforming) makes it possible to produce a part of any form whatsoever.

This theory is more than valid, but often comes up against the practical problems of getting heat into (so forming the part in) difficult to reach areas.

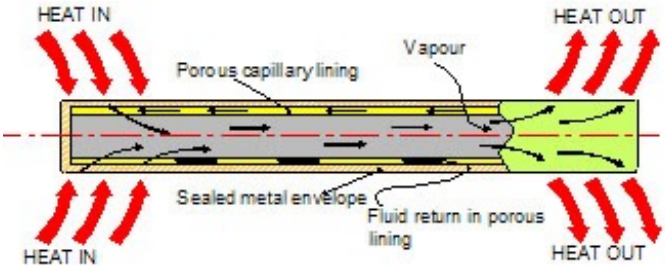
In recent years this problem has been tackled using air movers (based on Venturi technology) which force hot air into areas otherwise shielded from air flow. Air movers are an excellent solution to many problems, but require piping compressed air through the machine arm to the right point on the mould, which can be complicated or impossible.

There is another way to move large quantities of heat to where it is needed: use heat pipes. These ultra-efficient thermal conductors are extremely effective and simple to fit in rotational moulding tools.

Heat pipe technology has made significant progress over the last few years. The products are now used extensively all through industry, including sophisticated areas like electronics and aerospace.

In the plastics industry they are used in injection moulding for cooling, while their purpose in rotational moulds is principally the opposite – to take heat into areas where otherwise part wall build-up is too thin.

The heat pipe's virtually instant heat transmission is possible thanks its structure. The external vessel contains a porous capillary structure or wick which is saturated with the working fluid while the centre of the unit contains the same fluid in a semi-gaseous state (vapour).



Applying heat in any area of the heat pipe causes the fluid to boil at this point which increases internal pressure, transferring heat all along the heat pipe. The change of phase from liquid to vapour to liquid causes extremely efficient thermal conduction. Typically the temperature gradient along the heat pipe is not more than 2 °C when the heat pipe is running.

Example of products without and with heat pipes.

Without heat pipes

Photo courtesy of Persico

Photo courtesy of Maus

With heat pipes

Photo courtesy of Persico

Photo courtesy of Maus

Heat pipes used in rotational moulds are fitted so the final portion of the heat pipe is in intimate contact with the mould while the other extremity (where necessary, complete with fins) protrudes beyond the mould perimeter to collect heat from the hot air flow of the oven. Heat pipes are quick and easy to fit, and once in place do not require maintenance.

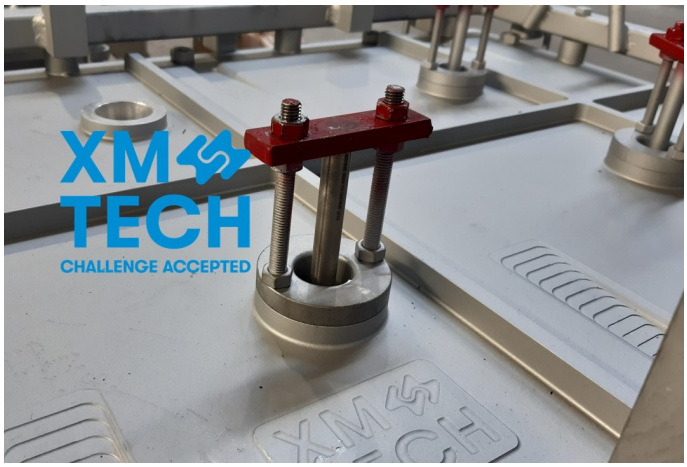


Photo courtesy of Xm Tech

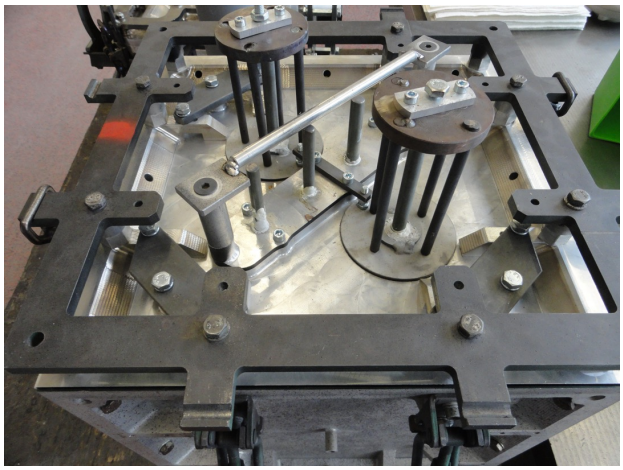


Photo courtesy of Maus

HEAT RESISTANCE

For normal applications two series of heat pipes are available:

- Standard: working temperature range: +5 - +170 °C
- VHT: working temperature range: +5 - +300 °C

To choose the type needed, the temperature to be considered is not the maximum heat of the environment in which the heat pipe will operate, but the temperature at which the heat pipe itself will operate. For example, if half the heat pipe is in air at 450°C and the other half is in contact with water at 20°C then the heat pipe will work at around 200 – 230°C.

SIZING

To optimise price/efficiency ratios, for most application cylindrical ("pipe") geometry heat pipes are used, but more complicated forms can be produced.

For rotational moulding applications the heat pipes are made to measure, generally with diameters from 8 to 18mm and without length restrictions.

To choose the correct heat pipe for a rotational moulding application, first consider the diameter. In general it makes sense to choose the biggest possible diameter that will fit in the section of mould, within the range of diameters available (ask us for details).

Just to stress the point: the contact area is extremely important. Heat pipes collect massive amounts of heat and need to be able to transfer them into the mould by sufficient intimate contact area.

To increase thermal conductivity in the contact interface a good thermal contact compound should be used and tolerances should be 1 mm max.


Photo courtesy of Tecnomodel


Photo courtesy of Persico

Please contact us if you wish further information or have a specific project you would like us to advise you on.