

PLASTINUM™ Temp S-CO₂ Spot Cooling. Temperature control for injection molds.



Higher quality and efficiency with CO₂ spot cooling

Linde's innovative spot cooling technology with liquid carbon dioxide (LCO₂) efficiently compliments the conventional water cooling of injection molds. In particular, CO₂ temperature control provides a dramatic advantage for the cooling of hot spots (eg. very thin parts, small cores, or areas where material accumulates) in the mold. In these locations the use of CO₂ can significantly enhance cooling and reduce cycle times (by 50% or more). In addition to improved cycle times, CO₂ spot cooling produces a more even temperature distribution in the mold, decisively increasing part quality.

Background

Uniform temperature distribution on the cavity surface is crucial for producing high quality parts and short cooling times in injection molding. Generally, the mold temperature for thermoplastic injection is controlled using water which flows through runners in the mold. Conventional water cooling proves to be inefficient where the space for cooling channels is limited.

Process description

Conventional cooling of long thin cores and other difficult-to-access areas pose severe cooling challenges caused by the runners clogging with deposits and hydraulic restrictions to flow. Moreover, small runner diameters as well as long distances between cooling channels and molding surfaces result in significant pressure losses. Flow restrictions lead to heat removal problems which can cause surface defects, part warpage, and long cooling times. CO₂ spot cooling is the viable solution.

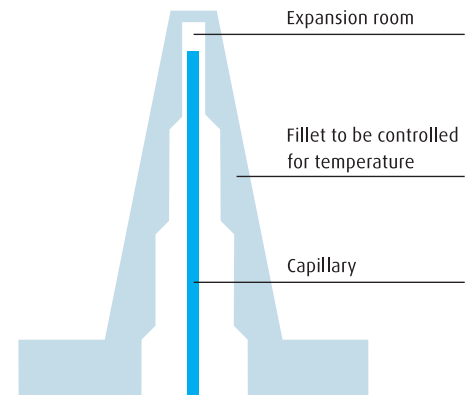
CO₂ temperature control of hot spots is beneficial where no other cooling method proves effective. Based on long-time expertise in cooling technologies, Linde has developed and refined the CO₂ spot cooling process for conventional steel molds.

Liquid CO₂ flows under high pressure (approx. 870psi) through small, flexible capillary tubes (outer diameter \leq 1/16 in) to the point of use where the cooling is required. The CO₂ expansion creates a snow and gas mixture with a temperature of -110 °F and a high cooling capacity. After removing heat from the hot steel of the mold, the now gaseous CO₂ leaves the cavity through open exhaust channels. To capture its high cooling potential, a controlled injection of CO₂ is absolutely essential.



Spot Cooling Controller

CO₂ temperature control



Advantages

The high efficiency of CO₂ temperature control provides many advantages – low investment costs, easy installation, convincing results – that make it very attractive for injection molding. CO₂ spot cooling is suitable for new molds as well as for retrofitting existing molds. In detail, it offers the following advantages:

- Significant reduction of cooling times
- Uniform temperature in mold and molding
- Higher quality and efficiency
- Intensive heat removal in problem areas (small cores, material accumulations)
- Thin, flexible pipes ($\varnothing \leq 1/16$ in)
- Easy installation in conventional tool steel

CO₂ supply concept

To fully capture the advantages of CO₂ spot cooling the process must be highly repeatable. Repetition can only be achieved when a reliable and stable CO₂ supply solution is used. Depending on customers' requirements and conditions, Linde offers a solution. A suitable CO₂ tank with pressure boosting equipment – and, if required, a heater – supplies bubblefree liquid CO₂. In terms of quantity, pressure and temperature, this system is flexible enough to meet the individual needs of different customers.

Service range

Linde offers full service:

- Analysis of the existing injection molding process.
- Feasibility study of the CO₂ temperature control for each product
- Economic calculation of the CO₂ temperature control
- Detailed modification layout
- Implementing the necessary equipment, including the CO₂ control device
- Installation of a suitable CO₂ supply system
- Start-up

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