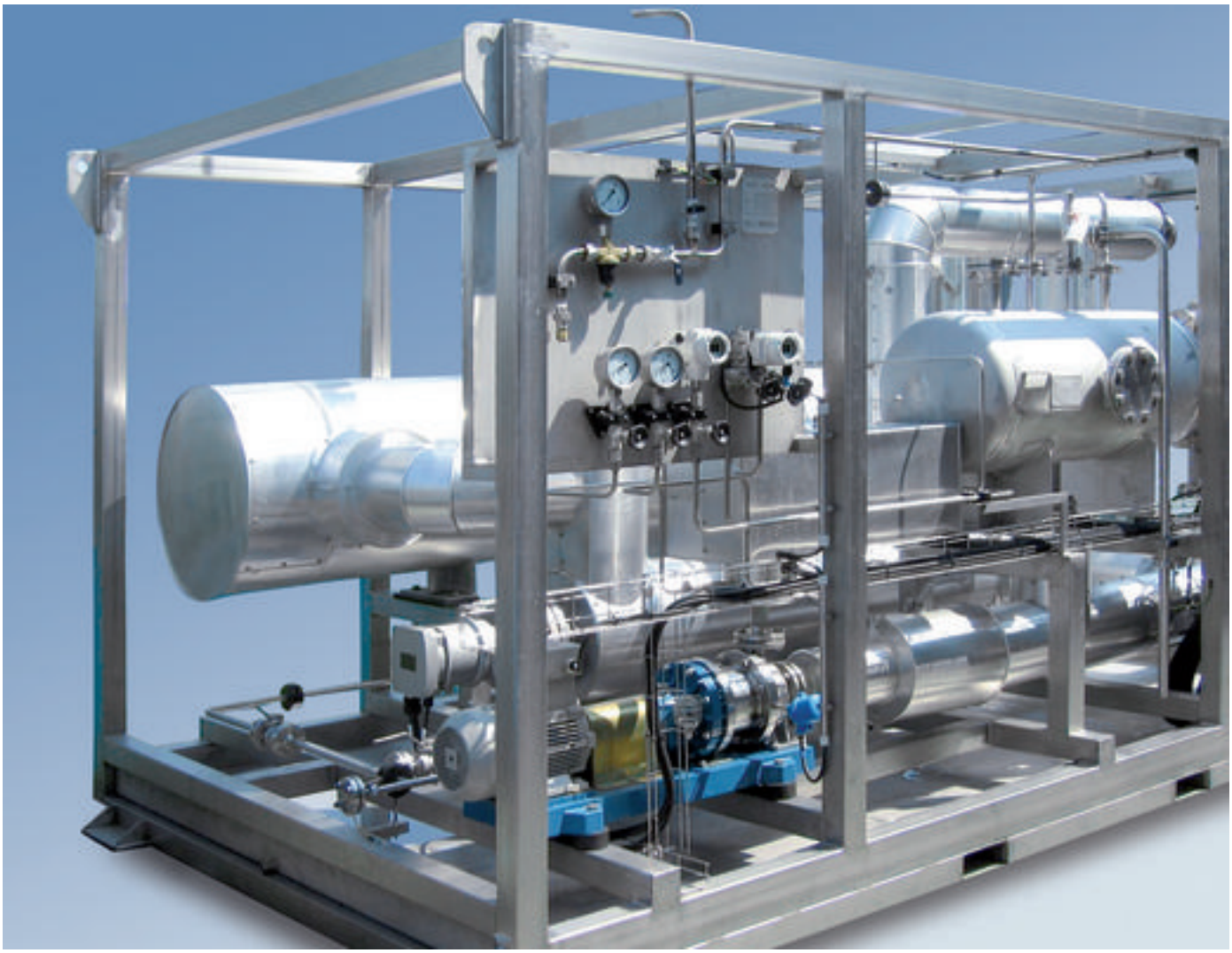
MESSER

High Efficiency through Low Temperatures

Cryocontrol – optimizes synthesis processes in pharmaceutics and fine chemistry



Optimization options that leave no one in the cold

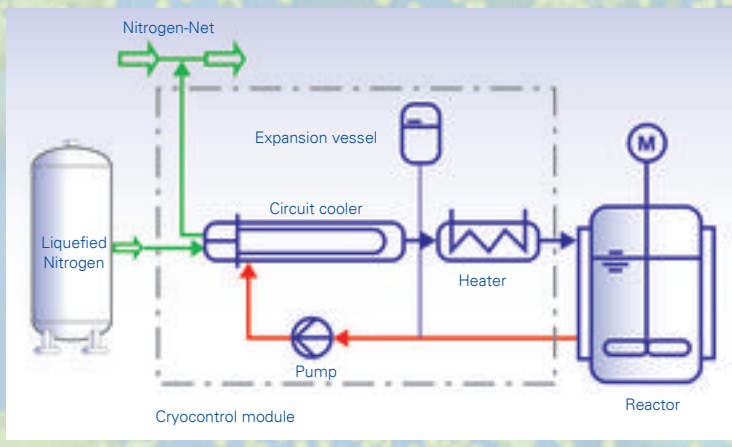
Very low process temperatures are frequently required in reactors in state-of-the-art pharmaceutics and fine chemistry (e.g. in producing active ingredients). They help to conduct synthesis steps in the desired direction or to increase product output. Requirements for temperatures down to -100 °C are not uncommon here. As a rule the same process step also requires high process temperatures. The Cryocontrol process from Messer supplies precisely this controlled cooling energy or heat. It satisfies the wish for high efficiency and short cycle times with rapid temperature change and low control deviation. Naturally high reliability and low maintenance requirements are also ensured, which makes a Cryocontrol system an almost ideal source of cooling energy.

Cryocontrol – maintaining temperatures efficiently and economically

The Cryocontrol process uses the cooling energy of liquid nitrogen which, thanks to its physical characteristics, is a perfect cooling medium.

Mixing vessel for high and low temperature reactions

The principle of the process is simple but efficient: an intermediary thermal unit heat carrier circulation is interposed between the source of cooling energy, nitrogen, and the reactor. When a suitable heat transfer medium is selected, this circulation enables the reactor to be both cooled and heated.



Process diagram of the Cryocontrol process

In cooling mode the heat carrier circulation is cooled using liquid nitrogen. The nitrogen evaporates when the heat is transferred, and after it has been heated can be used for other applications, e.g. for inerting. In heating mode the nitrogen supply is interrupted; the heat transfer medium is heated using a flow heater.

The low temperature difference between the cooling medium and the product means that the reactor contents are heated and cooled very gently and evenly. This permits the synthesis of temperature-sensitive products.

Nitrogen – many advantages at temperatures below zero

The Cryocontrol process is superior to conventional refrigerating machines in several respects – in particular for applications in the low temperature range. For example, refrigerating machines' compressors have to be very powerful so as to achieve extremely low temperatures at all.

But as performance requirements increase, so too do the investment costs - significantly. Added to this, investments in refrigerating compressors only rarely pay for themselves because refrigeration is not usually required permanently, but only for the limited period of a production campaign.

At the same time the compressors are subject to increased wear because they are constantly switched on and off in order to handle the rapid change between cooling and heating phases.But this is precisely what is required to implement the batch reactions which are generally required.

Low maintenance, high reliability

Only very few moving parts are used in the Cryocontrol process. Wear and maintenance effort and expenditure are correspondingly low. The simple structure of the process also improves the system's availability, which can be enhanced still further by incorporating a redundant pump: this guarantees that no uncontrolled exothermic reaction takes place if the cooling system fails, thereby ensuring that the system – and the reactor contents, some of which are costly – cannot be damaged.

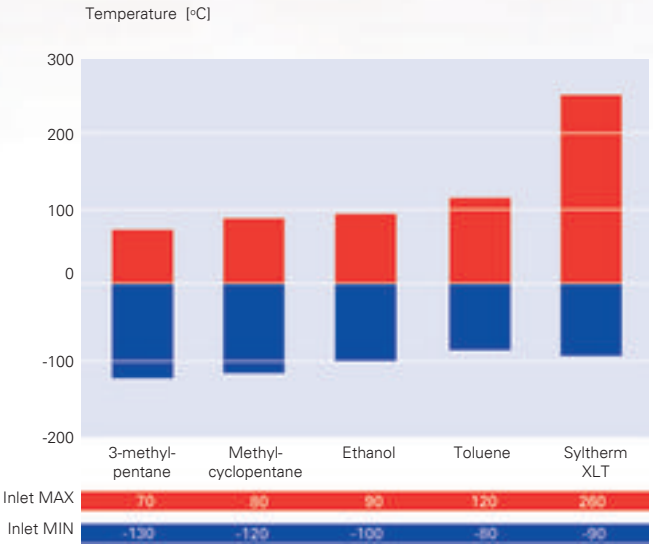
The Cryocontrol process is also attractive for ecological reasons: here we have central, low-cost production of nitrogen on the one hand, and the decentralized, electrical power input of compressors on the other. Furthermore, the use of potentially critical refrigerants such as ammonia or halogenated hydrocarbons can be dispensed with from the outset.

The suitable heat transfer medium

The range of possible applications for the Cryocontrol process is determined decisively by the physical characteristics of the heat transfer medium.The central selection criteria are:

- good heat transfer characteristics
- low viscosity, especially in the low temperature range
- low melting point
- high boiling point
- good environmental compatibility

Consequently different media have established themselves in practice:



Application temperature ranges for various heat transfer media

The essentials

The Cryocontrol process is always an ideal solution when

- low and medium average cooling effects or
- high peak cooling effects

are required in the cryogenic temperature range. Cryocontrol demonstrates the advantages it offers compared to mechanical refrigerating installations above all in batch production and/or campaigns.

We will be pleased to show you how you can utilize the strengths of Cryocontrol systems for your work – and not just on paper: our pilot system is available to you for tests and an initial sample campaign.

Cryocontrol pilot system for customer tests and sample campaigns

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