

# Reactor Cooling

## We deliver:

- High cooling power
- Precise temperature control
- Flexible operation
- Low capex



## The Industry Challenge

The production of active pharmaceutical ingredients (APIs) and that of fine and basic chemicals requires multiple reaction stages at precise and steady temperatures.

Cryogenics allow for accurate control of reactor temperature in the range of the ambient to  $-140^{\circ}\text{C}$  ( $-220^{\circ}\text{F}$ ). Many low-temperature processes leverage liquid nitrogen cooling and freezing capabilities.

Liquid nitrogen is an effective and convenient refrigerant due to its availability, low cost, and inert properties. It's also a practical cryogen because of its extremely low boiling temperature of  $-196^{\circ}\text{C}$  ( $-321^{\circ}\text{F}$ ) and high refrigeration capacity both at atmospheric and elevated pressures.

## The Nexelia Solution

A comprehensive gas solution designed for and adapted to your specific needs, **Nexelia for Reactor Cooling** combines the best of our gases, application technologies and expert support. As with all solutions under the **Nexelia** label, we work closely with you to predefine a concrete set of results, and we commit to delivering them.

**Nexelia for Reactor Cooling** provides a best-in-class indirect cooling solution to achieve effective temperature control by circulating a heat-transfer fluid refrigerated with liquid nitrogen. Our long experience with cryogenics and the simplicity of the process ensure you safety and reliability.

## Your Advantages

- **Low costs**
  - Very low pressure drop in the cryogenic exchanger
  - Reduced need for liquid nitrogen
  - Minimum power for circulating the heat-transfer fluid
  - No contact with the reaction medium: exhaust gaseous nitrogen is completely reusable to minimize operating costs
- **High efficiency**
  - High cooling rate up to 400 kW
  - Heat-transfer efficiency exceeding 99% with typically  $5^{\circ}\text{C}$  of temperature difference between exhaust gaseous nitrogen and heat-transfer fluid
  - Operating temperature from  $-140^{\circ}\text{C}$  ( $-220^{\circ}\text{F}$ ) to  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ) within  $\pm 1^{\circ}\text{C}$  high accuracy
- **Greater flexibility**
  - Installation anywhere between the liquid nitrogen storage tank and a reactor, even outdoor
  - Possibility to combine with existing mechanical chillers
  - Heat-transfer fluid best suited to reactor medium
  - Minimal maintenance and cleaning
  - Heating module option available
- **Safety and reliability**
  - No need for CFCs
  - No emission of volatile organic compounds (VOCs)
  - No cross-contamination
  - No loss of heat-transfer fluid or reaction medium

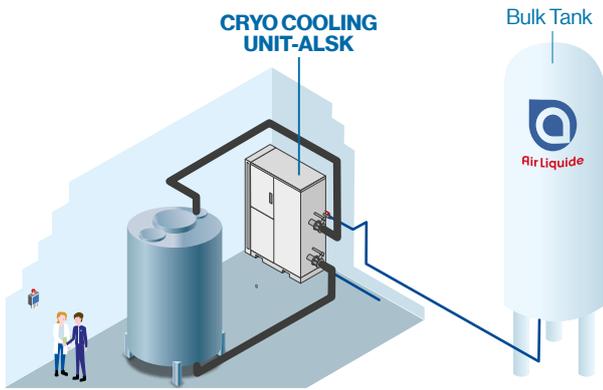
# Core Features

Nexelia for Reactor Cooling consists of:

- **Liquid nitrogen supply from liquid storage tank**
- **Application technologies**

We offer seven standard **CRYO COOLING UNIT-ALSK** versions ranging from 5 to 100 kW in refrigeration power. Beyond 100 kW, manufacturing is based on customized criteria, which may require additional options such as specific valves, sensors or pumps.

Heating up the reactor to positive-Celsius temperatures may also be necessary. Heating modules can be provided to warm up the heat-transfer fluid by using low-pressure steam. If steam is not available, electrical heaters can be used.



Whichever configuration you choose, you'll benefit from the full support of our industrial-cryogenics experts, from the auditing of your current system capacity to the complete rollout of your new system, including preliminary and detailed design, full installation and startup.

# Case Study

- **Customer need: higher cooling efficiency**
  - Initial technology: submerged heat exchanger (very low efficiency with liquid nitrogen)
- **Our solution:**
  - **CRYO COOLING UNIT-ALSK**
- **Benefits:**
  - 99% heat-transfer efficiency from liquid nitrogen to heat-transfer fluid
  - 25% lower liquid nitrogen consumption
  - Limited CAPEX with 18-month ROI

# Related Offers

- **Nexelia for Tank Inerting**

## Contact us

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