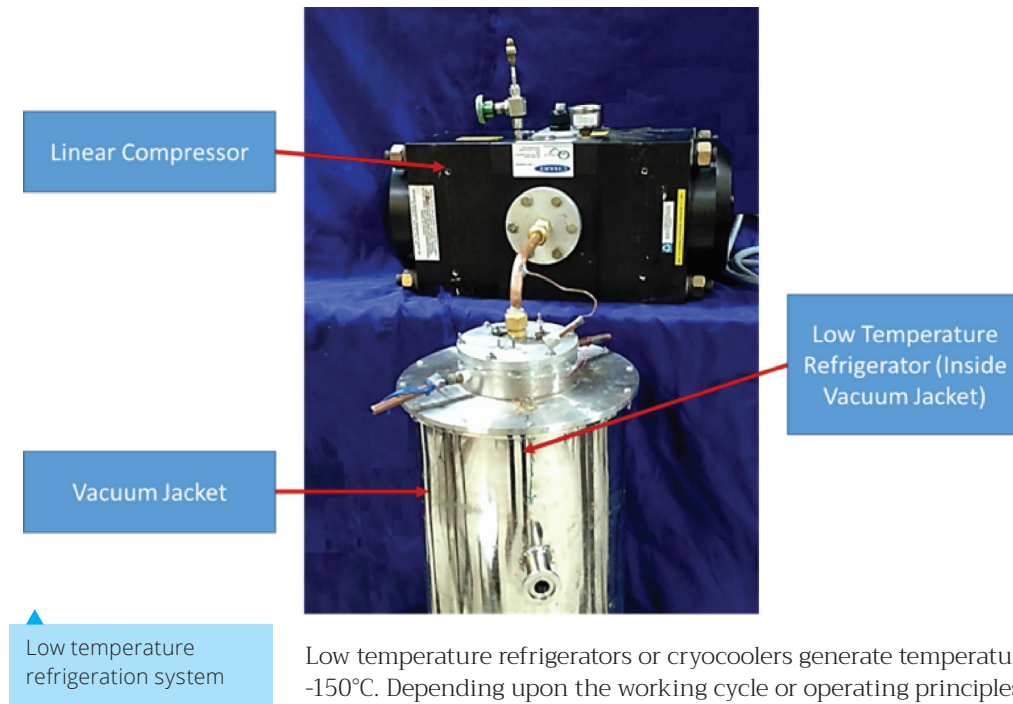


Development of low temperature refrigerators: Production of temperatures below -150°C



Low temperature refrigerators or cryocoolers generate temperatures below -150°C . Depending upon the working cycle or operating principles, there are various types of cryocoolers like Joule-Thompson, Stirling, Gifford-McMahon (GM), Pulse Tube, etc. These refrigerators are used to cool electronics, detectors in thermal imaging, gas cooling, cooling of pharma products, cooling of superconducting materials, medical applications, etc.

At IIT Bombay, several of such coolers have been developed. A Joule-Thompson Cryocooler uses capillary tube and mixture of gases as refrigerant. A cooler working on this principle has been developed at the Refrigeration and Cryogenics Laboratory, IIT Bombay which gives a temperature below -150°C . Such coolers are very cost effective and can be used for preserving blood, stem cells, pharma products, etc.

Our group has also developed several Pulse Tube Cryocoolers (PTC) which produce low temperatures by employing oscillating pressure wave in a hollow tube called 'Pulse Tube'. It uses an oil free linear compressor and the cooling head has no moving parts. Therefore it is high reliable and maintenance free. They use Helium gas as working fluid which is charged at a pressure of 16-20 bar. Such coolers have generated a low temperature below -200°C using a single stage expansion process and around -250°C using two stage expansion unit. Such coolers could be used for space applications, ground applications where vibration and maintenance free operations are needed. They single stage cooled generates a cooling effect of 5-10 W at 80 K with an input electrical power of 300-400 W.