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Cryogenic Systems: Recent Trends and New Directions

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The production of reliable cryogenic temperatures is vital for the use of superconductivity in accelerators. Cryogenics is found in the accelerating structures and magnets of the accelerator as well as in the magnets and calorimeters of the detectors in the experimental areas. In the century since the discovery of superconductivity, cryogenic systems have gone from small laboratory devices to very large industrial scale systems involving multiple refrigeration plants, containing over 100 tonnes of liquid helium. These systems, while specialized, represent a mature, well understood technology. This paper will survey the current status of cryogenic systems in accelerators and describe recent trends including: the large scale use of He II (superfluid helium) and the development of higher reliability and higher efficiency systems. It will also discuss future directions including the increased use of HiTc current leads, possible applications for small cryocoolers and the potential impact of the world helium supply on accelerator cryogenics.