TECHNOLOGY CARD

INTEGRATED CO2 COOLING SYSTEM CERN

What does it do?

Lowering the temperature of the sensors to below 0°C reduces the negative effects of radiation. CO2 as coolant is an excellent option for this application as it can withstand a large amount of radiation while providing stable, high-efficiency cooling over long distances

How does it work?

The CO2 is cooled in an accumulator, where it reaches the desired temperature and changes it's state of matter to liquid. With the use of a pump the CO2 gets delivered to the temperature exchange chamber, where it can evaporate and cool down the parts that need cooling. Once the gas is evaporated, it gets channeled back in the accumulator. It is a closed system, which means that there is little to no loss.

Is there an analogy or metaphor you can use to help describe this simply?

It´s like an air conditioning.

Unique characteristics

High-efficiency cooling
High thermal control
Distance cooling
Distributed cooling
Reduced risk of damage to expensive equipment
Natural refrigerant
Low vibration levels
Temperature range - -45°C to +25°C
Easy operation
non-toxic
non-flammable
non-ozone-depleting refrigerant.

Limitations

High-pressure system – requires appropriate hydraulic circuit design to be in place (specific safety procedures may apply).
High-tech system – not appropriate for applications with more basic cooling needs, such as food refrigeration, where cheaper CO2 cooling systems already exist.

Originally designed to be used for:

To improve the lifetime of the silicon sensors due to radiation damage, which are used to record the tracks of particles in the Large Hardon Collider.

Questions related to this technology

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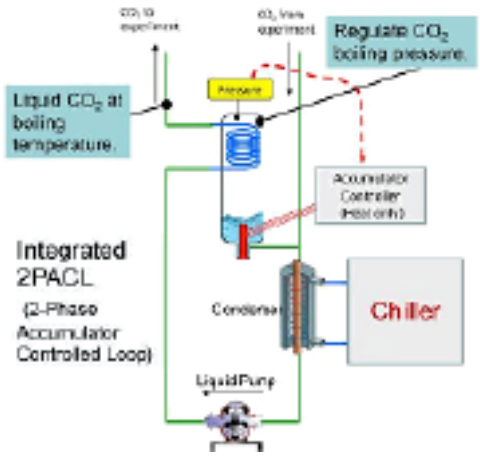
Where is extremly efficient cooling needed?
Could the system be modeld for heating?
Is there a method to improve the system?



References

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