Science & Technology Facilities Council
ISIS

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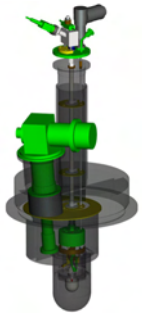
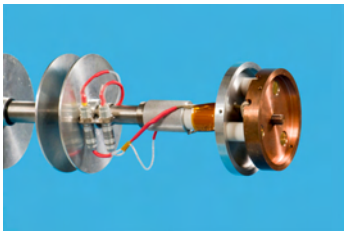
Wet or Dry, That is the question 2

R.B.E Down
ISIS Experimental Operations Division Cryogenics



Sample manipulation in top loading CCR's

A range of manipulation devices can be offered at ISIS for use with single crystal samples; these can be designed in house by the ISIS Project Engineering Group (PEG) who use a range of design aids including finite element analysis and 3D modelling. The device on the left is an example of PEG's work and is to be used on the single crystal diffractometre SXD; it will be able to move the sample through an arc and rotate on the axis of the arc using an Atto-cube goniometer. The sample rod within the SXD top loading CCR will also be able to be rotated conventionally using the rotation stage on the right; this is a VG Scienta rotary platform (ISIS pattern) that utilises a Renishaw rotary encoder ring. The platform is controlled by a Mclennan motor drive crate and remotely via a Labview VI and can deliver rotational accuracy of 0.01° per step and 0.01° Feedback.

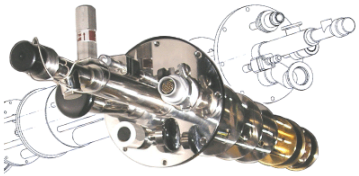


Extending the temperature range of top loading CCR

The top loading CCR can be normally operated between 4K and room temperature; to extend its range two devices are offered currently these are the "Hot Stick" and 1K insert.

The Hot Stick shown left is produced in house and consists of a copper sample holder that houses 2 Watlow Fire rod 100W 100V heaters and a PT100 sensor, the heating element is thermally insulated by ceramic spacers and 2 thermal shields can be attached to reduce temperature gradient. The device has been successfully used up to 700K; it should be noted that exchange gas needs to be removed from the top loading CCR before any hot work begins.

The 1K insert shown right is supplied by Ice Oxford, it is a continuous flow device that uses liquid Helium. The 1K insert is installed into the top loading CCR and cooled to 100K by exchange gas, the exchange gas is then removed. A low loss transfer line fed from a 100L liquid Helium dewer is then coupled to the insert and cooling begins. Helium liquid is fed to a 4K reservoir which in turn feeds a 1K pot. The 1K pot is then pumped upon to achieve continuous temperatures of 1.25K.



Cryogen Free Ultra Low Temperature

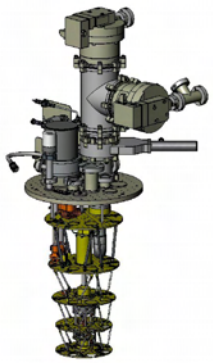
Shown here is the E18 Project that is being produced by VeriCold Technologies. E18 is a cryogen free high powered dilution refrigerator that is based on VeriCold's own pulse tube design.

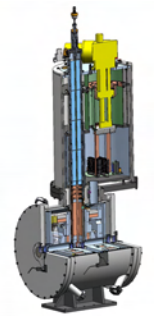
The system has a guaranteed base temperatures of 20mK and has a cooling power measured at 400mW at 100mK.

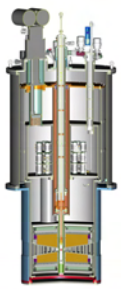
The system has been ordered to take over the more challenging work that current Kelvinox VT systems at ISIS struggle with; examples of the science intended for study using this fridge are further exploration of the Helium 4 super solid phenomenon and high pressure studies using clamped cells.

The E18 dilution fridge has been constructed with reinforcing supports from the 1st stage of the pulse tube to the mixing chamber. The 100mK plate and mixing chamber has a stainless steel skeleton fastened to it for extra strength. The fridge itself has been specified to take samples of up to 20Kg in mass.

The system has further benefits in that it is completely oil free, it operation is fully automated and computer controlled.







Recondencing Super conducting Magnets for reduced liquid Helium consumption

The **ISIS Advanced Magnets Project** started with a submission to the facilities development fund of the CCLRC. In July 2005 a positive response was received and funding was confirmed in June 2006. The project was split into two parts to spread the costs:

Part-I Consisted of four magnets:

- *Wide Angle Chopper Instrument Magnet for Spectrometry*
- *14T Superconducting Magnet for Diffraction*
- *3D Magnet for the reflectometers and low Q Instruments*
- *Pulsed Magnet Development*

Part-II will further expand facilities at ISIS and will be submitted after making some progress on Part-1.

3D magnet
which will allow the application of a magnetic field in any direction.
The maximum magnetic field is expected to be 2T in all directions.
Contract awarded to Scientific Magnetics.
Estimated delivery December 2008.

9T Wide Angle Chopper Magnet
With wide detector coverage ± 15° in the vertical plane and ± 40° in horizontal plane.
The aim is to achieve the widest aperture possible with the highest achievable field.
Contract awarded to Oxford Instruments.
Estimated delivery April 2009.

14T Superconducting Magnet
The state of the art for a split pair magnet is 15T, but by reducing the maximum field to 14T it is possible to increase the detector viewing angle from ±3° to +10° and -5 °.
Contract awarded to Oxford Instruments.
Estimated delivery April 2009.

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