

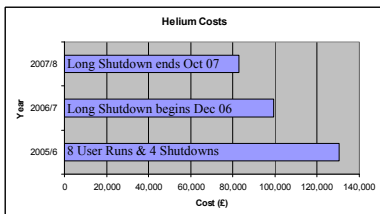


# Wet or Dry, That is the question

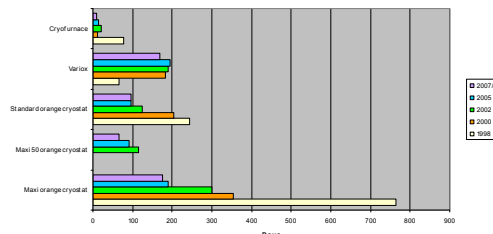
R.B.E Down  
ISIS Experimental Operations Division Cryogenics

### Liquid Helium and Helium Cryostats

The gas companies have been threatening Helium price increases for a number of years, as a result we have steadily responded by replacing wet systems with dry ones. We have seen no effect until recently in 2007 a number of UK customers were refused supply of liquid Helium and Force Majeure was declared by some of the gas companies. ISIS Helium costs have increased by 20% in the last six months and the message from suppliers is that we should expect more increases in the future. ISIS spends an average of £6k a month during operational periods and has a budget of around 130K for Helium per annum. Statistics appear to suggest that the usage of standard wet systems has reached a plateau and are only being supplied to instruments that have dedicated cryostats or are requested out of necessity for temperatures below 4K.



### Helium Cryostat Usage



### The 4K Top Loading Closed Cycle Refrigerator

This device has evolved over a number of years into a formidable asset in any sample environment department and has replaced many wet systems on our facility; the original 10K version was in use on ISIS in the early 90's, it has had several facelifts over the years. The current version utilises a vacuum tight 100mm diameter sample volume that is linked to the second stage of a Sumitomo Heavy Industries SRDK415 Gifford McMahon unit that delivers 1.5 Watts at 4.2K, the first stage is connected to a radiation shield that is of the order of 40K. The sample is cooled via static exchange gas that is loaded through a conventional 3 way valve and can be set via a twin gauge set that measures from atmospheric pressure to vacuum.

The unit is very simple to use with almost turn key operation, it has an operating temperature range between 4K and room temperature, the temperature is measured by a rhodium iron sensor mounted conventionally on a copper ring that is close to the sample; temperature control is achieved by two Watlow Fire rod 128 Watt heaters.

The top loaders temperature range can be extended by using a liquid helium continuous flow insert to achieve temperatures of the order of 1.25K and a thermally isolated hot stage mounted on a conventional sample rod that enables temperatures as high as 700K to be reached.



### The 4K Pulse Tube Top Loader

The newest addition to ISIS Cryogenics equipment base is a top loading cryostat based on the Sumitomo SRP-082B 1 Watt pulse tube.

Commissioning tests carried out by the manufacturer of the top loader A.S Scientific have been very promising with very close coupling between control and sample.

With a cost similar to the GM system the pulse tube offers low maintenance and extended servicing intervals compared to GM systems; some 30000 hours between pulse tube rotary valve and compressor absorber capsule change.

The last benefit offered by the pulse tube system is its reduction in vibration compared to the GM system, this has made it a platform for ultra low temperatures and there are now several dilution refrigerators on the market for consideration.



### The F70 Compressor

The F70 is the compressor unit used to run the Sumitomo SRP-082B pulse tube, it has been developed specifically for pulse tube use and utilises an in-line filter to stop any contamination from entering the system. A recent visit to the Sumitomo works in Tokyo has enabled a major breakthrough logistically for ISIS, the Sumitomo SRDK-415 Gifford McMahon system up till recently has been used with the CSW-71 compressor and this compressor has been the mainstay of 4K CCR operations since the 415's first appearance. Sumitomo at our request have now CE marked the F70 for use with the 415; the purchase of one type of compressor over a suppliers equipment base offers considerable advantage when moving and supporting equipment around a large facility.