

Safer, greener, cheaper route to ultra-cold freezers

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Scientists at Brunel University London have engineered an innovative new method to build the next generation of freezers capable of reaching temperatures as low as -180°C by using advanced cryogenically cooled

heat pipe technology.

Explained Dr Hussam Jouhara, of Brunel's Institute of Energy Futures: "At the heart of the new system is the concept that what we needed was to be able to efficiently transfer cold.

"The cold in our design comes from [liquid nitrogen](#). But unlike conventional cold storage using the liquefied gas we don't need to physically transfer the nitrogen. The cryogenic heat pipe is literally just moving the cold.

"In safety terms this has major implications as in the US alone eight deaths a year are attributed to nitrogen asphyxiation. Our innovations mean the gas tanks can be situated safely outside in the open air."

The system's green and money-saving credentials come from a highly efficient energy recovery process which means a potential of up to 50 per cent reduction in liquid nitrogen use compared to conventional equipment.

"Liquid nitrogen is expensive in both cash terms and energy consumption to produce," added Dr Jouhara. "And quite rightly there are strict health and safety rules because of the attendant dangers of asphyxiation. The Brunel system has no such special requirements."

Once installed heat pipes are regarded by engineers as a "fit and forget" technology as they have no moving parts and require no routine maintenance.

The research work is done with direct funding from the industrial gases giant Air Products PLC successfully passed laboratory trials, Dr Jouhara is partnering with Air Products to commercialise the new freezer technology.

The company's Head of Cryogenic Technology Development, Jon Trembley said: "After almost exactly 25 years, Air Products is back at Brunel University conducting leading Cryogenic Technology Research in collaboration with Dr Jouhara.

"It's great to be back at Brunel; 25 years ago Air Products European Technology Group was located on campus before out-growing the space and moving out in 1991 to new lab facilities in Basingstoke. Our new research programs into cryogenically cooled heat pipes is an exciting new development and Brunel's expertise and excellent capabilities are perfect for our research requirements'

Initial real world users are likely to be for medical storage and the team will be working with the NHS Blood and Transplant Service to develop prototype freezers to rapidly cool and store plasma made from donated blood.

"We also see strong demand from facilities which store cord blood or eggs or sperm or other biological materials at very low temperatures," said Dr Jouhara.

Provided by Brunel University

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