

## The University of Nottingham Facilities and Services Helium - Lost In Space

### About the project

#### Summary

Helium is a non-renewable resource and is essential in supporting research into drug discovery to cure diseases such as Alzheimer's and at current usage rates will be exhausted by 2050. The University has successfully managed to capture this gas from various Schools, re-liquefy and reuse it. This protects and futureproofs The University from dramatic fluctuations in availability, cost and in turn creates a more sustainable market.

#### Project partners

Internally the following areas were involved in the Project with Chemistry, Physics and Procurement the main contributors  
School of Chemistry  
School of Physics and Astronomy  
Procurement  
Estates  
Health & Safety

Externally we worked with several different companies to who assisted us in developing solutions to a complex project. Some of the main ones are listed below.

**Lydon Construction** - to design and implement an underground matrix of pipework to return the Helium gas for re-liquefaction.

**Attenborough Doors** assisted **Hill Bros.** in providing a safety office acceptable solution for door access.

**Manor Maintenance** provided an automatic light solution to cover the helium gas, Nitrogen liquid storage tank and trailer hard standing compound.

**RMS Ltd** provided a venting solution to prevent Nitrogen gas ingress into the control building from the storage tank within the compound.

**Jackson Key Ltd**, the estates transport department and the university safety office were consulted on the design and manufacture of the road going gas trailers.

**Central Compressor Consultants (CCC Ltd)**, provided and installed the remote recovery systems after joint development, experimentation and consultation with ourselves, This involved the installation of gas bag, blowers, compressors, receivers and internal metal and plastic pipework.

**Ilkeston Fencing** after on site discussions and survey designed tailor constructed weather protection, security enclosure gates and fencing for the remote gas recovery sites.



The University of  
**Nottingham**

UNITED KINGDOM · CHINA · MALAYSIA

#### Profile

- HEI
- 43,893 students (includes our China & Malaysia campuses)
- 7569 staff
- Urban and rural

Category supported by



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## The results

### The problem

In the past 4 years there has been a huge cost increase and a severe world shortage of liquid helium which resulted in severe delivery cut backs to the University compromising research into drug discovery and the use of body scanners. The uncertainty of supply affected grant applications, possible closure or damage to some of our mass spectrometers and magnets, putting equipment to a value of circa £8.5M at risk, along with job losses for research staff and PhD students.

### The approach

An interschool/departmental team was assembled to consider ways of mitigating the Helium shortage issue. Physics already had a small liquefier for their own use so it was from this that the wider project was based on.

A business proposal was submitted to the University Management Board for funding approval which was successful in Dec 2012.

Estates and Health & Safety were heavily involved at the beginning to ensure compliance to legal requirements.

Specialist contractors were employed to put forward innovative ideas of how to ensure that this would all work together, especially the pressures in the underground pipework and the gas bag and compressor system.

As the University is spread over different campuses we needed a way to transport the Helium gas safely back to the hub in Physics. The technical team along with Jackson Keay Ltd designed and developed, bespoke road going trailers which is now one of the unique parts of this project.

Weekly meetings were held with Physics and Procurement (Project Manager) to monitor progress and spend and discuss any obstacles that had arisen and what we could do to mitigate them.

The plant is now up running and we are recovering gas back which is routinely monitored for purity and volume.

### Our goals

- To mitigate the potential damage and loss caused to research and medical equipment caused by fluctuating helium prices and availability
- To conserve and re-use a dwindling and finite world resource
- To enable the continuation of vital medical and scientific research
- To continue to make possible the exposure to low temperature research to 3<sup>rd</sup> year and PhD students
- To enable the continuation of industrial and scientific collaboration
- To have a fully closed loop self-sufficient system.

# Finalist's case study

## Obstacles and solutions

Funding large project	Sought guidance and advice from Procurement on application procedure.
Securing funding from management board.	Explain in detail, in layman's terms, the proposal, outlining the problem, the solution, the costings and the time frame.
Campus wide disruption.	Worked closely with Estates office and consulting Project Managers.
Unforeseen problems	Built an excellent working relationship with Estates and Contractors to work out solutions
Over budget on items	Effect savings in other areas where possible, ensure a contingency is calculated into proposed costs
Resistance to change in working practices	Discuss, persuade and demonstrate benefits
No currently known solution to a problem	Worked with outside contractors, academics and in-house technical staff in order to overcome obstacles and develop techniques that hadn't been tried before

## Performance and results

- Helium Gas which is now being passed back to the recycling plant is 99% pure and showed a 100% capture rate, ie no leaks.!
- All elements of the project are performing to expectations
- The project, especially after being awarded the Winners of The Guardian Sustainability Award. greatly raised the profile of conserving a dwindling resource. Sustainability isn't just about "green" initiatives and negating carbon footprint but also about protecting scarce resources.
- The project had led to a reduced cost of buying in liquid helium from outside sources, (due to natural losses from decanting we still need to buy approximately 10% of our helium gas requirements)
- We have saved 50% of the energy consumption of the liquefaction plant by the injection of liquid nitrogen into the system resulting in a lower carbon footprint.
- Reduced bulk delivery transportation supplying helium and therefore reducing the carbon foot print on campus, which supports the Universities carbon reduction program.

## The future

### Lessons learned

- It is possible with a team of motivated staff to undertake a major project of this kind and see it through to a successful conclusion.
- Additional contingency funding should have been requested
- Things always take longer than expected - allocate more time to the Project Plan.
- Allocate specific resource to the project rather than trying to add onto your daily workload
- Believe in the project, its goals and the team and you will succeed

## Sharing your project

We have had discussions and visits from the Institutes and companies below and have generated much interest with them in moving this forward in their own environments.

- Manchester University
- Isis Rutherford Appleton Oxford
- Sheffield University to visit
- The project was the topic of a seminar at the National Cryogenic Magnet users conference held in Nottingham this year, in which the delegates visited the site.
- QMC Nottingham teaching Hospital (Body Scanners)
- The system was also a topic at the national universities annual Physics superintendent's conference in Oxford this year. Delegates are arranging to visit.
- The Project was presented at the High Field magnet Users conference held in Nottingham
- We are a Finalist in the Nottingham Evening Post Environmental Awards
- We gained national publicity exposure from winning the Guardian newspaper sustainability award earlier this year.
- Other institutions and companies have become aware of the project through communications with various contractors who have been involved with building the infrastructure

## What has it meant to your institution to be a Green Gown Award finalist?

“Being a finalist in the Green Gown Awards would bring an accolade that everyone understands, just like winning an Oscar. Success would therefore drive on students and staff who work tirelessly to embed social responsibility and sustainability as guiding values of Nottingham”.

## Further information

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