



Case study

Keeping the mummies alive – preserving the future

Sydney University Museums (SUM) – Comprising the Nicholson and Macleay Museums and the University Art Gallery – includes Australia’s oldest university collections, dating to the 1850’s.

Collections include natural history, historic photographs, ethnography, scientific instruments, art and antiquities. The collections include artefacts representing ancient Egyptian history with mummies, monumental sculpture, inscriptions and ancient organic materials.

SUM is constantly striving to ensure it continues to preserve the important pieces of history that have been entrusted to them. As part of this, they engaged the external expertise of BOC to help them update the process of their anoxic (absence of oxygen) treatment program.

SUM wanted to ensure that the process was complying with present-day safety standards and regulations, as well as maximising the effectiveness of the anoxic treatment.

BOC provided a reliable solution that helped the University of Sydney to protect these delicate and irreplaceable artefacts that are susceptible to insect infestation.

The challenge

SUM attracts 125,000 visitors each year, many who are enthusiastic devotees of Egyptian artefacts and the ancient world they represent. The challenge that the museums faced was to preserve these precious artefacts for future generations to enjoy.

The anoxic treatment is applied to the artefacts to ensure their survival, primarily by preventing insect attack, but once packed into high barrier plastic film bags and suitably stored, the objects are protected from deterioration resulting from fluctuating or excessively high or low humidity levels and damage from exposure to light.

As SUM has only a small Collection Management staff and with a hiatus of several years since the last nitrogen purging system was regularly used, along with an emphasis on higher safety standards, it was important that BOC undertake a comprehensive approach to a safe

nitrogen-based anoxic treatment solution. Key to the Museum staff’s participation was obtaining equipment and setting up practices for anoxic treatments to ensure that workplace safety was compliant with today’s standards.

Evaluation of University of Sydney’s preservation technique

BOC technical solutions engineers were invited to assess SUM’s existing anoxic treatment processes and design a tailored solution to suit their needs.

The original nitrogen anoxic treatment process was developed in 1960’s and is used regularly by many museums globally.

Contemporary anoxic treatment is not too dissimilar from the one used to extend the shelf life of foods that can be found in the supermarket. The artefacts are placed in oxygen-tight bags which are flushed with nitrogen and sealed with oxygen scavenging packs that are designed to remove any oxygen that remains in the bag. The scavenger packs are very similar to the ones you remove from sealed long-life food packaging.

The University’s need to apply the anoxic treatment to the artefacts was paramount to preserve them for the future and keep them safe from insects. They supplied BOC with literature and concept sketches of the nitrogen purging process to evaluate the safety and integrity of the process.

BOC determined that the process that they had been given was dated and was originally designed by laboratory technicians with no real consideration for the potential hazards involved or even a design review process. As part of BOC’s improvements, single-direction flow valves and a pressure release valve were included into the design of the purge unit. In-house testing of the fabricated equipment was undertaken before delivery to the user.



Providing a solution

It was important for BOC to understand the preservation requirements from a hands-on museum perspective. Site visits allowed the BOC team to familiarise themselves with the task, how museum staff intended to use the equipment and the special needs of the objects. One particular consideration was that the first major treatment using the nitrogen purge system would be treating two of the mummies held by the Nicholson Museum.

“When people think about mummies, it can be easy to forget that they are human beings, so we discussed with the BOC engineer onsite about any cultural issues when working with human remains. We are very mindful that we are dealing with human beings and try to treat them with respect.” said Alayne Alvis, Sydney University Museums’ Conservator.

BOC understood the importance of keeping the artefacts in a constant environment, protected from any drastic fluctuation in humidity, light and gas levels. The key concern when using nitrogen for the anoxic treatment is that in its purest form nitrogen is quite dry, and can lead the objects to become dehydrated and potentially cause embrittlement.

With this in mind, BOC developed a tailored process to deliver nitrogen at the correct relative humidity. The process involves placing the artefact in a nearly completely sealed bag with two small openings for nitrogen injection and venting. Once the nitrogen supply has been tested, the gaseous nitrogen is passed through a series of chambers before being used to purge the atmosphere from the bag. The first chamber is used to pass the nitrogen through water to humidify it; this is then mixed with dry nitrogen in the second chamber.

The resultant mixture is then analysed for correct relative humidity in a third chamber with a hygrometer before being applied to the bag containing the artefact. When the humidified nitrogen passes into the bag at opening it causes the atmosphere to flow out of the bag from the other opening. Having the gas at correct relative humidity prevents dehydration of sensitive organic material.

“The updated anoxic treatment process has enabled us to know that we can consistently create the correctly conditioned gas to treat our artefacts and has allowed us to treat larger objects and extend the range of objects that we can treat. Shifting to the BOC product has given us the confidence that our staff will be applying the treatment in a controlled and safe environment,” explained Ms Alvis.

Business benefit

“BOC has provided invaluable training to ensure that both our staff and artefacts are protected throughout the process,” said Ms Alvis.

The solutions delivered some noticeable improvements to Sydney University Museums:

- BOC staff training has empowered the Museum staff with the knowledge to carry out the anoxic process safely
- Enabling use of humidified nitrogen has increased Museums’ ability to protect a wider range of artefacts from deterioration
- Fitting the equipment with single direction flow and pressure release valves has increased the safety of using nitrogen in anoxic treatments
- Conditioning from a ‘dry’ nitrogen to a humidified nitrogen treatment process has insured that vulnerable organic objects like mummies are not at risk of dehydration

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