FIRE PROTECTION

Compiled by Danny Cameron

Mist suppression for museum

A high pressure water mist suppression system has been commissioned in the Northern Territory Museum wet store, where thousands of animal specimens are preserved in ethanol solution.

The wet store located at Bullocky Point, Darwin, contains approximately 75kL of ethanol by volume and presents a significant fire risk. It is a separate 500m² building from the museum itself, and was purpose built in 2001 for the storage of small historical animal specimens. The specimens are preserved in glass jars in a 70% ethanol solution, and stored in compactus shelving. The store is restricted and not for public access and is fitted with intrinsically safe electrical fittings.

The original fire protection system was based on nitrogen pressurised foam suppression which the museum said required costly maintenance and clean up from false alarms. The museum was keen to explore different systems for meeting the unique challenges faced with the storage, its operation and location.

BCA Engineers was engaged by the Northern Territory Department of Construction and Infrastructure to design and certify the installation of a new fire protection system. The agreed construction value was $1 million.

BCA Engineers selected a high pressure water mist suppression system.

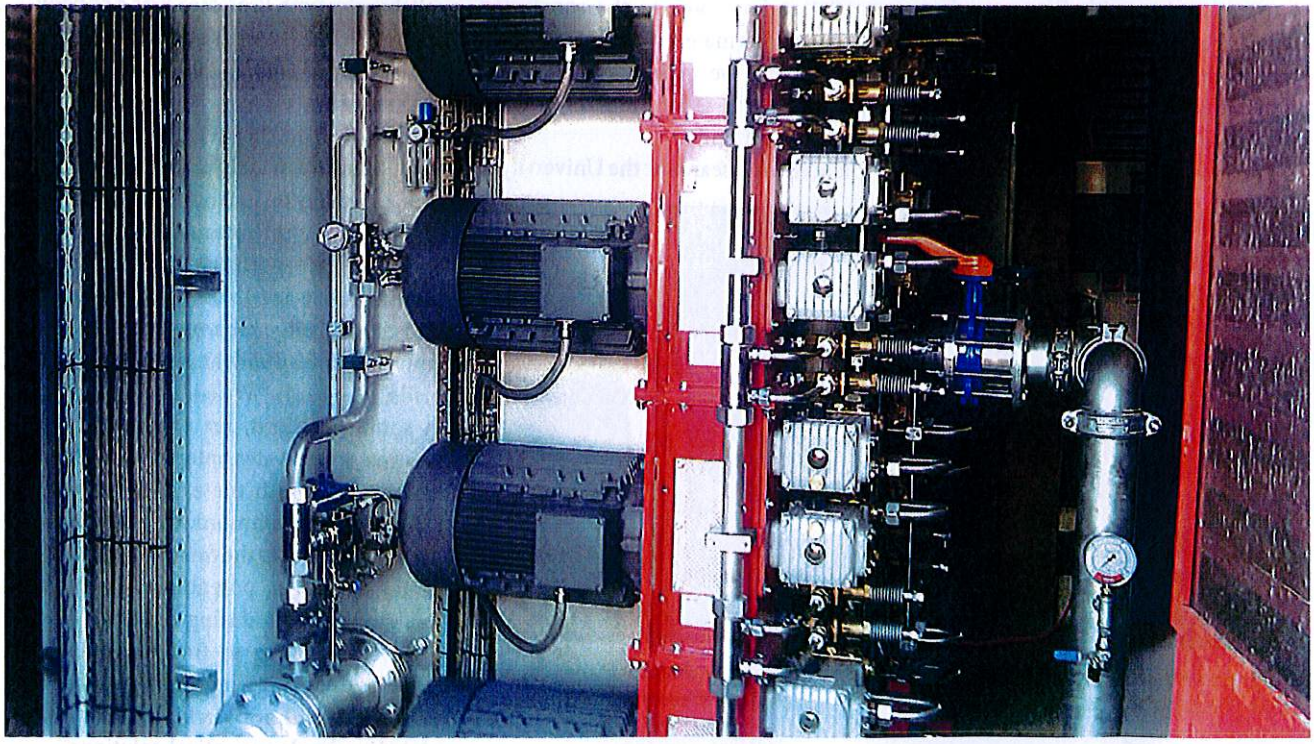
"One of the key selection reasons was the suppression medium (water) required no special additives or gases and was suitable for town water supply in Darwin," BCA Engineers director Nathan Brown said.

Also, he explained, a high pressure water mist system produces very small water particles (50-120um) – essentially a fog that is very effective in quickly extinguishing a fast developing fire. The system has been designed to impact an ethanol fire by saturating the air, cooling the fire and reducing the heat.

Brown said: "Water mist systems smother the fire from the combustion process rather than conventional sprinklers which have to wet the fire and the surrounding combustibles."

Chubb Fire won the construction contract using the Marioff Hi-Fog water mist suppression system, arranged as two mist zones. Flame detection is used to activate the system automatically.

BCA Engineers principal fire engineer Koroush Keshavarz said the system comprises a deluge water mist system discharging town water throughout the protected space. High pressure nozzles



The high pressure water mist suppression system has been commissioned in the Northern Territory Museum wet store.

After a nitrogen pressurised foam suppression system was deemed too costly to maintain, engineers have implemented a mist suppression system at a museum in Darwin, as the lead article reveals. In other articles, a bushfire simulator has tested sustainable building materials, and Engineers Australia's Society of Fire Safety national president Elissa Fazio reports from a conference in Singapore.

and distribution piping serves the risk area at ceiling level. The water supply to the system is provided from a dedicated 25kL storage tank and booster pump with a full flow bypass arranged from the museum's site fire water supply infrastructure.

"An eight-stage high-pressure pump skid pressurises the system to approximately 14MPa," Keshavarz explained. "The electrical demands of the pump required a new 400A dedicated supply from the museum's essential supply. The system is designed to load shed the museum's air conditioning chillers on the emergency generator supply to avoid overloading in the event of a power failure, which is common in Darwin's wet season."

The project commenced in late 2009 and was completed last December. Keshavarz said it is the largest system of its type in Australia.

Opening international research to all

The University of Newcastle Priority Research Centre for Energy director Professor Bogdan Dlugogorski has been elected chair of the International Association for Fire Safety Science.

The association has around 600 members worldwide and constitutes a peak body for international fire safety researchers. The chair is elected at the association's triennial symposium and Dlugogorski is the first Australian to lead the association, succeeding Hughes Associates US technical director Dr Craig Beyler.

In an interview with *Engineers Australia*, Dlugogorski said he was looking forward to promoting fire safety research around the world, particularly in countries where the topic was not so prominent.

"There are countries around the world like Australia that are at the cutting edge of fire safety research, however there are many others that we would like to develop," he explained.

His plans for promoting fire safety through the IAFSS include providing free access for students to all the association's technical publications and archived material. He said the association was also looking to provide free access to as much material as it could for anyone interested in fire safety.

"We have had long discussions, and our association has come to the conclusion that the more material we make public and the more we make freely available, then the better it is for fire safety around the world," he said.

In his own research at the University of Newcastle, Dlugogorski studies industrial fire safety.

His research team has just completed a three-year ARC linkage project, funded together with Dyno Nobel Asia-Pacific, on NO_x formation in sensitisation of explosives, and in December commenced a new three-year study period. The new linkage project is looking at the mitigation of NO_x formation in blasting of ammonium nitrate emulsion explosions, and is again jointly funded by ARC and Dyno Nobel. In this work, Dlugogorski collaborates with Professor Eric Kennedy of the University of Newcastle, Dr Jeff Gore of Dyno Nobel, and a team of five PhD students.

He explained that ammonium nitrate explosives are widely used on mining sites, especially on local coal mining sites.

"Although the ammonium nitrate emulsions are perfectly safe and only produce trace levels of NO_x, the situation could change for ammonium nitrate emulsions mixed with ammonium nitrate prills," he said. "When used together in some situations, for example in wet weather when water enters the borehole and interacts with the explosives, water can dissolve the ammonium nitrate prills. This compromises the fuel to oxygen ratio in the explosive, potentially leading to emissions of NO_x during blasting.

"We are trying to find technologies and ways of mitigating the formation of blast NO_x, and are working with Dyno Nobel to develop practical solutions."

(l-r) University of Newcastle Priority Research Centre for Energy director Professor Bogdan Dlugogorski, Dr Kai Chen, Sindra Summoogum and Professor Eric Kennedy. Chen and Summoogum are doctorate students who recently won major international prizes for their research into fire safety science and engineering.