



Safety Alert April 2021

Use of Hydrothermal

Autoclaves The Incident

In a recent incident a Hydrothermal Autoclave Vessel (HAV) was exposed to temperatures higher than intended in the experimental design (at approximately 550 °C; intended was 180 °C). The hydrothermal autoclave was operating well outside the temperature specifications of the unit when it failed. The over-temperature resulted in the HAV threaded cap ejecting from the collar and causing significant damage to the furnace and the surrounding area, and injury.



Actions after the incident was reported

This incident was reported to SafeWork NSW as it was a serious incident; the Faculty of Engineering was issued with three Improvement Notices.

The ensuing investigation identified the following as contributing factors:

- The HAV was operating in a furnace (capable of being programmed for varying temperatures); that had a maximum capability well exceeding experimental needs.
- The specifications of certification, use, maintenance, and monitoring of the hydrothermal autoclave vessel(s) were not provided by the manufacturer at time of purchase.
- Safe work procedure identifying controls and emergency shutdown process must be implemented and precisely followed.
- Documented Safe Work Procedures specific to the test and were not correctly followed.
- Mandated PPE requirements not followed.

What are we doing differently now?

- All users are to ensure that heating devices (ovens) are appropriate to the experimental needs. They should be selected to ensure that if programming of thermostats fail, or human error in their setting, that the temperatures will not result in vessel failure. That is, the design capability of the vessels should be greater than that of the oven. Furnaces with capability of very high temperature should not be used with Hydrothermal Autoclaves.
- Vessels are to be supplied with documentation for their use, including operational specifications, appropriate maintenance, and inspection requirements, and limitations for use (such as Teflon capsules are to be replaced every 20 uses).
- Vessels are to be provided with certification to AS/NZ standards, or relevant manufacturers certifications.
- Safe work procedures are to be updated to minimise human factors and to provide increased risk management (such as implementation of increased supervision or restriction of personnel into spaces where equipment is being used for higher risk activities, and appropriate shielding).
- Implementation of inspections and maintenance registers.

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