

Waste Screening Calorimeter

Custom manufactured screening apparatus to provide accurate data on the potential for unwanted exothermic reaction and associated pressure rise from the mixing of different waste substances.



HAZARDS FROM MIXING DIFFERENT CHEMICAL WASTE STREAMS

Waste streams are often mixed and stored prior to disposal/incineration and it is essential that consideration is given to the potential for unwanted exothermic and/or gas generating reactions during mixing. The outcome of incompatibility could result in a storage tank over-pressurising and either rupturing or venting to atmosphere resulting in injury and potentially unacceptable environmental and/or toxic impact. It has been common practice within industry for a simple "bucket test" to be performed where an incoming waste sample and storage tank sample are mixed within a container under ambient conditions. Any signs of a reactive mixture are visually noted and used for determining the suitability for temporary storage.

The bucket tests are very basic and do not simulate industrial scale heat losses or provide information of the effect of increased storage temperature as may be expected during on-site storage. Although other screening techniques already exist, experience within the Chemical Process Evaluation laboratory at Chilworth Technology has shown that these can be insufficient to provide the operator with confidence that the results obtained will identify the risk of exotherm on the industrial scale.

REDUCING THE RISK TO PEOPLE AND PLANT

Chilworth Technology have developed a robust and effective means of screening waste streams which simulates industrial conditions prior to mixing and storage. The equipment is based on Chilworth's, Adiabatic Dewar Calorimeter (ADC), which has been extensively used for many years at our laboratory facilities for chemical reaction safety evaluation. The apparatus permits exothermic and/or gas generating reactions to be analysed under very low heat loss and thermal inertia conditions thus simulating industrial conditions ensuring confidence in the results.

The screening calorimeter is manufactured to order and can be tailored to a customer's specific needs and will provide operators with an effective means of testing for exothermic and gas generation activity from the process of mixing two waste streams. The apparatus can be safely operated with a minimum of training and provide the user with a clear GO / NO-GO result to determine if they should continue with the intended large-scale mixing and storage operation.

The simplicity of the technique means the Screening Calorimeter can also be used when testing for unwanted exothermic reactions prior to road tanker loading operations. The existing tanker load can be sampled and tested with the outbound material prior to charging the tanker. Waste management companies in particular will find the Screening Calorimeter useful in testing mixed wastes prior to storage and disposal.

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SPECIFICATION

Control and Acquisition:

- Automatic stirrer motor, inlet/vent valve and internal heater control.
- Automatic sample temperature ramping : approx 1°C/min at pre-set times.
- Data acquisition - auto logging to disk every 20 secs. Autologging every 1 second during an event.
- Automatic venting upon detection of exothermic activity due to pressure : default 3 barg.
- Automatic evaluation of data / Automatic GO/NO GO indication
- Automatic graphical display of temperature and pressure vs time.

Sample temperature:

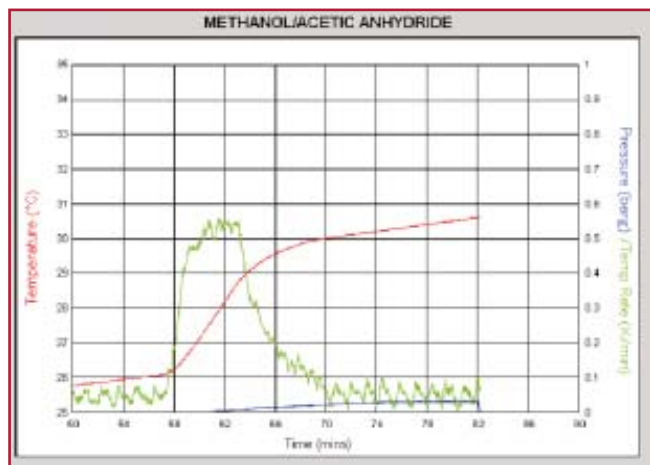
- PT100. Maximum range to 250°C. Accuracy +/- 0.1°C (with +/- 0.01°C precision).

Pressure:

- Sensor range 0 to 10 barg.
- Accuracy +/- 0.1 bar with +/- 0.001 barg precision.

Default Detection Parameters: (may be altered by the user).

- Over Temperature : 2.8°C
- Over Pressure : 0.1 bar
- Sensitivity dT/dt : 0.01K/min



Typical Screen Trace

THE BENEFITS

Benefits of the waste screening calorimeter are :-

- Low heat loss and thermal inertia providing confidence in industrial scale storing and mixing.
- Compact. Requires limited operating space.
- Fast experimental turnaround.
- User-friendly analysis software.
- Ease of operation (no specialist skills required).
- Clear indication of exothermic reaction.
- Competitively priced.
- Can be customised to meet client requirements.

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