

Case Study 2

Thermal Stability Involving Storage and Transport

In the United States, the OSHA Hazard Communication Standard requires every material to have Material Safety Data Sheets (MSDS). This data sheet can be used as a basis for safety for a wide variety of purposes, including storage. The quality of the data in these sheets can vary significantly and in some cases may be incomplete or lacking. Therefore, it is important to have knowledgeable personnel to interpret that validity of the data in these sheets and to identify critical gaps in information to allow for safe storage.

Chilworth Technology, Inc. was asked to investigate an incident in which a company purchased a tote tank containing “Chemical B”, which was stored in a warehouse for an extended period of time. The incident involved the unexpected rupture of the tote tank, which resulted in personnel injuries, an environmental incident, including facility and equipment damages. We developed a specific assessment strategy to determine the conditions necessary that would allow for this material to become unstable.

One of the critical tests we conducted involved the use of an adiabatic pressure Dewar which identified the self-accelerating decomposition temperature (SADT) of this material. We then used the temperature, pressure, and time data to develop a kinetic model of the decomposition reaction. The Time to Maximum Rate (TMR) was calculated from the experimental kinetic data. Then we calculated the heat loss from the actual container used to store Chemical B. Finally, using the kinetic and heat loss data, we calculated the temperature and time limits including the container size (surface area) to allow for safe storage of Chemical B.

To verify our kinetic/heat loss model, we conducted full-scale testing on the actual container in our specialized high-pressure barricaded cell area. There was excellent agreement between the predicted and actual temperatures over time.

Chilworth Technology, Inc. has the ability to use advanced thermokinetic software with data generated from a wide-variety of sources, i.e., DSC, ARC, C-80, adiabatic pressure Dewar, and other calorimeters.

Chilworth Technology, Inc. has fully equipped laboratories to conduct all the required tests and consulting staff to conduct a structured evaluation of a chemical, for transport and storage purposes, as per the UN/DOT regulations. We can provide advice on handling, storage, and transportation testing. If you have any questions or wish to speak to a process safety specialist regarding any process safety concern, please contact us at 609-799-4449 or email us at safety@chilworth.com.