

By 1972 changes in Canadian Policy suggested that the mustard was no longer of use to the Canadian Forces. By measurement of fluid levels and simple density calculations, it was determined that about 700 tons of liquid remained in the vats, although some decomposition had occurred and layers of impurities had separated. However, analysis showed that the bulk of the liquid was still potent mustard.

The simplest means of disposal would have been by burning on the range or dumping at sea, however advances in environmental science by this time precluded either method. Burial in the ground was also out of the question. An ideal approach would have been to burn the mustard in a thermal destructor with stack scrubbing to remove the acids. In 1969 a large thermal destructor had been constructed at Suffield to destroy DDT stocks remaining after the banning of its use as an insecticide. The destructor was available but was located in the midst of tank maintenance facilities which had been constructed after the thermal destructor. It was not possible to move the mustard to the destructor safely either by truck or through a pipeline. Costs of moving the thermal destructor to a safer location or of building a new one were very high and the possibility of more economical chemical methods was examined.

Details of the study were reported in CCD 434. Eventually it was shown that mustard could be readily destroyed by alkaline hydrolysis. Some heating was required for initiation but the reaction was exothermic and rapidly rose to a maximum of about 95°C. Good agitation was required and lime was found to be a convenient and inexpensive base with which to maintain the pH above 10. The reaction product was a thick non-vesicant suspension of lime, salts and thiodiglycol in water. The DRES mustard was destroyed in eight ton batches over a three year period. Work could not proceed during the winter as all equipment was exposed to the elements and the mustard congealed in the vats. The disposal was also slowed by some equipment failures particularly in the steam generators and stirrers. Hydrolysis of the final batch of mustard was carried out on 18 October 1976.

The hydrolysate products were placed first into a spare vat and then into each of the others as they were emptied of mustard. This hydrolysate was stirred and kept above pH10 in order to act as a decouplant for the traces of mustard which could not be removed from the vats with the pumps. When cool, without agitation the hydrolysate separated into two layers, the top one being mainly water with dissolved salts, and the lower one a thick syrupy gel of thiodiglycol and solid impurities.

Early experiments on the disposal of the mustard hydrolysate are described in CCD 434. Eventually many thousands of gallons were incinerated in the thermal destructor. In this process, the water evaporated, the thiodiglycol was consumed and the salts were dispersed as a finely divided aerosol. A high stack was added to the destructor so that all products including the aerosolized salt could be dispersed at such a height that all emission standards were met. Unfortunately the salt aerosolization was not completely efficient and the stack and destructor gradually became clogged.

In the meantime, experiments were attempted in which the hydrolysate was spread in strips onto the prairie grass to determine its effect. Studies by experts showed that the thiodiglycol was rapidly consumed by micro-organisms, however, the salts, primarily calcium chloride and lime, retarded some of the prairie grasses. These experiments were eventually terminated and the grass is now returning to normal.