

# Tank fire caused by cutting torch



*Photo left:* East neutralization tank

*Photo below:* Smoke and flames during the fire



## What happened?

On the morning of February 25, a crew of two workers set up to remove a six-inch pipe attached near the top of the tank. The work was being done to prepare for demolition of an abandoned wastewater neutralization tank. Two pieces of equipment were in use: a long-reach forklift to lift the waste pipe and an aerial work platform (also referred to as a man-lift). One worker was on the ground and the other was in the aerial work platform basket near the top of the tank, at a height of approximately 30 feet, to remove the six-inch pipe nozzle using an oxy-acetylene torch.

When the pipe cut was approximately three-quarters complete using the oxy-acetylene torch, the workers noticed black smoke (presumably from the internal PVC tank liner) issuing out of a tank vent atop the tank and from the lower end of the piping being cut. The worker in the basket discontinued cutting and the worker on the ground went to get a water hose to douse the source of the black smoke. Before the ground worker returned with the hose, the black smoke issuing from the tank increased dramatically. Pressure building up in the tank blew out of the top vent and opened a safety relief or "thief" hatch. Moments later, associated PVC piping on the outside of the tank ruptured at the elbow and blew apart. Flames and black smoke could be seen coming from the top of the tank. Smoke from other openings in the tank engulfed the worker in the basket, so he enabled the "drive" and "down" controls on the aerial work platform to move away from the tank and get to the ground as quick as possible. Workers evacuated safely from the tank vicinity, with no injuries. The fire was largely self-extinguished within the first minute, due to lack of fuel and oxygen at the source, inside the tank. Methanex fire responders completely extinguished the remaining embers by purging the tank with steam.

## INADEQUATE JOB PLANNING AND RISK ASSESSMENT

### Preventing re-occurrence

#### Lessons

- ◊ Retirement and demolition of all site equipment require planning and multi-disciplinary pre-job risk assessment.
- ◊ Hot work in non-process areas requires greater supervisory oversight of .
- ◊ There needs to be a process of identifying non-routine jobs that require a job planning process, a detailed job scope, and appropriate pre-job risk reviews.
- ◊ Communication between permitting authorities needs improvement to better identify all associated job hazards before work starts.
- ◊ Competency requirements for risk awareness and identification need to be strengthened.

## Why did it happen?

### Root causes

#### 1. Inadequate identification of risk

- There is no defined process to consistently identify non-routine work that could have hidden risks and no site process that requires a pre-job risk review prior to a job hazard assessment.
- Workers involved in issuing the permit and performing the work did not consider that the PVC liner may catch on fire and produce flammable by-products as a result

of thermal decomposition. (See "Possible mechanism of reaction," below.)

#### 2. Inadequate policies, procedures, and planning

- Risk-assessment processes within the site's work-permitting system do not include verifying absence of combustible materials or materials/residues that may release flammable vapours. (See below.) Also risk ranking results did not require supervisory oversight.
- There is no site process for demolition of assets.

#### 3. Inadequate work planning

- A detailed work plan specific to removal of piping was not developed.
- The entire demolition project did not yet have a work plan.

### Contributing factors

#### Work-permitting system accountability needs improving

There was no isolation verification done nor pre-job internal verification of the task performed; the tank was presumed "dead" and ready for demolition. Field visits were not consistently completed.

### Possible mechanism of reaction:

#### PVC by-products from incomplete combustion

PVC has intrinsic flame-retardant properties. But when exposed to continuous high heat and flames, it begins to sustain combustion. PVC combustion is typically "incomplete": It produces black smoke containing carbon monoxide and other by-products that are still flammable.

*In an enclosed space, exposed to continuous high heat and flames, these by-products may have built up and ignited, and caused a pressure increase that subsequently lifted the thief hatch and ruptured piping.*

**This situation is a reminder that both combustible materials and by-products or residues that may release flammable vapours are risks to examine carefully in hot-work situations.**

### Actions

- Establish a process to trigger appropriate planning and risk reviews for non-routine work.
- Categorize work lists by routine/non-routine and review weekly with managers and supervisors to ensure appropriate level of risk review.
- Conduct a survey to identify any vessels and piping that contain combustible materials or residues that may release flammable vapours when exposed to heat.
- Revise work permitting to require confirmation that no combustible materials are present.
- Revise work permitting risk-ranking of work involving cutting, welding, or grinding to elevate the level of oversight in lower-risk areas.

Photo below: Close-up of the tank nozzle

Photo below right: Smoke stain from ruptured PVC pipe opening

