

BOILOVER

The Sleeping Giant

All industrial emergencies and fire related events are certainly highly volatile and dangerous situations. Some events may eventually become less threatening to the most experienced firefighters — firefighters who have seen such events time and time again and lived to fight another day — only because their experience has afforded them a familiarity with the characteristics and behaviors of certain types of fires.

However, one complex fire related situation continues to evade the perceptions of many firefighters on the ground who respond to a burning tank and want so badly to put water somewhere ... anywhere.

A crude tank that is fully involved — and particularly one that has been on fire for a long period of time — is a sleeping giant that on its surface is mean looking, ugly, and certainly threatening. However, if mistakes and poor judgement allow this giant to wake, the results are far more dangerous than most firefighters will ever know.

It is obviously important and clear to most all firefighters to know the proper strategies and tactics for applying extinguishment procedures. It is not always so obvious to firefighters the many dynamics that are involved in a fire under the surface, behind a wall, or under a pipe band.

Crude oil fires are a unique breed of animal and they will react to various tactics, sometimes in unexpected ways. It is imperative to know that unlike other fuel related fires such as gasoline, any volume of crude product will conduct heat downward through its mass within any given container — such as a storage tank.

The heat generated at the surface moves slowly downward through the crude in a “heat wave” at a steady pace. When this heat wave reaches any encapsulated water source — such as within the tank’s sump located



This massive boilover caught many by surprise

at the tank floor — it will begin to heat that water through its boiling point until the water converts to steam.

If the water content of the tank is allowed to convert to steam, an expansion rate of 1,700 to 1 will turn that dormant water residue into a violent vapor air explosion. If, for example, there was 500 gallons of water contained at some level within the tank, the rapid expansion explosion would propel 850,000 gallons of steam upward through the volume of crude and cause an explosion that could potentially reach outwards up to 6 tank diameters as it falls back to the ground!

With the close structural proximities built into most of today’s facilities, this means adjacent tanks, LPG bullets, pipe bands, neighboring residents, and perhaps more, are all affected by this crude explosion.

Also, most staging areas considered today for any given tank fire are certainly within 1/2 to 2 tank diameters immediately adjacent to the involved tank. With a boilover, response personnel, fire trucks, foam resources, water resources, standby medical personnel ... all

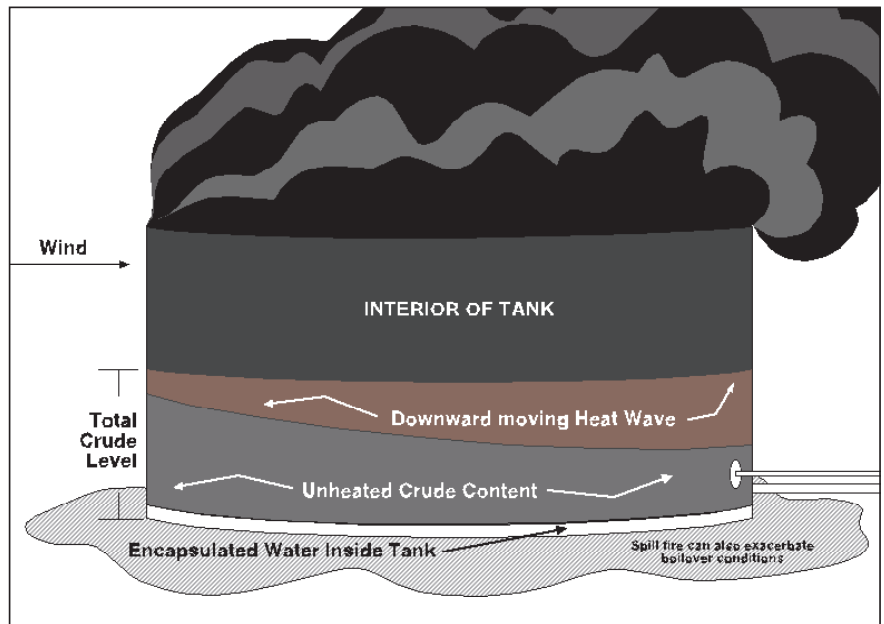
these people and valuable extinguishment assets are jeopardized by such an event.

These results prove the importance of:

1) *Knowing your enemy.* How much product is in the tank? How long has it been burning? How much water has been introduced to this “sleeping giant” during initial fire response activities? Dumping large amounts of water into a fully involved crude tank will agitate it and cause great disruption in the surface fire. Be cognizant of and continually monitor the “heat wave” – if any – within the volume of crude.

2) *Having a proper strategy for success.* What are your water, foam, personnel, pumping, and application resources? What is your safest, most effective staging area? How will your resources and your personnel move in, changeover, and – if necessary – evacuate?

3) *Applying the correct methods from the outset of any response.* Know that crude may take any initial water application and ultimately use it against you in a boilover. Consider your strategy, confirm resources, and apply tactical procedures with purpose and method. Foam applications must be made as soon as possible.



Beneath the surface of a fully involved crude tank fire, a heat wave makes its way to trapped water sources which results in water to steam conversion. Expansion forces are enough to cause a major explosion.



Initial wind conditions may lead to additional tank ignitions. A boilover may destroy everything within a 4 tank radius. Crude product left to burn may boilover repeatedly. The lingering fire will result in solid coke within the tank.

