Dwight Williams, Williams Fire & Hazard Control, Edited by Brent Gaspard, CODE Red

Glenpool Tank Fire

Expect the Unexpected

Williams Fire & Hazard Control set the stage for their attack on this 140 f storage tank fire. Williams would apply tactics that were tailor made or this fire.

"I have never been to a fire that didn't present surprises or complexities at some point during the event." This statement from Dwight Williams – President of Williams Fire & Hazard Control is the heart and soul of the real challenge before Industrial Firefighters.

Certainly tactical prowess, product knowledge of apparatus, system components, extinguishing agents and their applications (methodology), safety practices, team dynamics, and more are all valuable (even necessary) aspects of a response effort. However, firefighters — and in particular Command Personnel — with the ability to think on their feet, to observe and assess the ever changing characteristics of the emergency at hand and factor these changes into their response is a talent that will enhance the effectiveness of a response in many ways.

A tank fire, a process unit fire, a pressurized fire, a spill fire, a vapor release … all these scenarios obviously have an immediate range of impact. However, their impingement on nearby assets, the intermingling of chemicals or gases in the affected area, severe weather changes, structural damage resulting from an explosion, or changes due to the heat load from an industrial fire — these elements and so much more can dramatically affect the emergency itself and the response at any given moment. Responders need to be able to recognize these "vital signs" of the event in order to maintain proper and effective tactical efforts throughout the emergency response.

A firefighter's greatest ability .... to pay attention to and adapt tactics to the inevitable changes in the fires they face.

An echo from the past rings loud and clear for the firefighters of Williams Fire & Hazard Control – "Adapt and Overcome". This mantra has led Williams Fire & Hazard Control to defeat the odds again and again. Because in fact, experience and deliberate application of that experience can turn the odds in your favor when faced with a major event – such as the following …

Dwight recounts the tank fire incident of June 12, 2006 at the Glenpool storage facility in Oklahoma.

"Initial reports informed us we were responding to what appeared to be a rim fire atop a 100 foot tank, when in fact lightning had ignited this tank which was an internal floater. These tanks are designed with a weak seam along most of the roof's perimeter allowing the roof to blow upward in the event of an internal explosion. In this case, the tank's roof initially only buckled upward at several points along the perimeter leaving the roof atop what became a very intense flammable liquid fire contained under the roof structure.

This tank had just been filled with 43 feet of product — just 2 feet shy of its maximum wall height. I suspect

oot diameter gasoline the characteristics of

that a thunderstorm which skirted the area may have ignited vapor causing a flash back into the tank and igniting the vapor space above the pan.

The circumstances immediately following the ignition were that the pan which floats on top of the product pitched — likely as a result of the initial hammer effect of the explosion — and sank partially into the product where it became wedged along the tank wall. This action caused a wave within the tank splashing product out and over the top of the tank wall. This gave the impression initially that part of the tank wall had been compromised.

The roof which did not "blow free" of the tank remained above the surface. The extreme heat over a period of hours eventually broke down the roof structure and it dropped into the tank as a crumpled mess.

This is essentially when we got the call to respond.

Over the years we have developed regional "Hired Gun Gang" relationships which allow us to place vital emergency assets strategically throughout the U.S. for major responses such as this. There is a tremendous amount of crude and flammable liquids stored in the Oklahoma area. This region has been well served by the "TKO" (Texas, Kansas, Oklahoma) branch of the Hired Gun Gang. Because of these provisions we were able to respond very quickly with 5 men and a minimal load of portable equipment such as our Daspit Tool, through the pump proportioners, and fittings.

We cannot say enough about Sun's cooperation in this endeavor. Sun personnel brought our equipment to the location, they had people to help deploy the equipment, and allowed us to use their 2,000 gpm hired gun which performed very well at this event. Also, approximately 10 totes of emergency ThunderStorm ATC 1 x 3 foam stocks were moved in from Sunoco, as well as a 4,000 gpm pump from Sun refinery in Tulsa.

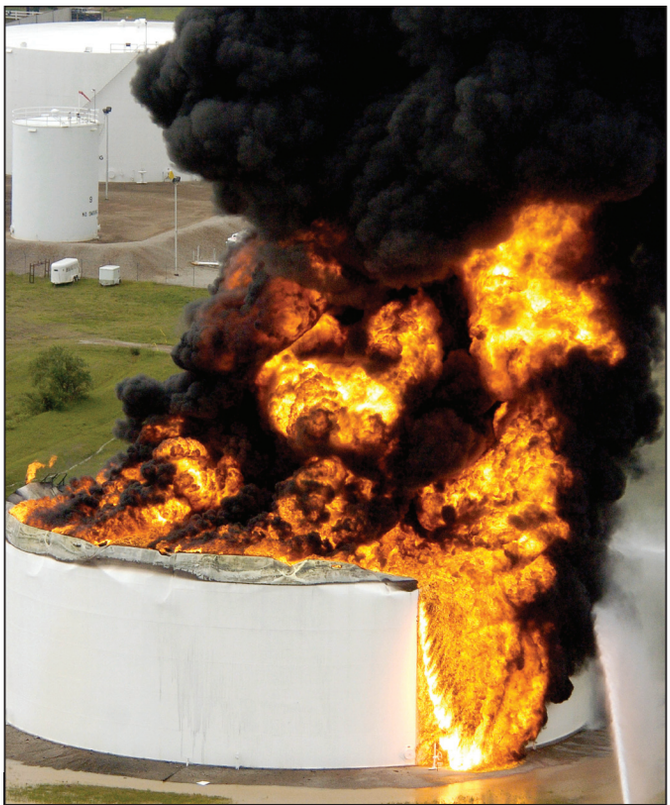
The Glenpool fire department did a phenomenal job as well in support on this response. All we had to do was ask and they got about getting things done with great efficiency. They were a pivotal link in setting up our relays for precious water resources.

In every fire response water is very precious. It is quite common in both terminal facilities and tank farms that water is more difficult to come by than in other types of facilities. In this case, we set up water relay from a tank within the facility that contained about 5' of water, and as stated earlier, Glenpool Municipal was a great help in establishing our hose lays from that tank.

Before we arrived, facility personnel cooled the adjacent exposed tanks while wisely monitoring and saving resources for the tank fire response itself. Too many times excited firefighters will throw a lot of water at a tank fire with inadequate foam applications or with improper methods which may actually compromise the structural integrity of the tank as well as wasting water.

The intelligence we had going into this job was that the involved tank was a 100 feet in diameter. That was about to change. Once we were on the ground, I told Chauncey Naylor, one of my Lead Firefighters, we got more than a 100 foot tank here. The tank was in fact 140 foot in diameter.

This basically doubled our resource requirements to make this attack because now essentially we had two times the surface area to deal with. Before we even charged our lines for the attack, we were adapting to



A wave sent through the product by the sinking pan gave the false impression of a tank wall failure.

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what was in front of us.

The calculations ran as follows:

A) For the initial 100 foot tank consideration:

50 x 50 x 3.14 = 7,850 x .16 = 1,256 gallons per minute application

Obstructions caused this fire to behave like several fires in one tank

1% application rate = 13 gallons of concentrate per minute

* Total foam allowance is 13 x 65 = 845 gallons of concentrate

* barring any surprises or complexity

B) For the actual 140 foot tank scenario:

70 x 70 x 3.14 = 15,386 x .16 = 2,462 gallons per minute application

1% application rate = 25 gallons of concentrate per minute

* Total foam allowance is 25 x 65 = 1,625 gallons of concentrate

* barring any surprises or complexity

I have never been to a fire with no surprises or complexities. It is also important to note that it may take at least as much foam to keep the fire out as it does to extinguish the fire.

Sunoco brought approximately 10 totes and we had 10 totes of our own at 265 gallons per tote. Therefore, we were well covered for both the extinguishment efforts and the ensuing vapor mitigation and foam blanket suspension.

As we were staging our attack, we had one adjacent tank vaporizing so violently the vapor looked as if someone had turned loose some propane. The vapor was blowing in the direction of the fire and just as we hit that side we knocked the heat load off of it and were able to save that tank. Also, the tank behind the involved tank was actually boiling product out of the eyebrow vents and running down the exterior of the tank walls.

This all was occurring just as we began our foam attack. It is the opinion of most of us there that had we not applied foam when we did, we would have seen several surrounding assets involved in this fire within about 5 minutes!

When we arrived the fire was immense. It looked and behaved like a full surface fire without obstruction due to the very active flame characteristic we were seeing. Once we began our attack, however, it quickly became apparent to me that we were dealing with a different type of animal. I saw behavior that told me our foam application was not making a normal run across the surface within the tank due to one or more obstructions inside. ThunderStorm® under proper application is a very effective and fast knock-down agent for a flammable liquid fire – even one of this magnitude.

Our initial attack had severely weakened the fire and we saw a moderate flame collapse within 14 minutes. At this point I told Bill Williams of Explorer Pipeline that we had multiple fires that were not communicating – that there were apparently peaks and/or pipes that were above the flammable liquid surface which were blocking the foam's ability to communicate across the entire surface.

I sent Herman Ladner, one of our Lead Firefighters, onto an adjacent tank where he confirmed that we did in fact have 4 different fires inside the tank due to these various obstructions. We identified the obstructions inside the tank as being the pitched over floating pan, buckled areas of the roof which had collapsed earlier, and a large pipe in the middle of the tank which was radiating heat and flaring in the center of the tank just above the flammable liquid and our foam blanket.

I then climbed onto an adjacent tank to direct the ongoing application where I could now see the various fire locations and their reactions to our attack.

Again, adapting to what was in front of us, we modified our approach to what we call a "Teasing Method" — in this case a high tease. This tactic moves our foam stream nearly vertical to a point of lobbing our foam high above the tank resulting in a "Rooster Tail" which rains the foam application straight downward into the tank and smothering all surface areas inside the tank.

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Following initial flame collapse at 14 minutes into the attack, obstructions to foam runs were overcome with this Rooster Tail application (Shown right) for final extinguishment.

This application method overcomes obstructions and will allow our foam application to disperse and drop foam into hidden areas.

Rather than a 6 o'clock ground position attack this tactic essentially created a full vertical attack from directly above the tank — which is what allowed us to kill the fire.

A stubborn component we had to deal with was a coked area (a shelf or eyebrow) that was a "hanging spot" near the center of the tank resulting from one of the peaked structural areas above the product which had become so thoroughly coked that it continued to flash like sparklers. This would of course fall from time to time on the foam blanket, which extended our application time to protect against potential re-ignition of the surface below. We maintained a steady foam application thereby pushing the foam against this area for approximately 30 extra minutes after initial extinguishment.

This event truly accentuated the importance for industrial fire response teams to have a nozzle that will allow them quick traverse maneuvers as well as near vertical shots that can result in this Rooster Tail application to rain down their foam application over the entire flammable liquid surface area.

Now it should be noted that the flow capacity and the velocity of our large volume equipment on this response (4,000 gpm transportable pump, large diameter hose, and our large-volume hired gun apparatus) allowed us to maintain such a flow density that even after throwing the foam hundreds of feet into the air above a fully involved flammable liquid fire that our resulting foam application remained adequate. Even with the winds above such a fire — which can exceed 80 miles an hour — our fall out ratio from the foam stream was negligible.

Extinguishment was called at about 1 hour 45 minutes from the beginning of our attack — only 2 hours after we arrived!

There have been fires like this with much higher application rates made by others that have burned to the ground. I believe the difference was that we don't merely react to a fire that we are faced with — we in fact assess its characteristics and adapt to what we see on the ground. In this case we were able to extinguish this fire with proper tactical adaptations that were tailored to the fire's personality and structure. I will of course also give much credit to our Maker. You know, we do the best we can, but I don't believe one can have the success we have had with out divine intervention.

Footnote:

Local media covered this event doggedly, and advised surrounding communities throughout the emergency regarding extinguishment efforts, facility status, and potential health risks due to the column of smoke.

This region and many facilities such as the Glenpool tank facility have taken a proactive posture with regard to their emergency preparedness. This mindset practices dynamic awareness, pre-planning, and pre-staging emergency response assets such as foam, pumps, and large volume apparatus to deploy a rapid response if and when such an event occurs. They also actively forge key relationships to gain guidance and/or support for securing extinguishment. This posture shows that these events can be addressed quickly and effectively — saving production assets, money, and exposures to public health.

Following the initial lightning strike ignition 9:30 am, Monday - June 12, William Fire & Hazard Control responded quickly to help save:

- ❑ ***Adjacent tanks that were exposed at the time of the attack***
- ❑ ***90,000 barrels = 3,780,000 gallons of gasoline x $2.70 pump price which equates to $10,206,000.00***
- ❑ ***And local health risks were mitigated a mere two hours after their arrival!***