



**ABOVEGROUND STORAGE TANKS:**

**THE GOOD THE BAD AND THE UGLY**

Dana Schmidt, PE, Standards Engineer STI/SPFA

### What is STI/SPFA?

- Not-for-profit trade association of steel fabricators
- High-visibility advocate for steel as material of choice for fabricated products
- Recognized authority on steel tanks, water pipe and storage, and pressure vessels
- Significant focus on construction products in the energy and water markets

Shop Fabricated Tanks

Field Erected Tanks

Water Piping



Pressure Vessels

Affiliates

### Who is STI/SPFA?

### What does Steel Tank Institute do?

- UST and AST tank technologies
- Industry standards
- Recommended practices
- Quality control of tank fabricators who build tanks to STI specifications
- Information resource
  - TankTalk, Tank Mishaps
- Certification
- Education for:
  - Members and their customers
  - Specification engineering community
  - Regulators
  - Safety



### STI/SPFA's Annual Product Awards

Judged by member peers on four criteria:

- Promotional value: Promotes the value of steel fabrication
- Uniqueness of product/project: Shows originality and versatility
- Design and engineering: Excels in technical aspects
- Aesthetics: Has visual appeal

<p><b>FIELD ERECTED TANK OF THE YEAR</b></p> <ul style="list-style-type: none"> <li>• Elevated tank</li> <li>• Reservoir tank</li> <li>• Standpipe</li> <li>• Special storage tank</li> <li>• API 650 atmospheric oil storage tank</li> <li>• API 620 low pressure liquid storage tank</li> <li>• ASME pressure vessel storage</li> </ul>	<p><b>FABRICATED PRODUCT OF THE YEAR</b></p> <ul style="list-style-type: none"> <li>• Pressure vessel</li> <li>• Shop-fabricated atmospheric tank</li> <li>• Special fabrication</li> </ul>
<p><b>AFFILIATE NEW PRODUCT OF THE YEAR</b></p>	<p><b>STEEL WATER PIPE PROJECT OF THE YEAR</b></p> <ul style="list-style-type: none"> <li>• Pipe fabrication</li> <li>• Pipeline project</li> <li>• Pipe Section Affiliate product/project</li> </ul>

<http://www.steel tank.com/FabricatedSteelProducts/Awards/tabid/63/Default.aspx>



**FISHER**

### STI/SPFA 2013 Tank of the Year Award Winner

- API 620 Low Pressure Storage Tank
- Dakota Gasification, Beulah, ND

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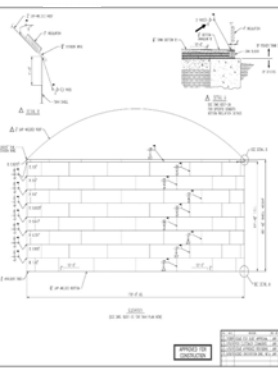
Dakota Gasification's  
**Great Plains Synfuels Plant - Beulah, ND**

- The only commercial-scale coal gasification plant in the United States that manufactures natural gas
- Unique scrubbing process makes it an ultra-clean plant
- Ammonium Sulfate
- Feedstock for other chemicals



Great Plains Synfuels Plant before 2<sup>nd</sup> Ammonia Storage Tank

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**Design**

- Capacity = 30,000 tons of Anhydrous Ammonia
- SG = .67 @ -32 °F
- Design Pressure: = 1 psig / -8" H<sub>2</sub>O
- Metal Temperature = -35 °F
- API-620 Appendix "R" & API-625

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**Scope**

- Installation of Foam / Insulation under tank bottom
- Single containment tank with vapor recovery system
- 170'0" D x 98' overall height utilizing a self supported dome roof.
- Hydro and Pressure Test
- Painting
- Insulation of shell and roof

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**Primary Challenges**

- Construction of a tank, that would normally take 55 weeks, in 40 weeks
- Raising the large self supported dome roof (254,000 tons or 509,000 lbs. 64' to top of shell)

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**Tank Solutions**

- Close coordination with all Subcontractors Involved
  - 2<sup>nd</sup> shift
  - Phased Array testing of welds
  - Shop priming of steel plates
  - Painting and insulation of the tank roof while still on the ground.
- 

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**Foundation**

- Slab foundation
  - Base heating system
  - Foam glass insulation between the tank bottom and the slab; this protects the slab from the very cold operating temperature of the tank itself.
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Roof under construction inside the tank



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Prepping roof for insulation



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Roof being  
air raised  
into place

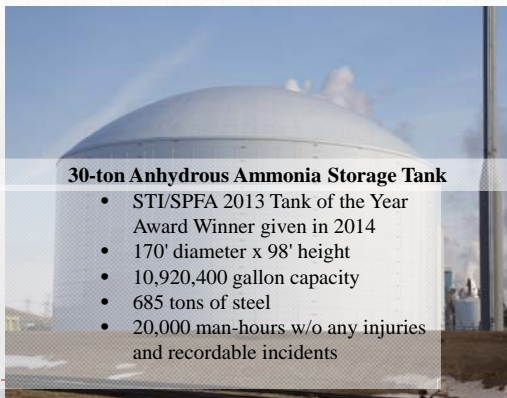


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**Video – Roof Being Raised**

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**30-ton Anhydrous Ammonia Storage Tank**

- STI/SPFA 2013 Tank of the Year Award Winner given in 2014
- 170' diameter x 98' height
- 10,920,400 gallon capacity
- 685 tons of steel
- 20,000 man-hours w/o any injuries and recordable incidents

**API 650 Atmospheric Oil Storage Tank**

- Exxon Mobil
- Prudhoe Bay Alaska
- (4) 650,000 and (1) 17,000 gallon capacity
- PWHT at 1195°F for 2 hours
- 531 tons of steel



Diesel Tank Modules  
Point Thompson Project  
Designed and built by CBI Services, Inc.

## ASME Pressure Vessel Field erected

- Marshall County, WV
- Propane, Butane and Natural Gas Liquid
- Largest 50,000 bbls of propane at 250 psig
- Transported 3800 miles by barge
- Designed for -50°F
- 2075 tons of steel



Natrium Processing Facility  
Caiman Energy  
Designed and built by CB&I Inc.

## ASME Pressure Vessel Shop Fabricated

- Pocatello, Idaho
- 198 feet high
- Diameters from 108 in. to 156 in.
- 1.43 in. 304 SS and 3.12 in. ASME 537 CL2 carbon steel
- Designed for pressure of 1100 PSI and -75°F
- 261 tons steel total



Demethanizer and Cold Separator  
Designed and built by Eaton Metal Products

## Special Storage Tank

- Livingston, CA
- 16 tanks
- 5,600,000 gallons storage
- 39 ft. diameter x 40 ft. tall
- Tanks were erected in the field using panelized construction due to short construction schedule
- 520 tons of steel



Wine Storage Tanks with  
Dimple Style Refrigeration  
Jackets  
Paso Robles Tank, Inc.

## Tank and Petroleum Use Mishaps

Collections of news stories showing the hazards associated with tanks and flammable liquids

Posted monthly on STI web site under "Publications"

Top stories featured in STI Tank Talk free e-newsletter



<http://www.steeltank.com/Publications/TankUseMishaps/tabid/187/Default.aspx>

## The BAD

### Incidents at Well Sites

### Central Texas ~ July 14, 2014

- 12,000 gallon oilfield tank at abandoned well contained sludge and < 20 gallons of oil
- Worker with safety harness removing bolts from catwalk with a torch
- Explosion
- Worker critically injured



### Near Graford, TX – June 22, 2014

- Two separate tank batteries struck by lightning about 30 minutes apart north & south of Graford, TX
- One tank exploded
- Three tanks destroyed
- Regulators pleased with clean-up



### Fayette County, TX

- Saltwater disposal facility
- 6:30 am Sept. 28
- Lightning struck 1 of the 5 fiberglass tanks
- Tank exploded and fire destroyed remaining tanks



## Minerva, Ohio – March 17, 2013

- Explosion caused by welding on tank battery
- Lid blew off the tank, landing 400-500 feet away
- Oil remained in near empty tank



## Saltwater Disposal from Fracking Pearsall, TX - Jan 6, 2012

- Nearby welding ignites vapors while saltwater, with skim of condensate was unloaded into a collection tank
- Oil spread to other tanks
- 3 workers injured



<http://stateimpact.npr.org/texas/2012/01/20/railroad-commission-responds-to-explosion-in-pearsall>



- A man and a woman were injured when an oil storage tank exploded while the pair were smoking on a catwalk over oil storage tanks
- 24-year-old man with burns to his face, chest and arms, and a 24-year-old woman also critically injured, showed up at the Fire Department seeking medical attention
- Six 400-barrel (17,000 gallons) fiberglass storage tanks, three of which caught fire

## Van Zandt, TX



## Van Zandt, TX



- One of the four tanks exploded
  - The tanks contained crude oil, condensate and saltwater, a Three Forks Energy executive said.
  - 3 fiberglass tanks were destroyed and 2 empty metal tanks were damaged, the company said.



## Van Zandt, TX

Three Forks Energy

- Victims Brandy Wolfe and H.R. Price
- Arrested for
  - criminal mischief-over \$200,000, which is a first degree felony,
  - criminal trespass of a critical infrastructure, which is a Class A misdemeanor



## Van Zandt, TX

## Saltwater Tank Incidents

- Rockport, TX
  - Lightning struck one tank containing a minimal amount of petroleum, and that explosion set fire to 2 other fiberglass tanks containing salt water
  - Tammie Shelton was working nearby when it happened. "I saw the lightning. I heard the kaboom! I saw the flames come up instantly right at the same time."



Williston, ND

- Lightning strikes caused 3 fires, Summer 2014, in ND with FRP saltwater tanks
- <http://www.environment.com/Environment/Latest-News-Wires/2014/07/19/Why-lightning-is-a-fire-risk-for-fiberglass-saltwater-tanks>



## LaMesa TX

## Remember LaMesa, TX video



API 12F, para. 4.2 “Unless tanks are installed in remote locations, the purchaser shall provide, ..., pressure relieving devices which will provide capacity in addition to normal venting to meet the requirements tabulated in Table C.1. ...”

## New Albany MS Biodiesel - Jan 22, 2014

<http://www.youtube.com/watch?v=AAvjkJ0E3Tc>



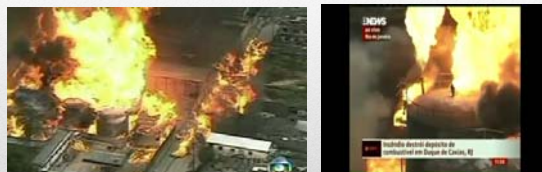
- Onsite storage
  - 8,000 gallons of methanol
  - 37,000 gallons of glycerin
  - 46,000 gallons of feedstock oil
  - 8,000 gallons of sodium methylate
  - 2,000 gallons of fuel oil.
- Likely cause was a problem with a thermal oil heater or pump used in the distillation process
- Chicken fat, soybean oils and other oils to produce B100 biodiesel

## The UGLY

### Incidents at Terminal Facilities and End Use Facilities

## Rio de Janiero - May 2013

[http://www.youtube.com/watch?v=wiDH\\_H1sEvQ](http://www.youtube.com/watch?v=wiDH_H1sEvQ)



- One dead from inhalation of vapors, 7 injured
- 6 tanks at terminal, spread to administration buildings
- Site did not have environmental license to operate

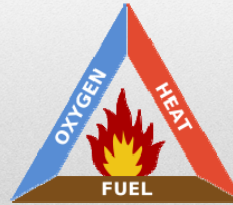
## Surat, India – Jan. 2013

<http://www.bing.com/videos/search?q=Surat%2c+India+terminal+fire&FORM=HDRSC3view=detail&mid=7AAC4DD29507831F37E57AAC4DD29507831F37E5>

- 10,000 kL tank is one of 9 tanks at terminal
- Welding work ongoing
- Cause was faulty valve and no blind used
- 3 contractors killed
- 500 firefighters & 50 water tankers to extinguish
- Upper lid blown 30 meters



## Tank Mishaps Causes



- Lightning strike
- Poor design
- Poor installation
- Improper venting
- Overfill
- Equipment malfunction
- Hot work
- Vehicle accident

## STI SP001 5<sup>th</sup> Edition

- STI AST Inspection Standard
- Issued September 2011
- Available at [www.steeltank.com](http://www.steeltank.com)
- SP031 Repair of Shop-Fabricated ASTs

