




Silver Eagle Refinery Flash Fire and Explosion and Catastrophic Pipe Explosion

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Accident Description

Accident: Silver Eagle Refinery Flash Fire and Explosion and Catastrophic Pipe Explosion

Location: Location: Woods Cross, UT

Accident Occured On: 01/12/2009 | **Final Report Released On:** 04/14/2014

Accident Type: Oil and Refining - Fire and Explosion

Investigation Status: The CSB issued a technical report on April 14, 2014, and formally closed the investigation at a public meeting on January 28, 2015.

On the evening of January 12, 2009, 2 refinery operators and 2 contractors suffered serious burns resulting from a flash fire at the Silver Eagle Refinery in Woods Cross, Utah. The accident occurred when a large flammable vapor cloud was released from an atmospheric storage tank, known as tank 105, which contained an estimated 440,000 gallons of light naphtha. The vapor cloud found an ignition source and the ensuing flash fire spread up to 230 feet west of the tank farm. On November 4, 2009, a second accident occurred at the Silver Eagle Refinery in Woods Cross, Utah, when a powerful blast wave - caused by the failure of a 10 inch pipe - damaged nearby homes.



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Silver Eagle Refinery Explosion Surveillance Footage

4/10/2014 6:00:00 PM

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Board releases report on Silver Eagle Refining explosion

By Amy Joi O'Donoghue and Jed Boal | Posted - Apr. 10, 2014 at 10:26 p.m.

14 photos

10



10PM: Board releases report on Silver Eagle Refining explosion

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WOODS CROSS — A segment of a 10-inch pipeline at Silver Eagle Refining that suffered a catastrophic rupture did so because of corrosion and was never inspected in its lifetime, a new report concludes.

The 2009 failure led to a massive explosion and fire at the refinery, 2355 S. 1100 West, blowing four workers off their feet and damaging 100 homes, including one that was knocked from its foundation.

"The hydrogen pipe was directed at the back of my garage," Linda Wood said. Her house suffered the greatest damage, along with her neighbor's home.

Findings in the report commissioned by the U.S. Chemical Safety Board point to extreme corrosion of the line similar to conditions that led to deaths in other states.

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"This is the same syndrome we found in the Bay Area Chevron refinery fire of 2012 and the Tesoro refinery explosion and fire that killed seven in Anacortes, Wash., in 2010," said Rafael Moure-Eraso, board chairman.

"Fortunately, there were no fatalities resulting from the explosion, and it was only by chance no one was in the immediate area. But many lives were disrupted as residents in

The investigation showed eerie similarities between the Woods Cross and Bay Area incidents when it came to the extent of corrosion.

"The metallurgical analysis details the same kind of sulfidation corrosion at the Silver Eagle refinery that we found in the Chevron accident. Sulfur compounds in the process stream corroded a steel piping segment, causing the pipe walls to become severely thin," said Dan Tillema, lead investigator from the Chemical Safety Board. "This incident is also similar to Chevron in that, while sulfidation is a well-known damage mechanism at refineries that requires regular inspection and monitoring, the segment that failed has no record of ever being inspected."

The board noted the problem at Silver Eagle in 2009 is emblematic of a larger, systemic problem in refineries across the country, with companies that rely more on inspections to catch problems rather than assuring safe design at the outset.

An investigation conducted by Exponent — a Texas-based engineering company — showed the pipe segment that failed was put into service in 1993 in the bottom of a reactor in the distillate dewaxing unit. The rupture sent a tremendous blast across the refinery into a nearby subdivision, but did not result in any serious injuries.

"I can say to the best of our knowledge, we have
addressed everything that has been noted from the
(Chemical Safety Board)."

—Jerry Lockie, general manager of Silver Eagle Refining

Four workers near the process unit at the time of the explosion were knocked to the ground, and one worker was taking readings next to the pipe just minutes before it failed.

The report said the analysis shows that "years of thinning" had taken place in that segment of the pipeline, and refinery records detailed "serious widespread mechanical integrity deficiencies and gaps across the refinery" at the time of the incident.

storage tank.

The refinery was fined more than \$1 million by Utah regulators for equipment and safety violations.

Jerry Lockie, general manager over the refinery, said the facility is on a comprehensive inspection program and all pipelines are maintained.

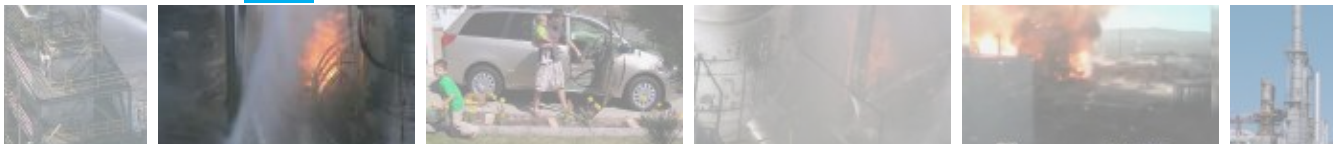
"I have not personally reviewed the report, but I can say to the best of our knowledge, we have addressed everything that has been noted from the (Chemical Safety Board)," he said.

Moure-Eraso noted that, ironically, the investigation into what happened at Silver Eagle was delayed because of a "pressing" series of accidents in the oil production and refining sector.

The Chemical Safety Board is an independent federal agency charged with investigating industrial chemical accidents. It does not issue citations or fines but makes safety recommendations to industry, labor and regulatory agencies.

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KSL WEATHER FORECAST

The Salt Lake Tribune

Woods Cross refinery sues 4 companies over 2009 explosion, fire

Courts • Suit seeks \$75 million in damages.



By Paul Beebe The Salt Lake Tribune

• November 6, 2012 2:34 pm

This is an archived article that was published on sltrib.com in 2012, and information in the article may be outdated. It is provided only for personal research purposes and may not be reprinted.

Silver Eagle Refining has sued four companies, alleging their negligence and breaches of contract led to a massive explosion in 2009 that rocked the company's Woods Cross crude oil refinery and damaged dozens of nearby homes.

The lawsuit filed Monday in U.S. District Court in Salt Lake City seeks more than \$75 million from Professional Service Industries Inc., Sun Shipbuilding and Dry Dock Co., Sun Oil Co. and Moose's Construction as defendants.

Jeremy Seeley, an attorney with Plant Christensen and Kanell in Salt Lake City, said Tuesday that Silver Eagle had not authorized him to discuss the case.

The explosion at the 10,250-barrel-per-day refinery happened on Nov. 4, 2009 shortly after 9 a.m., when a 10-inch pipe filled with pressurized hydrogen suddenly failed. A resulting fireball and vibrations surged east toward a Woods Cross neighborhood.

At least one house was blown off its foundation. No one was hurt, but 10 homes were seriously damaged and nearly 300 homes were affected.

Professional Services, a suburban Chicago engineering consulting and testing company, allegedly failed to inspect the pipe. The company didn't respond to a request for comment.

Sun Shipbuilding and Dry Dock Co. manufactured the pipe, which was attached to a dewaxing unit at the refinery. Sun Shipbuilding, a Pennsylvania company, allegedly improperly designed and manufactured the pipe and dewaxing unit. The company appears to have gone out of business in 1989.

Sun Oil Co. allegedly misrepresented the "fitness and integrity" of the dewaxing unit. The Philadelphia-based company did not respond to a request for comment.

Moose's Construction, a Wyoming company, allegedly failed to install the pipe, failed to use proper materials and didn't inspect its work. The company apparently no longer exists.

Silver Eagle's suit said the explosion and fire caused "extensive damage" to homes in the neighborhood; it didn't calculate the amount. The company did say that its refinery suffered more than \$3.3 million in damage.

In 2010, the Utah Occupational Safety and Health Division fined Silver Eagle nearly \$1 million. The division's investigation of the explosion pinpointed 71 violations of state law that singled out problems with equipment, safety procedures and record keeping. Sixteen violations were deemed "willful." Another 55 were said to be "serious."

pbeebe@sltrib.com

Twitter: @sltribpaul





UTAH

Refinery explosion injures 4; homes evacuated

By Deseret News | Jan 12, 2009, 10:21pm MST

Ben Winslow and Jacob Hancock



Fire crews attempt to contain a fire after an explosion at the Silver Eagle Refinery in Woods Cross, UT on Monday January 12, 2009.
| Kristin Murphy, Deseret News

WOODS CROSS — Firefighters began a "blitz" approach late Monday in an attempt to suffocate a blaze that erupted at the Silver Eagle Refinery here following a 5:30 p.m. explosion that seriously injured four refinery workers.

Crews began pumping foam into vents on the 42,000 gallon gasoline tank about 9:30 p.m. in an effort to suffocate the fire burning inside by eliminating its oxygen source, said deputy South Davis Metro Fire Chief Jeff Bassett. If successful, the blaze could be out by about midnight.

Bassett said that would effectively end the need for any evacuation of the surrounding homes as the threat to three nearby tanks of similar size would be eliminated.

Police ended the mandatory evacuation order for neighborhoods in a half-mile radius surrounding the refinery about 8:30 p.m. but urged residents to stay away voluntarily.

"It is a voluntary evacuation at this time, but we strongly suggest you stay (at the evacuation center)," Woods Cross Police Sgt. Ekolu Delos Santos told about 100 evacuees gathered at the Woods Cross High gymnasium.

Police assured those at the gym that neighborhoods were being heavily patrolled in their absence.

Flames were seen shooting up into the sky above one of the 42,000 gallon gasoline tanks shortly after the explosion at the refinery at 2355 S. 1100 West, as fire crews from several nearby cities poured water on it. Firefighters early on said they were able to keep the fire from spreading, but were worried about the seams of the tank — and if oxygen should seep in.

"We have the tank surrounded," Bassett said at that time. "We have a large amount of water on it and we're holding it right there. There's no degradation and we don't see tank failure happening."

Four men, ages 30 to 50, at the refinery were injured when the explosion occurred, authorities said, being pulled to safety by co-workers. Two were flown by medical helicopter and the other two were taken by ambulance.

"We have treated four patients on scene," Bassett told the Deseret News. "They have now been transported to the burn unit at University Hospital."

The injuries were described as burns to the faces, necks, arms and hands of the workers. One also suffered lung damage from inhaling the searing heat.

Hospital spokesman Chris Nelson said one man was listed in critical condition, two were serious and one was in fair condition. Their names have not been released.

A Red Cross spokesperson said shortly after the mandatory evacuation order was lifted that its volunteers would remain on scene to provide those fighting the fire with

food, water and other assistance as needed. She said they expected to be working through the night.

A half-mile radius surrounding the refinery was evacuated with police going door-to-door telling residents east of the refinery to leave. Residents along 800 West between 2100 South and 2600 South were ordered to leave their homes, Bassett said.

Jason and Jana Pace were told to evacuate with their children. They packed up their SUV with carseats, their dog and a blanket headed toward an evacuation center at Woods Cross High School.

"We don't think it will be very bad. We expect to be back home in about an hour or so," Jason Pace said.

But authorities expected the fire to burn well into the night.

The Pace's 7-year-old daughter Madeline appeared nervous as they left their neighborhood.

"I'm scared because fire is scary," she said.

Dean Erickson, 52, has lived near the refinery for years. He watched the fire for about 30 minutes before police knocked on his door and told his family to leave.

Erickson said he has seen fires at nearby refineries before, but this is the first time he has ever been evacuated.

"We finished up dinner real quick — had to have that — and grabbed some clothes and then left," he said.

Bassett said residents will be evacuated "through the night."

The Utah Transit Authority has also halted its commuter rail service which passes right by the Silver Eagle Refinery. UTA has set up a bus bridge taking commuters from the Salt Lake City station to Woods Cross, where they will board trains that will take them north, authority spokeswoman Carrie Bohnsack-Ware said Monday.

This is not the first fire at the Silver Eagle refinery. In 2007, a fire sent a heavy plume of black smoke into the air. In that blaze, authorities shut off a fuel supply valve and let the blaze burn itself out.

Bassett said firefighters in the area receive specialized training in College Station, Texas, to learn how to battle a refinery fire. The refineries themselves pay for the training, he said.

E-MAIL: bwinslow@desnews.com



UTAH BUSINESS POLICE/COURTS

Safety board offers video of Silver Eagle Refining explosion

By Deseret News | Nov 18, 2009, 12:00am MST
Joseph M. Dougherty

 GRID VIEW



Frame grab from a surveillance camera at the Silver Eagle refinery in Woods Cross shows the Nov. 4 explosion. | U.S. Chemical Safety Board

| 1 of 2



WOODS CROSS — The video is silent but violent. A truck drives away from an area about to be engulfed in flame.

Twenty-three seconds after the truck leaves the area, a pipe bursts, spewing a cloud of 800-degree hydrogen gas within 9 feet of an open flame.

Instantly, the hydrogen ignites, erupting into a fireball estimated to be 100 feet high. The fire then continues to burn for several minutes.

What the video doesn't show is the four men who were working nearby and blown to the ground but not seriously injured.

It doesn't show the extent of damage at the nearby Morningside subdivision, where four homes were severely damaged, and two of them were deemed uninhabitable. At least 100 other damage claims are being processed.

The Nov. 4 explosion at Silver Eagle Refining is the third refinery incident in Utah this year being investigated by the U.S. Chemical Safety Board. The board also plans to look at how refineries are regulated in Utah. The three Utah incidents account for 20 percent of the board's 15 investigations this year.

"As a percentage, that is a high number," said Don Holmstrom, the board's lead investigator for the Nov. 4 explosion at Silver Eagle, as well as for a Jan. 12 explosion at the same refinery that injured four workers.

The third Utah incident occurred Oct. 21 at the Tesoro Corp. refinery in Salt Lake City, when a pool of crude oil caught fire and spread to become a three-alarm blaze, damaging several trailers and equipment. Interstate 15 and FrontRunner commuter train service near the scene were briefly closed. The Silver Eagle refinery in Woods Cross is currently in the process of shutting down its fifth and final processing unit so it can begin a wall-to-wall inspection of its infrastructure.

"The frequency of accidents at U.S. refineries is very troubling," said U.S. Chemical Safety Board Chairman John Bresland, who spoke to the media Tuesday in Woods Cross. "The current rate of accidents is not sustainable, and it is not acceptable."

Bresland called on refineries to redouble their commitment to safer operations and safer communities.

Holmstrom said refineries are supposed to have a mechanical integrity program that identifies when certain equipment and materials are maintained or replaced when necessary.

"Our investigation to date indicates that the Silver Eagle refinery was operating with a mechanical integrity program that had some serious deficiencies," Holmstrom said.

In a statement released Tuesday evening, Silver Eagle re-emphasized that it is sorry for the explosion and is grateful no one was injured.

"Silver Eagle has been following an established mechanical integrity program and disagrees with any suggestion or assertion to the contrary," according to the statement. "It is apparent to the refinery that the program was insufficient and that changes need to be made."

Silver Eagle has also worked hard in recent years to upgrade the refinery and improve safety, refinery officials said.

Holmstrom agreed and credited the refinery with dismissing a previous consultant when it was determined that certain inspections were inaccurate.

Some measurements showed the pipe that failed on Nov. 4 was thinner than previously measured and that other pipes and vessels have no documented thickness readings.

The refinery says it has hired an internationally renowned industry consulting firm to help with its current investigation and get proper thickness measurements during the shut-down period.

Safety-board officials don't expect employees to lose their jobs. Rather, there will likely be more work as operators move into maintenance.

It's too early to determine the financial cost — damage to homes and the refinery — of the Nov. 4 explosion, Bresland said.

But the economic cost to the refinery, which is capable of processing 10,000 barrels of oil a day, is significant.

Tuesday's crude-oil price was \$79.14 per barrel, meaning the refinery is missing out on as much as \$791,400 worth of product a day.

Holmstrom said his team will be in Utah for the rest of the week and will likely make return trips as it compiles information and interviews for a final report.

He and Bresland said they also plan to investigate how the refinery managed to operate without a robust mechanical integrity program, how residential housing came to be located so close to potential refinery explosions and whether existing guidelines for siting hazardous facilities provide enough protection for residents.

e-mail: jdougherty@desnews.com. TWITTER: desnewsdavis



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