



U.S. Chemical Safety and Hazard Investigation Board

CSB Public Meeting

November 5, 2021

Fire During Hot Work at
Evergreen Packaging Paper Mill

Canton, North Carolina

September 21, 2020



Executive Director's Introduction

Stephen Klejst, Executive Director of Investigations and Recommendations

Investigation Team

Drew Sahli Investigator-In-Charge

Lauren Grim Supervisory Chemical
Incident Investigator

William Houglund Chemical Incident
Investigator



U.S. Chemical Safety and Hazard Investigation Board

Investigation Presentation

November 5, 2021

Fire During Hot Work at Evergreen Packaging Paper Mill

Canton, North Carolina

September 21, 2020

Drew Sahli
Investigator-In-Charge



Incident Summary

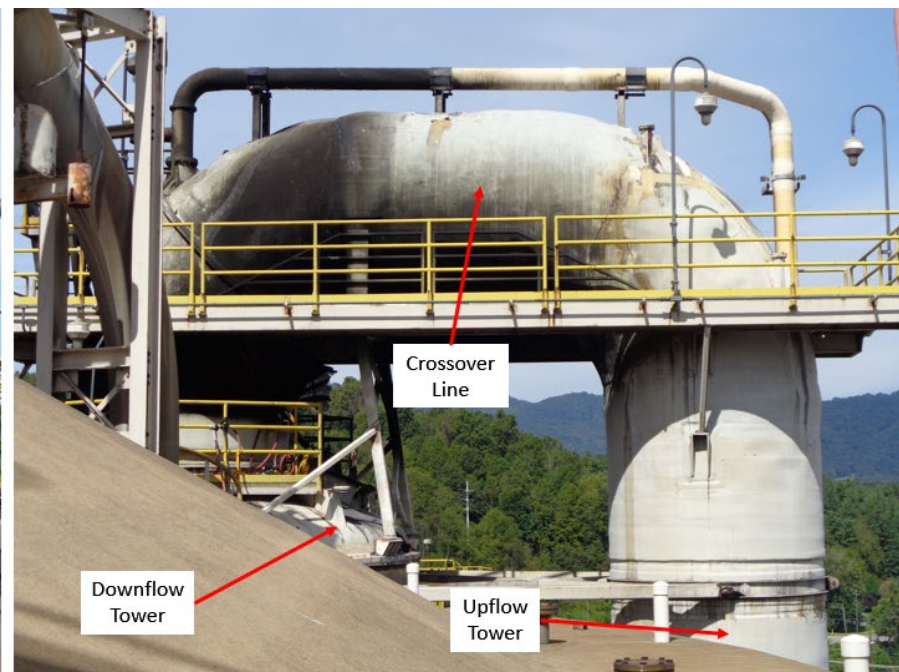
On Monday September 21, 2020, a fire occurred during a planned maintenance event at the Evergreen Packaging Mill in Canton, NC. The fire started in a process vessel in which one contract company was working and spread to a connected process vessel in which a second contract company was working. Two contractors were fatally injured.

CSB staff propose eight recommendations, and the reiteration of one previously issued recommendation, as a result of the investigation.



Evergreen Packaging Background

- Incident occurred in one of the mill's pulp bleaching units
- Bleaching process occurs in three reaction stages
- Each stage consists of two process vessels, called “upflow” and “downflow” towers, connected by “crossover line”
- Bleaching chemicals mixed with pulp
- Pulp whitens as it flows through





Evergreen Packaging Background

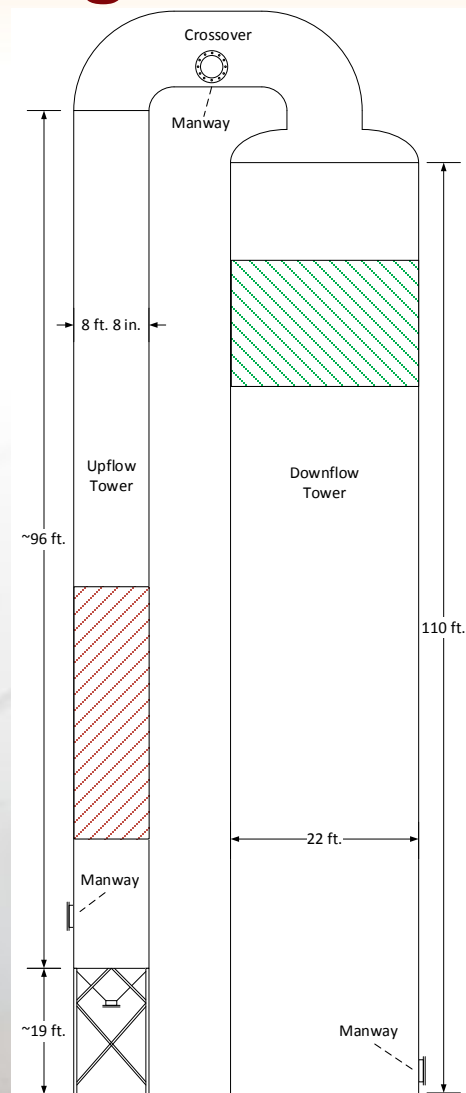
- Pulp bleaching process is corrosive by design
- The upflow tower, downflow tower, and crossover line were constructed of corrosion-resistant materials
- Periodic maintenance is required to the inside surface of the towers
- Evergreen was conducting a planned, facility-wide shutdown, called a “cold mill outage”





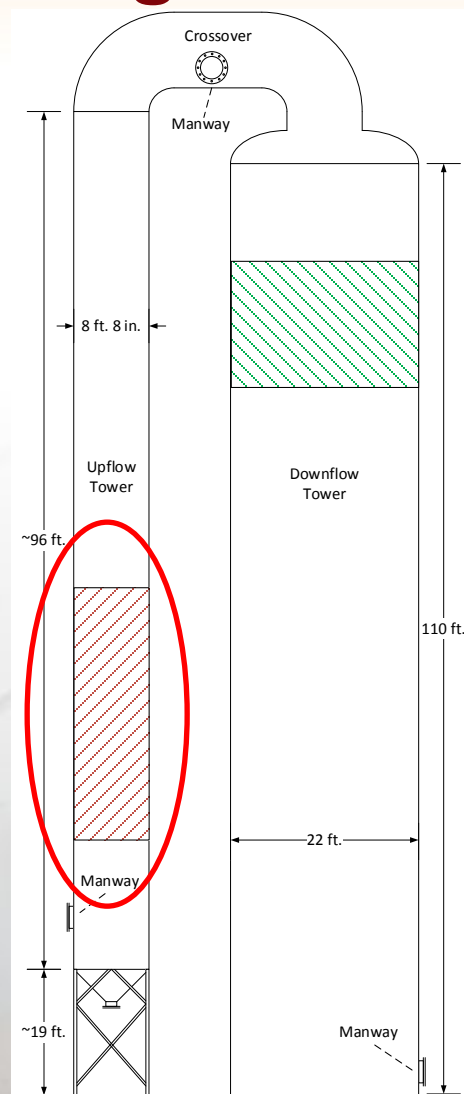
Evergreen Packaging Background

- Two contract companies hired to perform maintenance work in the #2 Fiber Line D2 upflow and downflow towers
- Blastco worked in the upflow tower (red shading)
- Rimcor worked in the downflow tower (green shading)



Blastco & Upflow Tower Background

- Upflow tower constructed of fiber-reinforced plastic, or FRP
- Blastco first removed damaged material using grinders
- Blastco replaced with epoxy vinyl ester resin and fiberglass
- Using paint rollers, Blastco applied resin to the walls of the upflow tower
- Blastco then alternated layers of resin and fiberglass



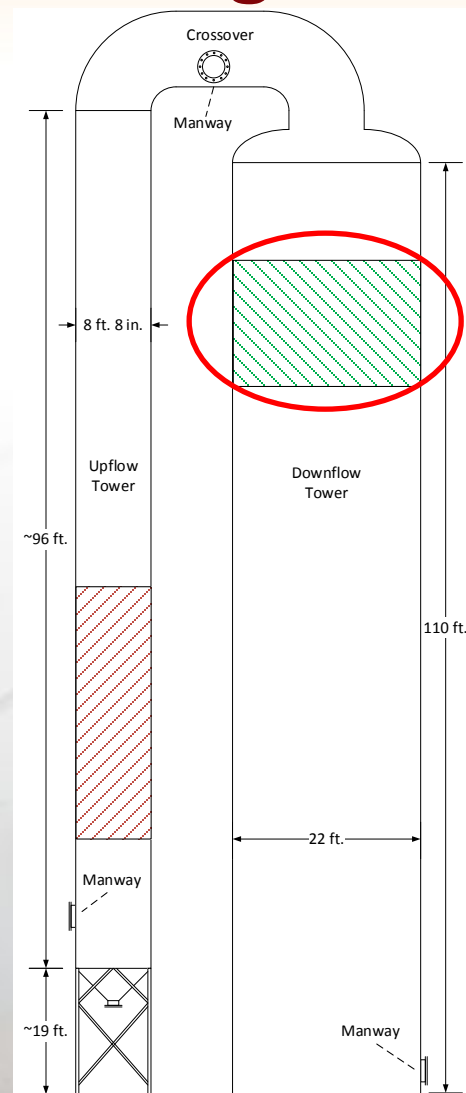


Resin Characteristics

- Over time, the resin hardened, and the fiberglass bonded to it, forming the FRP composite
- Gel time is dependent on ambient conditions
- Higher temperatures cause shorter gel time, colder temperatures cause longer gel time
- The resin was classified as a Category 3 flammable liquid
- Resin flash point: 79 degrees Fahrenheit

Rimcor and Downflow Tower Background

- The downflow tower was constructed of carbon steel lined with fireclay acid brick
- Rimcor removed damaged brick lining and abrasive blasted steel surface to prepare it for new brick
- Rimcor worked on a scaffolding platform suspended from the roof of the tower
- At time of incident, Rimcor was abrasive blasting





Incident Overview

- September 20, 2020, start of night shift
- Evergreen issued confined space entry permits separately to Blastco and Rimcor
- Blastco experienced difficulty laminating the resin
- Resin was hardening too slowly and the resin and fiberglass matting were sliding down the walls of the vessel
- Temperatures in the area were in the upper 40s and lower 50s (degrees Fahrenheit)



Incident Overview

- Blastco workers attempted several methods of addressing the problem
- None were successful
- Two Blastco workers obtained an electric heat gun
- The workers used it inside the upflow tower to warm the resin
- This caused the resin to gel faster





Incident Overview

- Approximately 5:15 a.m. September 21, 2020
- The heat gun fell into a five-gallon bucket containing the flammable resin
- A fire ignited inside the bucket
- The crew did not have a fire extinguisher immediately available



Incident Overview

- Blastco workers began evacuating the upflow tower
- One worker stayed behind and tried to smother the fire
- All Blastco workers successfully evacuated
- After evacuating the upflow tower, Blastco workers alerted Rimcor and notified Evergreen of the fire



Incident Overview

- Rimcor workers outside downflow tower tried to radio the two entrants
- Witnesses told the CSB that the two workers inside the downflow tower did not respond to radio hails
- Around 5:25 a.m., the Evergreen emergency response team (ERT) arrived at the scene
- Smoke and flames had spread to the downflow tower
- The ERT decided against attempting rescue inside the downflow tower



Incident Overview

- Evergreen summoned all surrounding mutual aid fire resources to the incident
- Emergency responders fought the fire for roughly two hours
- The two Rimcor workers found on floor of downflow tower
- Fatally injured by carbon monoxide exposure



Safety Issues

- Hot Work Safety
- Pre-Job Planning
- Confined Space Safety
- Combustible Materials of Construction



Hot Work Safety

- Heat gun could produce temperatures in excess of resin flash point and autoignition temperatures
- Use of ignition sources in the presence of flammable liquids is a practice prohibited by OSHA
- Blastco did not warn Evergreen or Rimcor of its use of the heat gun in the presence of the resin





Hot Work Safety

- Blastco did not recognize the ignition hazard presented by the heat gun
- Evergreen's internal policies and contractor orientation materials contained different definitions of hot work
- Staff proposes a recommendation each to Evergreen and Blastco



Pre-Job Planning

- Blastco had acceptable alternatives to using the heat gun to warm the resin inside the confined space
- When the Blastco workers obtained the heat gun, they first looked for drum heating bands but could not find them
- Temperatures during the day were in the mid-60s (degrees Fahrenheit)
- Blastco did not have standard operating procedures for addressing poor resin performance





Confined Space Safety

- Evergreen's policy required contractors to complete the confined space permit if entry is performed by contractors
- Blastco did not complete its confined space permit
- Blastco failed to terminate its confined space entry when the heat gun was introduced into the space
- Blastco failed to adequately prevent or control the introduction of ignition sources to its work in the upflow tower



Confined Space Safety

- Blastco waited to warn Evergreen and Rimcor until Blastco employees were safely evacuated
- OSHA requires the confined space permit to contain emergency services contact information
- Evergreen's permit listed the emergency phone number
- When the fire ignited, Blastco did not call the emergency number
- Instead called Evergreen contact, who called control room, who called the safety office, who summoned the ERT



Confined Space Safety

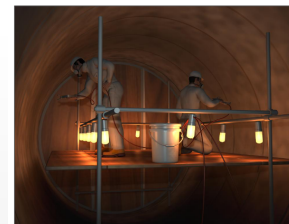
- In 2010, the CSB identified gaps in OSHA's guidance to companies regarding flammables in confined spaces (Xcel Energy Incident)
- Gaps the CSB identified include guidance on:
 - The need to control all potential sources of ignition and to perform continuous atmospheric monitoring *at the location of work* when using flammables in PRCS
 - The importance of stationing emergency responders directly outside the PRCS when using flammables
- The CSB issued a recommendation to OSHA to provide such guidance, but the recommendation remains open
- Staff proposes a recommendation to Evergreen and proposes reiterating the remaining Xcel recommendation



U.S. CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD

INVESTIGATION REPORT

XCEL ENERGY HYDROELECTRIC PLANT
PENSTOCK FIRE
(Five Dead, Three Injured)



CABIN CREEK
GEORGETOWN,
COLORADO
OCTOBER 2, 2007

Key Issues:

- SAFE LIMITS FOR WORKING IN CONFINED SPACE FLAMMABLE ATMOSPHERES
- PRE-JOB SAFETY PLANNING OF HAZARDOUS MAINTENANCE WORK
- CONTRACTOR SELECTION AND OVERSIGHT
- EMERGENCY RESPONSE AND RESCUE

REPORT NO. 2008-01-L-CO
AUGUST 2010



Confined Space Safety

- The two towers were connected by the crossover and were not isolated – single space
- OSHA requires companies to coordinate simultaneous entry into a shared confined space
- NFPA recommends Owner/Operator to ensure coordination
- Blastco and Rimcor did not coordinate entry operations
- Evergreen did not ensure coordination



Confined Space Safety

- AICHE offers some guidance on Simultaneous Operations, or SIMOPs:
 - Identify SIMOPs
 - Collect information
 - Identify interactions
 - Identify consequences
 - Identify existing safeguards
 - Identify and implement missing risk controls
- Evergreen had no SIMOPs program
- Staff proposes two recommendations each to Evergreen and OSHA



Combustible Materials of Construction

- FRP is combustible and will burn in the presence of a flame
- Upflow tower and crossover line constructed of FRP
- Evidence shows that inside surface of upflow tower burned
- This enabled the fire to rapidly spread to downflow tower





This Concludes the Staff Presentation