



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



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# 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

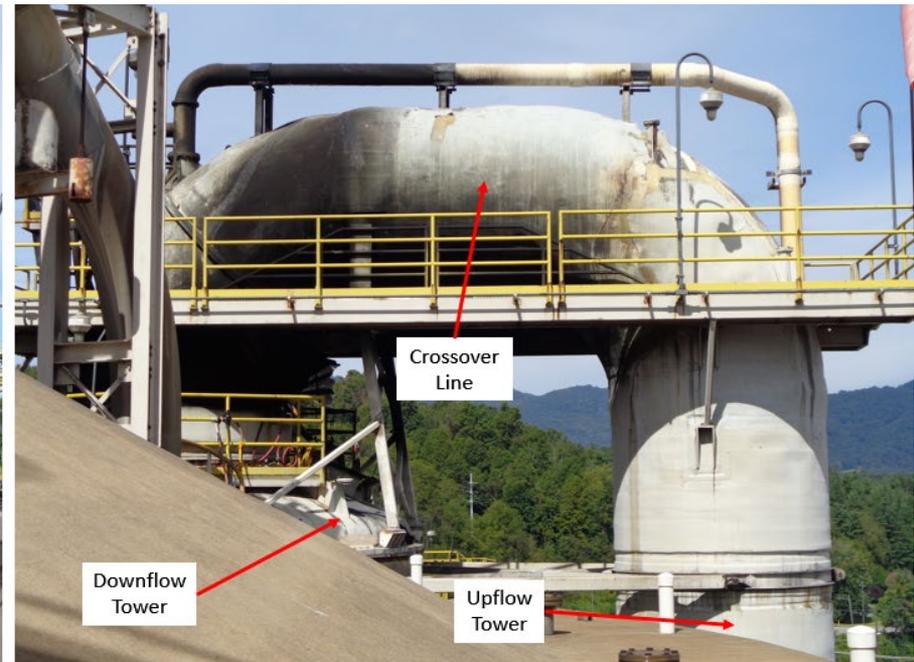
On Monday September 21, 2020, a fire occurred during a planned maintenance event at the Evergreen Packaging Mill in Canton, NC. The fire started in a process vessel in which one contract company was working and spread to a connected process vessel in which a second contract company was working. Two contractors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

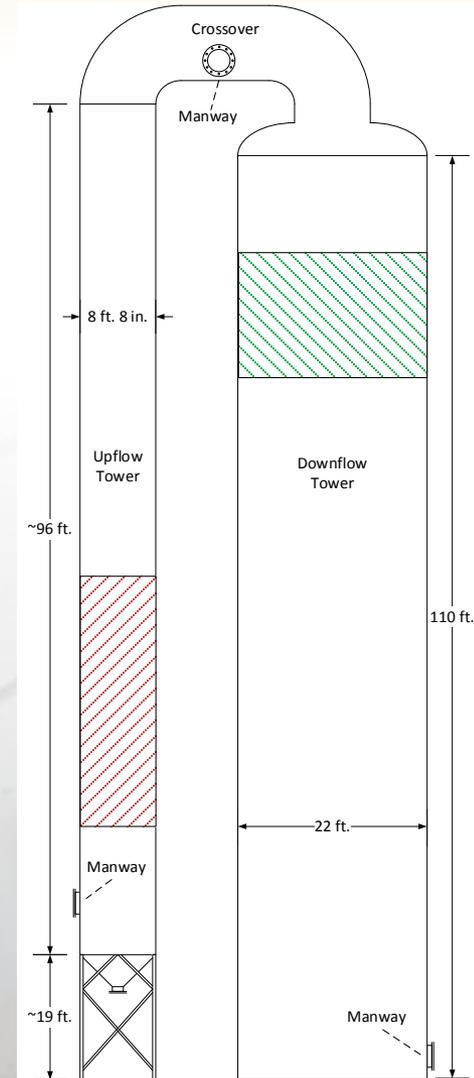
- Pulp bleaching process is corrosive by design
- The upflow tower, downflow tower, and crossover line were constructed of corrosion-resistant materials
- Periodic maintenance is required to the inside surface of the towers
- Evergreen was conducting a planned, facility-wide shutdown, called a “cold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





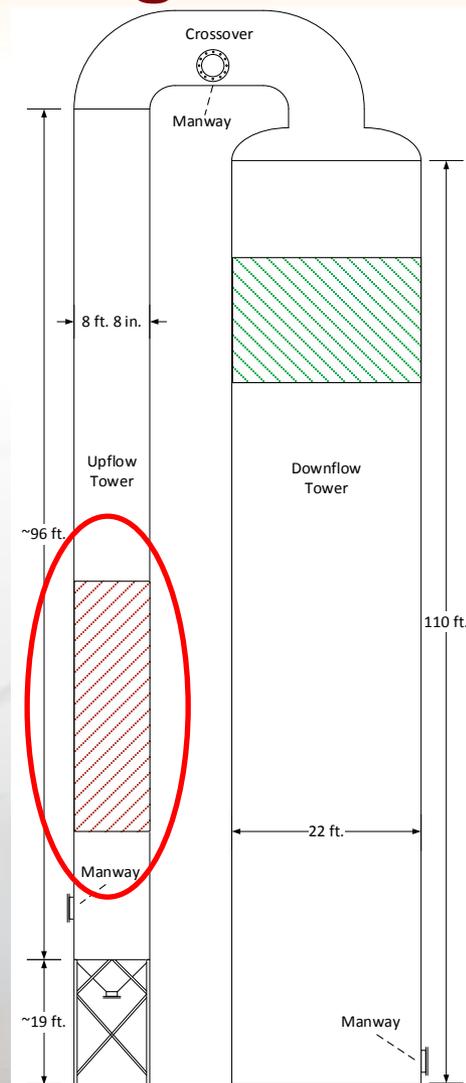
# Evergreen Packaging Background

- 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



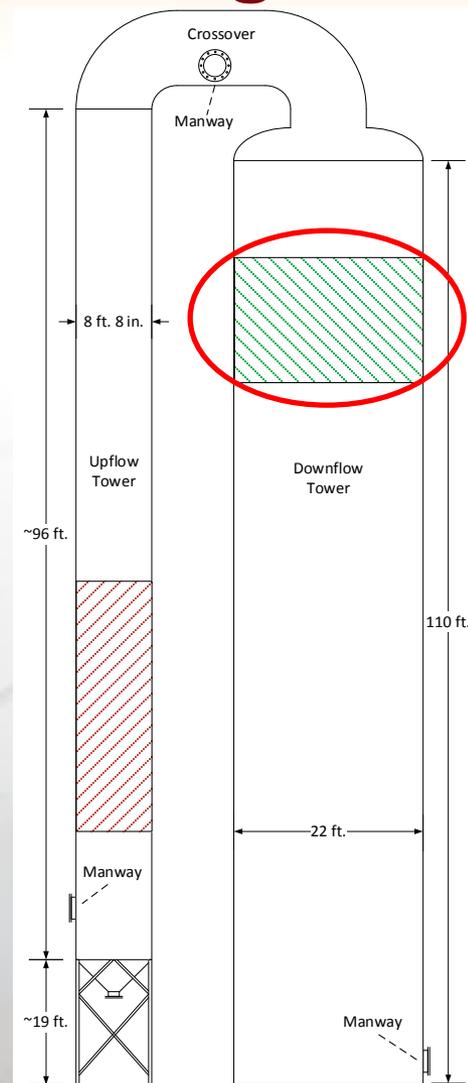


## Resin Characteristics

- 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



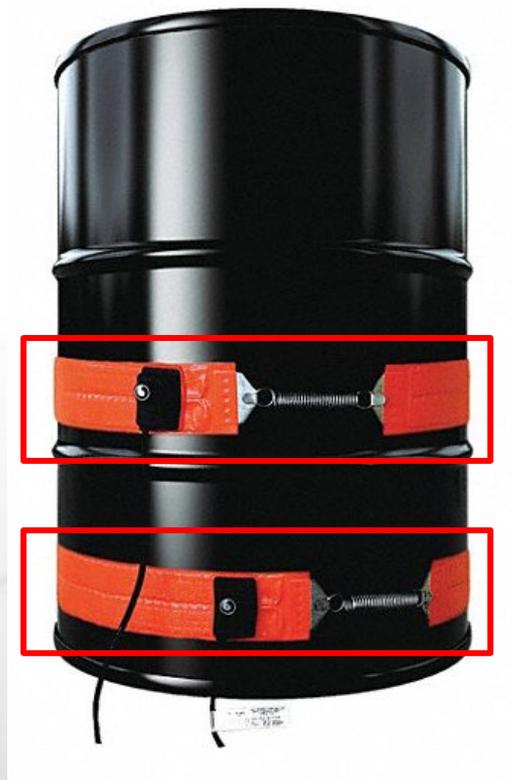


# Hot Work Safety

- 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**