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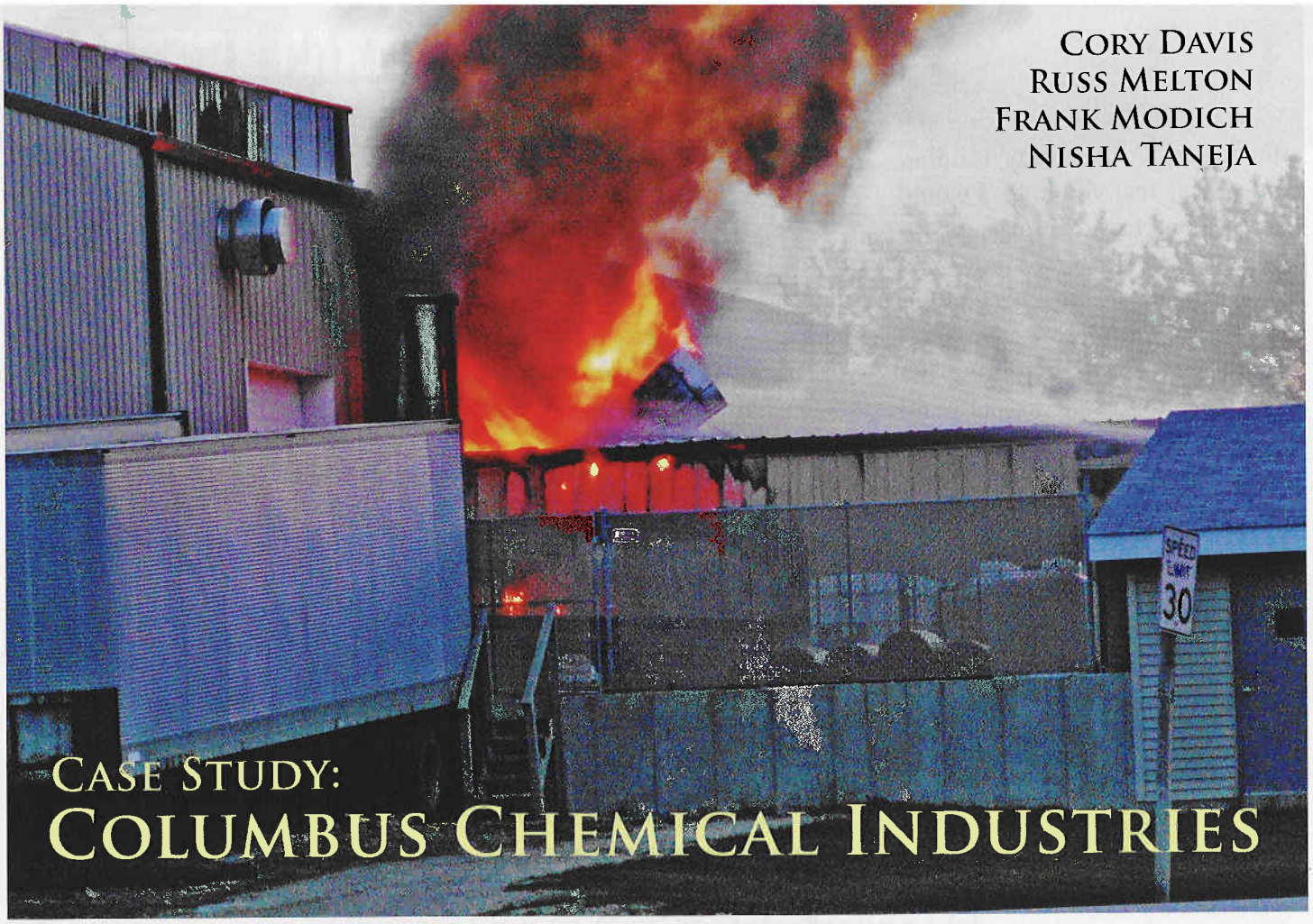

Case Study: Columbus Chemical Industries

Introduction

In May 2009, a fire and subsequent explosions destroyed one of Columbus, Wisconsin's premier companies, Columbus Chemical Industries, Inc. (CCI). CCI is a chemical blending and packaging facility. This article is a brief case study of the catastrophic incident, the mitigation of numerous chemical hazards, and the complicated issues faced by the company and origin and cause investigators. Yet, in spite of these many challenges, HAZWOPER-certified investigators successfully used sound investigative science to safely collapse the scene, identify the fire's origin, and return CCI to full production.

Background

Northeast of Madison, Wisconsin, along the Crawfish River, is the town of Columbus. Recently made famous by the movie "Public Enemies," Columbus is home to several historic landmarks, as well as one of the town's oldest and largest employers, CCI. In the 1960s, three brothers began selling laboratory chemicals from a printed catalogue. Their vision, the modern day CCI, now serves several diverse markets, including pharmaceutical, semi-conductor, electronic, high-performance battery, and educational and research. CCI provides high-purity acids and salts, analytical and production solutions/blends, and private-label packaging.

While expanding its business, CCI also kept pace in the safety and environmental arenas by prioritizing the health and safety of its employees and the surrounding community. Among its numerous safety initiatives, CCI provided Hazardous Communication and DOT hazardous material (HAZMAT) training to its employees. CCI was one of 41 Wisconsin companies nominated for the prestigious Business Friend of the Environment Award, honoring leadership in pollution prevention and environmental innovation and stewardship. CCI Executive Vice President, Steve Quandt, was named 2006 Distributor of the Year by the National Association of Chemical Distributors (NACD). This award was presented to Mr. Quandt in recognition of his successful "raising the bar" of greater global use of the Responsible Distribution Process and increasing NACD's credibility with lawmakers, policy makers, and the general public.

Consistent with their vision, CCI contracted a local civil and environmental engineering firm in 2006 to develop a disaster recovery plan. The plan identified potential disasters, critical business functions, created lists of key individuals and responsibilities, procedures, hazardous chemical lists, and site drainage plans. However, the plan failed to account for the hidden obstacles of every chemical catastrophe, including handling the media and a potential facility take over by regulatory agencies, which may halt production for months. Essentially, the plan prepared CCI to manage itself internally; however, it did not prepare CCI for handling an emergency response managed by outside parties.

Incident

On the evening of May 11, 2009, a heat sensor at CCI activated and resulted in an ADT call to local authorities. Several subsequent "911" calls also notified authorities a fire was raging at CCI. Within minutes, the volunteer fire department arrived at the scene. One firefighter knocked down a man-door and another laid down a suppression stream of water. Moments later, explosions, believed to be the result of chemical reactions between water and bulk sodium, rocked the facility. Three firefighters were knocked to the ground and transported for medical attention. As a result of the explosions, sodium ingots were spewed, spattering and crackling, on wet pavement. In an effort to neutralize the violent reactions, responders shoveled the particles and immersed them in oil-filled drums. Attempting to protect storm drains and the neighboring Crawfish River from runoff, the response crews quickly converted roadside ditches into emergency dikes and ponds.

Explosions injuring three firefighters and presence of hazardous chemicals hampered the initial attempts of fire suppression. Eventually over one hundred first responders, numerous state and county agencies and HAZMAT teams were involved before the catastrophe was contained.

Eleven fire departments responded to the fire. Additionally, the Dodge County and Columbia County Sheriffs Departments, Wisconsin National Guard Civil Support Team, Wisconsin Emergency Management, Wisconsin Department of Natural Resources, Environmental Protection Agency and Dodge County and Madison HAZMAT teams responded. At its climax, over one hundred first responders were on-site fighting the fire before officials allowed the fire to consume the facility and numerous hazardous chemicals.

As the fire raged and receded, the EPA monitored air quality and HAZMAT teams prepared for entry into the "hot spots[1]." Eight air quality monitors showed no signs of hazardous contaminants and readings did not exceed federal air standards. According to the Dodge County Office of Emergency Management, rains extinguished remaining "hot spots." The EPA conducted one last round of air testing, and Dodge County officials concluded the catastrophe was over. Regulatory officials released the scene to CCI.

Once in possession of the scene, CCI retained two local contractors for HAZMAT response, environmental remediation, and continued monitoring. However, within hours of the scene transfer and the haphazard entry and remediation by contractors, inquiries from OSHA, EPA and Wisconsin DNR laid the groundwork for possible regulatory sanctions. Officials were concerned with the safety of contractors, employees and residents; the lack of site security; the acidic runoff (pH of 0) in containment ponds adjacent to a major highway; and the resurgence of fumes by unknown chemicals. To complicate matters further, there were health and environmental concerns regarding asbestos, formaldehyde, and vast and unknown quantities of some of the most dangerous chemicals known to mankind, including heavy metals, concentrated acids and bases, cyanides, and hydrogen fluoride. Additionally, the containment ponds held highly acidic and chemically contaminated runoff.

Origin and Cause Investigation

As local contractors pushed forward, the level of regulatory scrutiny increased. Simultaneously, CCI's environmental and property insurers organized separate investigations to determine the origin and cause of the fire. To coordinate their investigation, CCI's environmental insurer retained the Meagher & Geer catastrophic loss team, including a degreed biochemist attorney; chemical engineer attorneys; electrical engineer, Mark Svare; and certified fire investigator, Jack Malooly. Likewise, CCI's property and business interruption insurer retained a team.

With the investigation about to begin, "hot spots" flared and the many chemical hazards posed serious safety concerns for the remediation contractors, CCI employees, origin and cause investigators, residents, and the random passer-by. CCI was faced with the complete site takeover by governmental agencies, which would ultimately disrupt the origin and cause investigations and prevent a re-

turn to business. To assist the local contractors with emergency response, monitoring, remediation, waste disposal, and health and safety concerns, as well as coordinate with involved regulatory agencies, CCI retained the Center for Toxicology and Environmental Health, LLC (CTEH) and the Environmental Quality Company (EQ).

The CCI site was clearly a HAZMAT scene as defined by OSHA in 29 CFR 1910.120, and the statute explicitly requires special training for all personnel entering the HAZMAT scene. CTEH alleviated regulatory agency concerns by conducting comprehensive air monitoring, testing, and sampling for reliable scientific data. They also coordinated with OSHA officials to establish safety protocols and guidelines, to determine the required training and proper personal protective equipment (PPE) for entry, and to discuss safe entry/exit for the established exclusionary zone. Furthermore, EQ provided the proper PPE, training, equipment, and supervision for safe entry/exit by contractors and investigators. Immediately, perimeter security fencing was installed, asbestos and formaldehyde awareness training was conducted, an asbestos site waiver was obtained for removal of disposable waste, and the 100,000 gallons of contaminated runoff was collected in fractionation tanks, chemically neutralized, and authorized by EPA officials for disposal at a local publicly-owned treatment works facility.

Because many chemical hazards posed serious safety concerns, a sound scientific plan was established to process and investigate the scene in a safe and methodical manner.

With CTEH and EQ overseeing contractor, employee and investigator safety, the origin and cause investigations moved in separate directions. However, almost immediately, some investigators faced a perilous situation wherein large concentrated pools of acids migrated between buildings and interfaced with the thin metal base plates of shelving containing approximately twenty cans of potassium cyanide. It was feared the shelving would deteriorate, collapse, and result in a chemical reaction producing vapor clouds of hydrogen cyanide [2]. It became readily apparent that the safest and most efficient manner to conduct the origin and cause investigation was to unify under a central command structure.

Thus, utilizing a scheme similar to the National Incident Management System, the unified command consisted of two section chiefs (one from each investigative entity) to collaborate and coordinate the joint investigation. The fire and engineering experts investigating the origin and cause were were supported and led by the section chiefs. DuPont chemists [3] , HAZMAT personnel for monitoring, decontamination and a rapid insertion team, and structural engineer, Doug Fell, assisted with the safety of the investigators. The new unified command team quickly identified potentially responsible parties (PRPs), scheduled an all-party investigation, and sent notice letters advising PRPs of the hazardous waste operations and emergency response (HAZWOPER [4]) requirements for safe entry into the exclusionary zone. The HAZWOPER standard was used at this site to ensure the safety of the investigators who, when entering the site, were continuously at risk of hazardous chemical exposure.

Eighteen experts attended the investigation, yet, only three had the requisite certifications to enter a HAZWOPER site. Even though denying access delayed the origin and cause investigation, investigator safety was paramount. Therefore, the unified command denied the entry of untrained experts. There was a consensus, however, that HAZWOPER-certified experts would enter the exclusion zone, photo document areas of interest, and return to share the photographs with the parties who were not properly trained to make entry. Furthermore, the investigation was rescheduled to allow the parties to retain HAZWOPER-certified experts.

In reconvening, a sound scientific plan was established to process and investigate the scene in a safe and methodical manner. Additionally, attending experts agreed to communicate, cooperate, and share photographs and data collected from the scene. Utilizing CTEH and EQ staff, investigators, moving inward from the perimeter, examined and processed areas to eliminate them as the origin of the fire and ultimately collapse the scene. As the scene was processed and collapsed, EQ and CTEH mitigated chemical hazards and "hot spots" and assisted CCI employees in retrieving and decontaminating undamaged product from areas saturated with hydrochloric and hydrofluoric acid. Furthermore, to accommodate regulatory officials, EQ demolished, decontaminated, and disposed of waste in areas cleared by investigators.

Notably, many of these "hot spots" erupted in severe chemical reactions during the investigation. Instances included:

(1) reactions between broken bottles of ammonium hydroxide and sodium chloride;
(2) violent reactions between peroxides and organics;
(3) vast pools of hydrochloric and hydrofluoric acid migrating throughout the facility;
(4) drums exploding and venting a red nitric acid mists; and
(5) tank releases of hydrobromic acid.

Throughout the process, DuPont chemists counseled EQ staff in neutralizing these many chemical hazards.

As the investigation progressed, investigators relied on arc mapping to safely collapse the scene and investigate the origin and cause of the fire. Arc mapping, also known as arc fault circuit analysis, assists investigators in reconstructing a fire scene by using the facility's electrical system to determine the fire's origin [5]. Investigators rely upon eyewitness accounts of electrical equipment operation, methodical examination of electrical distribution equipment, examination and identification of electrical arc residue (in the form of beads), and other electrical data to determine the origin of the fire. However, chemical contamination of the electrical conduit, conductors, and other electrical equipment within the facility was a serious concern for investigators. Consequently, after investigators identified and photographed the electrical evidence of interest, EQ employees removed and decontaminated/neutralized the artifacts in large baths of a sodium hydroxide and calcium chloride solution that was prepared under the direction of DuPont chemists. The investigators then placed the artifacts on large poly sheets for examination. Based on the gathered information and data, investigators were able to narrow the area of origin to a small portion of the facility.

Conclusion

By May 28, 2009, a mere seventeen days following the catastrophic fire at CCI, the origin and cause investigation was complete, and the company was provided full access to their facility. According to Executive Vice President Steve Quandt, CCI established a monthly record for shipments in the month of June and was on track to meet their 2009 business expectations. Thus, this case study is a testament to how certified, qualified, and competent investigators, working together, can rapidly, yet safely, utilize sound investigative science in collapsing a scene, identifying an area of origin, and returning a desperate company to full production while protecting and subsequently regaining the respect of a community. ●

FOOTNOTES:

[1] *Hot spots* refers to areas where chemical reactions that could cause additional explosions were thought to be occurring.

[2] According to the Material Safety Data Sheet, Hydrogen Cyanide is highly poisonous.

[3] Two chemists from E.I. du Pont de Nemours and Company (DuPont) provided guidance regarding the proper handling of chemicals and artifact decontamination.

[4] As defined by OSHA in 29 C.F.R. 1910.120.

[5] Essentially, when fire impinges on an electrical line, it melts the wire insulation and causes a fault at the first point the fire reaches on the electrical line. Thus, one can begin to exclude areas as the origin and move towards the area of origin.

ABOUT THE AUTHORS

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A large portion of Cory's focus has been on community exposures and public health. He has worked with occupational health and safety issues related to chemical exposure, aerosol/dust exposure, asbestos exposure, industrial ventilation, and indoor air quality for the transportation, mining, oil refining, and chemical manufacturing industries. Cory received a Bachelor of Science in Environmental Health Sciences from the University of Arkansas, Little Rock. Cory has nine years experience working on hundreds of projects involving the release or threat of release of hazardous materials.

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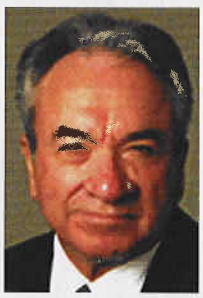
With an extensive chemical and biological background, Frank focuses his legal practice on complex civil litigation, products liability and catastrophic losses, involving pharmaceuticals, fires, explosions and chemical releases. Prior to his practice of law, he gained valuable environmental experience in the mining industry with responsibilities in permitting and site sampling. In addition, his previous biochemical-based work in a cerebral vascular laboratory provide an excellent base for his assignments in the firm's Catastrophic Loss practice group.

Presently, much of Frank's practice involves offering in-depth defense and subrogation services to clients facing catastrophic losses within hotels/casinos, manufacturing, power generation and distribution, chemical processing facilities, pharmaceutical plants, mining operations, refineries and hazardous waste facilities.



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Russ Melton is schooled in Nuclear Engineering, Metallurgical Engineering, and Human Factors Engineering. Russ has held positions within industry as design engineer, production engineer, and complex risk manager. He has served as an adjunct professor teaching product safety, as well as serving as adjunct faculty at the Federal Law Enforcement Training Center teaching advanced fire and arson investigation. Russ has led Catastrophic Loss Groups for the past 18 years, and is currently at Meagher & Geer, where he heads a team of engineers and scientists/attorneys. He has presented more than 200 lectures, both nationally and internationally, on spoliation of evidence, gas migration dispersion and ignition, vapor release, and incident command, and authored such publications as the Employee Right to Know Act (RTK)–Chemical Hazards, Vibration Analysis for Blasting Activities and NFPA 921, Fire & Explosion Investigations: Study Guide Chapter 18, Explosions. He is certified in Fuel Gas (Propane). Russ is also certified as a 29CFR1910.120(q) Hazardous Materials Technician (Proboard) and FEMA ICS 100, 200, 300, 700 and 800 for emergency management operations. He is a Certified Proboard Safety Officer and Certified Proboard Branch Officer.

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With a chemical engineering degree and industry experience in the process instrumentation and control systems area, Nisha focuses her legal practice on catastrophic loss and recovery, products liability, and mass/toxic torts. Much of Nisha's practice involves offering defense and subrogation services to clients facing losses within the chemical manufacturing and processing industries.