# RESEARCH INTO CHEMICAL SPILL RESPONSE PROTOCOL AT HUTCHINSON TECHNOLOGY INCORPORATED IN EAU CLAIRE, WISCONSIN

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# ABSTRACT

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**Research into Chemical Spill Response Protocol at Hutchinson Technology Incorporated in Eau Claire Wisconsin**

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Hutchinson Technology, Inc. (HTI) is the worldwide leader in the manufacture of suspension assemblies for computer disk drives. In the manufacture of suspension assemblies, a variety of chemicals are either used or created. HTI's facility in Eau Claire, Wisconsin, utilizes an Emergency Management System (EMS) team of employees to respond to a multitude of emergencies. One portion of that team is the Chemical Release Response Team (CRRT). CRRT members respond to chemical spills and releases that cannot be safely cleaned up by area personnel.

The objectives of this study were to compare/contrast current training requirements with federal regulatory requirements, identify basic knowledge-related competencies of individuals who are members of the CRRT, and identify HTI specific information about the chemicals in use and their spill potential and severity.

Regulations from the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) that require emergency response plans were examined. The majority of the research focused on OSHA's Hazardous Waste

Operations and Emergency Response (HAZWOPER) standard. This standard outlines initial and refresher training requirements for workers depending upon what position they hold in the chemical spill clean-up operation. It also requires the use of an Incident Command System for organization of the emergency response. Current training requirements for members of the CRRT were compared to the regulatory requirements.

There are ten chemicals that have the largest potential for response by the CRRT. These chemicals include chlorine, hydrogen fluoride, nitrogen trifluoride, hydrogen cyanide, nitric acid, hydrochloric acid, sulfuric acid, sodium hydroxide, cupric chloride, and ferric chloride. Each of these ten chemicals was discussed to identify the process they were used in and the hazards associated with their use. They then were analyzed to determine their greatest spill potential and the severity of that, or other, spill situations.

Recommendations were made to HTI-Eau Claire on how they could improve upon their current chemical release protocol. These recommendations include items such as performing drills with and without EMS personnel, implementing short informational training sessions on a periodic basis, and developing short written procedures for chemical spill response.

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# CHAPTER I

# Research Problem and Objectives

## Introduction

It seems as though chemicals have become commonplace in today's society. They are used at home, school, and work with generally great success. However, this success can be threatened when an upset condition occurs. What was a quite normal day may quickly turn into a chaotic, frightening, even tragic event. Given the hazardous nature of chemicals, it is conceivable that all users need to be well prepared for the every day use of chemicals, but also need to be well prepared for those rare, unplanned events that could possibly lead to a wide array of problems.

Hutchinson Technology, Incorporated (HTI) is one of those companies in industry that uses a multitude of chemicals on a daily basis in their manufacturing processes with reasonable success. HTI is the worldwide leader in the manufacture of suspension assemblies for computer disk drives. "Suspension assemblies are very precise metal springs that hold the read/write heads at microscopic distances from the disks in the disk drives" (HTI, 1999a). The suspension assembly is a critical component to the successful operation of the drive. HTI is based in Hutchinson, Minnesota and has four manufacturing facilities in Minnesota, South Dakota, and Wisconsin. This study will focus only on the manufacturing facility in Eau Claire, Wisconsin. The Eau Claire manufacturing facility has Assembly, PhotoEtch, and Trace Operations.

In the manufacture of suspension assemblies, a variety of chemicals are either used or created as by-products of the process. More specifically, these chemicals include nitric acid, sulfuric acid, chlorine, hydrogen cyanide, ferric chloride, cupric chloride, sodium hydroxide, hydrogen fluoride, nitrogen trifluoride, and hydrochloric acid. These chemicals are used frequently according to strict procedures on process specifics, storage, transfer, and personal protection. Given the hazardous nature of the previously mentioned chemicals and rare instances when an unplanned chemical emergency occurs, it would appear preferable that persons working with or near chemicals be prepared to handle the situation effectively to minimize losses to people, processes, product, and equipment.

Hutchinson Technology's manufacturing facility in Eau Claire utilizes an Emergency Management Services (EMS) Team. This volunteer group of employees' mission is to "provide immediate response and assistance for in-plant emergencies while enhancing the professionalism, control, communication, and decision-making process within the Eau Claire facility" (HTI, 1999b). They respond to events associated with medical, fire, severe weather, natural disaster, bomb threat, and chemical release/spill emergencies. There are two sub-teams to the larger EMS Team, one for responding to chemical emergencies and one for responding to the other emergencies. These team members have training specific to their area of expertise. The Chemical Release Response Team will be the focus of this research.

The approximately 24 members of the Chemical Release Response Team come from mainly three departments within the facility: Component Production Maintenance, Facilities/Water Systems, and Chemical Services. These members are spread across the various shifts worked at HTI so that there will always be at least a few members of the Chemical Release Response Team on duty at all times during facility operation.

Chemical release response training and procedure development has taken place on a limited basis, but there are some questions about its validity and effectiveness. Thus, it appears likely that current chemical spill response protocol place Chemical Release Response Team members at risk of injury in the event of an unplanned chemical spill/release.

## Purpose of the Study

The purpose of this study is to evaluate the current chemical spill response protocol in place at Hutchinson Technology in Eau Claire, Wisconsin.

## Goals/Objectives of the Study

The objectives of this study are to:

1. Compare/contrast current training requirements, for those employees who are members of the Chemical Release Response Team, with regulatory requirements and/or accepted industrial practices.
2. Identify basic knowledge-related competencies of individuals who are members of, as well as leaders of, the Chemical Release Response Team.
3. Identify HTI and chemical manufacturer specific information with respect to the chemicals in this study.

## Background and Significance

Improper or inadequate chemical spill response can be very costly to employee safety and a company's bottom line. It would appear to be prudent to prepare all employees, both responding and non-responding, for chemical spill response. As with any operating procedure, it would appear preferable that chemical spill procedures be developed, trained, practiced, and evaluated on a regular basis to most likely help ensure safe and effective chemical spill response in emergency situations.

Chemical spill response can go smoothly with proper training, procedures, equipment, and practice. But without those criteria being met, chemical spill response results can be devastating. For example, in one chemical spill accident at an undisclosed company, 10 persons were hospitalized due to contact with or inhalation of chemicals. The accident event chemically burned one individual and caused him to be hospitalized, while nine others were hospitalized due to inhalation of chemical vapors. Those nine others were responding to help the first victim (DOL, 1987). If proper procedures and equipment were used, it is likely that many less persons would have been hospitalized due to the chemical exposure associated with this incident. In yet another example, a hazardous waste recycling company received a chemical that it was not authorized or licensed to receive. The chemical caused a reaction that ruptured a 20,000-gallon storage tank. Of the nine employees responded to the incident, one employee failed to implement the necessary contingency plan and follow the company safety and health plan. The other eight responding employees were not given the proper personal protective equipment. As a result, all nine responding employees suffered chemical burns to their eyes and skin (DOL, 1990). Again, if proper procedures and equipment were used, it is probable that employee injuries would have been significantly reduced.

## Summary

Hutchinson Technology in Eau Claire, Wisconsin needs to identify inadequacies in their chemical spill response protocol that place Chemical Release Response Team members at risk in the event of an unplanned chemical spill/release. It is also necessary to provide the necessary training and proper procedures to employees to minimize this risk.  The applicable training requirements, member knowledge competencies, and specific chemical information will be reviewed in Chapter 2.

# CHAPTER 2

# Review of Literature

## Introduction

Emergency response plans are required by a number of federal, state, and local regulations. Given the legal, as well as, safety-based nature of these regulations, it appears to be prudent for companies to be aware of what regulations apply to their facilities and which do not. Some emergency response plans have similar components, but have enough differences so that all of their requirements must be taken into consideration when developing them (Borak, 1999). Both the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have regulations that require the development of an emergency response plan with a specific focus. Four from the EPA and three from OSHA will be reviewed to determine applicability to HTI-Eau Claire's chemical release response protocol.

### FWPCA – Federal Water Pollution Control Act

This regulation requires companies who store a significant amount of oils to develop a Spill Prevention Control and Countermeasures (SPCC) Plan. This type of a plan details what a facility is doing to prevent spills of oil and details how the facility would react to a spill of oil that would threaten navigable waters or natural resources (Borak, 1999). In light of the fact that this research does not focus on oil usage at HTI-Eau Claire, its' requirements will not be discussed any further.

CAAA – Clean Air Act Amendments

Under the CAAA, EPA's Risk Management Program (RMP) dictates the necessity of emergency response plans for facilities storing certain "regulated substances" in quantities greater than listed threshold quantities (Borak, 1999). The RMP requirements support those that are set forth in the EPA's Emergency Planning and Community Right to Know Act, which will be discussed shortly. The RMP builds on OSHA's Process Safety Management standard and contains many of the same requirements as OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, both of which also will be discussed later in this chapter. The key difference between RMP and HAZWOPER is that while RMP focuses on the safety and health of the community, HAZWOPER focuses on the safety and health of workers.

RCRA – Resource Conservation and Recovery Act

RCRA defines "cradle to grave" management and disposal of hazardous waste. Emergency response plan requirements differ depending on whether the facility is considered a small-quantity or large-quantity generator of hazardous waste (Borak, 1999). This research does not focus on hazardous waste handling at HTI-Eau Claire, so this regulation will not be discussed any further.

EPCRA – Emergency Planning and Community Right to Know Act

EPCRA is part of the Superfund Amendments Re-Authorization Act (SARA Title III). Superfund, formally known as the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) was established in 1980 to aid in the cleanup of hazardous waste sites. EPCRA was passed by Congress in 1986 after the 1984 disaster at the Union Carbide facility in Bhopal, India. This disaster involved the release of a large amount of methyl isocyanate, which quickly killed over a thousand people and permanently sickened thousands more. This regulation requires facilities to submit Tier I or II chemical inventory report forms to their State Emergency Response Commission, Local Emergency Planning Committee, and local fire department. Along with this report, they must also submit MSDS's for chemicals housed and used on-site (Chemspill.org, 2000).

OSHA Regulations

1910.38 – Employee Emergency and Fire Prevention Plans

This standard applies to all facilities required by other OSHA standards to have some minimum type of emergency action plan. The required emergency action plan must be in writing and must include those actions necessary to be taken by employees and employers to protect employees from fire and other emergencies. At a minimum, the plan must include information on emergency escape procedures and routes, procedures for those employees who must remain behind in an emergency to operate equipment, procedures to account for all employees after the evacuation is complete, rescue and medical duties, means of reporting emergencies, and personnel responsible for plan information and updating. Training must be given to employees on the plan at various intervals: before plan implementation, when responsibilities change, or when the plan changes (DOL, 1980). This research does not focus on Fire Prevention Plans as required by this standard, so that particular component of this standard will not be discussed.

1910.119 – Process Safety Management

This regulation was authorized through EPA's Clean Air Act Amendments and utilizes a list similar to the EPA's list of chemicals considered to be 'highly hazardous substances'. Any facility that stores 'highly hazardous substances' (HHS) in quantities greater than the threshold quantities listed within the standard, or has a process which involves a flammable liquid or gas on site in one location in a quantity of 10,000 pounds or more (with a couple of exceptions), are required to comply with this standard, as well as, 29CFR1910.38 (Employee Emergency and Fire Prevention Plans) and 29CFR1910.200 (Hazardous Waste Operations and Emergency Response). This standard involves a number of requirements specific to the process of the HHS, such as process design, process hazard analysis, operating procedures, employer/employee/contractor responsibilities, process safety training, incident reporting and debriefing, and emergency planning and response (DOL, 1996a).

The requirements of this standard were developed to cover catastrophic releases of highly hazardous substances, but they do not address the specific procedures for responding to such releases. The emergency response procedures for responding to such emergencies would be covered under the Hazardous Waste Operations and Emergency Response (HAZWOPER) standard (DOL, 1998). The requirements of the HAZWOPER standard will be discussed shortly.

HTI-Eau Claire houses chlorine on-site in a quantity of 8 tons. This is greater than the threshold quantity for chlorine of 1500 pounds as listed in Appendix A of this standard and, thus, the chlorine process would be covered under this standard. At this time, the process that utilizes chlorine is shut down and, therefore, no chlorine is present on-site at the facility.

1910.120 – Hazardous Waste Operations and Emergency Response (HAZWOPER)

This regulation was developed at the same time as EPA's EPCRA because Congress recognized that workers at Superfund hazardous waste cleanup sites were being exposed to some of the most toxic workplace environments around (Shriver, 2000). OSHA was asked to develop a health and safety standard to protect those hazardous waste site cleanup personnel and it eventually became final in 1990. This regulation applies to facilities that have employees who respond to emergency spills or releases of hazardous chemicals unless the employer can demonstrate that the operation does not involve employee exposure or the reasonable possibility for employee exposure to safety and/or health hazards (DOL, 1996b).

Potential releases of hazardous substances in the workplace can be categorized into three distinct groups according to HAZWOPER; releases that are clearly incidental regardless of the circumstances, releases that may be incidental or may require an emergency response depending on the circumstances, and releases that clearly require an emergency response regardless of the circumstances. The scope of HAZWOPER does not cover the release of a hazardous substance that is limited in quantity and poses no emergency or significant threat to the health and safety of employees in the immediate vicinity. This type of release is termed "incidental" and the response to this type of release would fall under the training requirements of the Hazard Communication standard, which will be discussed shortly. The second type of release may or may not be covered under HAZWOPER depending on the circumstances of that specific release. Factors such as the properties of the hazardous substance (toxicity, flammability, corrosiveness), as well as the circumstances of the specific situation (ventilation, quantity, location, procedures developed, PPE on hand) have to be considered when determining what employees (trained to a given level) can handle while protecting themselves from safety and health hazards. The third type of release involves hazardous substances whose release poses a significant threat to the health and safety of employees and, in and of themselves, requires an emergency response regardless of the circumstances surrounding the release or any other factors (DOL, 1998). Personnel to be protected by this standard include employees involved in operations at hazardous waste sites being cleaned up under government mandate, those who work at hazardous waste treatment, storage, and disposal facilities, and personnel responding to emergency chemical spill/releases regardless of their location (Shriver, 2000). This last group of workers is the one this research will focus on and, therefore, only the applicable parts of this standard will be discussed.

The HAZWOPER standard (DOL, 1996b) requires the development and implementation of an emergency response plan prior to beginning emergency response operations. The plan must include items such as pre-emergency planning and coordination with outside agencies, personnel roles, evacuation routes and procedures, emergency alerting and response procedures, emergency medical treatment, decontamination, and post emergency critique and follow-up. HAZWOPER also requires the use of an incident-command system. The on-scene incident commander assumes control of the emergency, no matter how large or small, and directs other personnel on how to proceed with mitigation of the emergency. This person is the most senior, from a responsibility standpoint, person responding to the emergency. This ensures that there will be only one individual through whom all decisions and directions pass, and that all of the communications for the emergency flow through one central point. It would appear likely that this could minimize the confusion of the emergency response and maximize the safety of the participants. There are five levels of command outlined in the standard; first responder awareness level, first responder operations level, hazardous material technician, hazardous material specialist, and on-scene incident commander. The following paragraphs will outline the duties of each category of responder as stated in the standard (DOL, 1996b).

First responder awareness level workers are those who typically discover the spill and need to notify the appropriate personnel. The standard states that they must be able to recognize what hazardous substances are, the risks associated with them, the need for additional resources, and make appropriate notifications to the communications center. First responder operations level workers are those who are trained on how to protect themselves and others by containing and/or controlling the spill from a safe distance. They are trained to respond in a defensive manner without trying to stop the spill/release. Their responsibility is to act from a safe distance to stop the spill from spreading and minimize employee exposures. The standard requires them to be trained in areas such as PPE selection, basic hazardous material control/containment/confinement, fundamental decontamination procedures, and basic standard operating procedures.

Hazardous material technician level workers respond to a spill with the training on how to stop the spill. According to the standard, these workers approach the source of the spill and “plug, patch or otherwise stop the release of a hazardous substance”. The standard requires them to be trained in areas such as emergency response plan implementation, field instrumentation use, incident command system roles/functions, chemical PPE selection and use, containment/confinement of spills, decontamination, and basic chemistry skills. Hazardous material specialist level workers are similar to technician level workers, except they have a more detailed knowledge of a specific chemical and of the best methods to control a spill of that substance (DOL, 1996b).

An on-scene incident commander level individual would be considered the leader of the emergency response process. They have training on how to direct the spill cleanup operation and other response personnel. They must be trained more globally in emergency response plan (site, local, state, Federal) implementation and Incident Command System organization and use (DOL, 1996b).

1910.1200 – Hazard Communication

The development of this standard began in OSHA's early years (1974) and went through many revisions until a final rule was passed in 1983. The Hazard Communication standard was developed to inform employees about the hazards of the chemicals they work with and how to protect themselves against those hazards. This dissemination of chemical hazard information is accomplished through chemical container labeling, distribution of chemical material safety data sheets by the chemical manufacturers and importers to the organization purchasing the chemical(s), and employee training. As described above in the explanation of the HAZWOPER standard, HAZWOPER covers training for employees who respond to spills of hazardous substances where employee health and safety could be compromised. The Hazard Communication standard covers training for employees who will clean up "incidental" spills of chemicals. HAZWOPER does not cover spills that do not have the potential for becoming an emergency (DOL, 1994).

The Hazard Communication standard does not require a facility to develop emergency procedures although this standard does require employers to train their employees in emergency procedures if they have been developed. For example, in facilities where there is a potential for emergencies arising out of chemical spills, the employer's Hazard Communication training program must cover the HAZWOPER emergency response plan (DOL, 1998).

Other OSHA Regulations

Standards on Confined Space Entry, Blood Borne Pathogens, and Fire Brigades also contain information relating to the development and implementation of emergency response plans. Due to the breadth of information contained in these standards and the narrow scope of this study, their requirements will not be discussed.

Other Agencies

There are several other Federal agencies that require the development and implementation of emergency response plans. The National Fire Protection Association (NFPA), Department of Transportation (DOT), National Response Team (NRT), and United States Coast Guard (USCG) all have specific emergency response plan guidelines. These requirements do not directly affect HTI-EC and consequently will not be discussed.

## Chemical Release Response Team Member Competencies

Members of the Chemical Release Response Team come from mainly three departments at HTI-Eau Claire. These departments include Component Maintenance, Water Systems, and Chemical Services. The following paragraphs outline the job specific training personnel receive in each department. The training that they received as a member of the CRRT will be discussed in chapter 4.

Component Maintenance

Component Maintenance technicians install and service the manufacturing equipment used in the Photo Etch and Trace processes. Technicians in this department all have, at minimum, an Associate Degree in areas such as fluid power, electronics, electro mechanical technician, etc. When first hired, they spend a number of months working with a first shift crew dedicated to project work. They will 'shadow' experienced technicians and help them with maintenance of the equipment. During this time they are not only trained on how to maintain the equipment but also are trained in the hazards of the equipment and the chemicals contained within them. They are instructed on how to protect themselves from those hazards. They are transferred out of the project work crew when they are needed to fill an opening on one of the alternating work schedule (AWS) crews. The role of the Component Maintenance Technician on the CRRT will be discussed further in Chapter 4.

Water Systems

Water System Technicians control the processes of water treatment and manufacture of deionized and reverse osmosis water. Technicians in this department may have Associate Degrees in areas such as fluid power, electro mechanical technician, wastewater technician, etc. They also may come from the Chemical Services department, which will be discussed next, and have a chemical background. When first hired, they spend a fair amount of time working with an experienced technician. During this time they learn not only how to operate the wastewater treatment equipment, but learn the hazards associated with that equipment and the chemicals contained within them. They are also instructed by the senior technician how to protect themselves from those hazards. A new requirement that just has been instituted by HTI-Corporate is that all Wastewater Technicians acquire a Wastewater Certification from the Minnesota Pollution Control Agency. This training gives technicians a better understanding of the chemistries involved in the wastewater treatment process. The role of the Water Systems Technician on the CRRT will be discussed further in Chapter 4.

Chemical Services

Chemical Services Coordinators transfer, store, distribute, label, and ship chemicals at HTI-Eau Claire. They also aid Component Maintenance personnel, discussed earlier, in cleaning out production process equipment. There is one Chemical Services Coordinator per shift for a total of four. The Chemical Services area was set up when the Components (Photo Etch and Trace) production facility became operational in Eau Claire. One of the requirements for Chemical Services applicants is that they have at least two years "chemical handling" experience. This can range from taking many Chemistry classes in school, to working in a chemical laboratory, to working in another manufacturing field with chemicals. The four initial Chemical Services Coordinators went to the HTI-Hutchinson site in Hutchinson, Minnesota for two weeks of on-the-job training. While there, they "shadowed" an experienced Chemical Services Coordinator and learned a variety of information. As time progresses, they gain more knowledge of the chemicals by consistently working with them and the production process and personnel. They also attend regular Safety training on a variety of subjects, DOT Hazardous Material training, Basic Chemistry, and OSHA HAZWOPER training. In the future, when additional Chemical Services Coordinators are needed, they will be trained at the Eau Claire site by “shadowing” experienced personnel there.

To aid in the performance of everyday job duties, there is a database that is accessible online by any of the Chemical Services personnel. This database contains a myriad of work instructions on how to perform specific tasks. This helps to ensure proper and consistent performance of tasks by all Chemical Services personnel. These work instructions are directly tied to the training checklist that is used for training all new Chemical Services Coordinators. The role of the Chemical Services Coordinator on the CRRT will be discussed further in Chapter 4.

## HTI and Chemical Specific Information

The following will discuss how each chemical is used in various manufacturing processes at HTI-Eau Claire. The descriptions of specific chemical use in the given process will be simplified so as to protect any process confidentiality. Each section will also give some chemical manufacturer specific information on the hazards associated with the specific chemical. More process specifics, including probable spill/release scenarios and employee exposure potential, will be discussed in Chapter 4.

### Nitric Acid

Nitric acid ($HNO_3$) is used as part of the cleaning process of the suspension assemblies during the assembly process. Nitric acid is a colorless to yellow liquid with a pungent odor. It is very corrosive to the eyes, skin, and respiratory tract (NIOSH, 1993a).

### Sulfuric Acid

Sulfuric acid ($H_2SO_4$) is used as part of the cleaning process of the suspension assemblies during the plating process. Sulfuric acid is a colorless liquid with no odor. It is very corrosive to the eyes, skin, and respiratory tract. Short-term exposure to sulfuric acid can cause severe burns, while long-term exposure may lead to tooth erosion and lung problems (NIOSH, 1993c).

Chlorine

Chlorine ($Cl_2$) is used in the Photo Etch process. The Photo Etch process is currently shutdown and, therefore, no chlorine is presently on-site. Chlorine in the gaseous form is a greenish-yellow gas with a pungent and irritating odor. Short-term inhalation exposure can cause shortness of breath, coughing, nausea, and sensation of tightness in the chest. The nose and throat can experience a stinging and burning sensation. Immediate fatalities can occur as a result of suffocation while delayed fatalities can occur as a result of pulmonary edema (fluid in the lungs). Chronic repeated exposures to chlorine gas can result in a loss of ability to detect the odor of chlorine. Long-term exposure may result in damage to teeth and ulceration of the nasal passages. Chlorine has not been classified as a carcinogen (PPG, 1989).

Hydrochloric Acid

Hydrochloric acid is used in the pre-rinse module prior to the etch module in the Photo Etch process. Hydrochloric acid can cause severe burns to the eyes and skin upon contact. Inhalation of hydrochloric acid vapor can cause pulmonary edema, circulatory failure, respiratory system damage, collapse, coughing, and/or difficulty breathing. Hydrochloric acid has not been classified as a human carcinogen (J.T. Baker, 1994).

Ferric Chloride

Ferric chloride is used for etching stainless steel sheets in the Photo Etch process. Ferric chloride is an orange-brown liquid with a slightly acrid odor. Skin exposure to ferric chloride liquid can cause irritation with discomfort or rash, skin burns or ulceration. It has been only infrequently associated with skin sensitization. Contact with eyes may cause irritation and discomfort, tearing and blurring of vision, or eye corrosion. Overexposure to ferric chloride vapor may result in irritation of the upper respiratory passages with coughing. Ferric chloride has not been classified as a human carcinogen (Gulbrandson, 1993).

### Cupric Chloride

Cupric chloride is used in addition to ferric chloride for etching stainless steel sheets in the Photo Etch process, depending on the specific product line. Cupric chloride is a clear, green odorless liquid and has been reported as causing irritation to the skin and eyes. The severity of irritation varies by individual, which suggests some allergic reactions do exist. There is not evidence to suggest that chronic poisoning from exposure to copper compounds exist (PPB, 1994).

## Sodium Hydroxide

Sodium hydroxide (NaOH) is a white solid, in various forms, with no odor. It is also known as caustic soda and is used in the Water Systems area, boilers, and Component manufacturing processes for pH adjustment. Sodium hydroxide is very corrosive to the eyes, skin, and respiratory tract. Short-term exposure can cause severe burns to eyes and skin, while long-term exposure may cause skin dermatitis (NIOSH, 1993b).

### Nitrogen Trifluoride

A plasma etch process is used to etch away certain areas of the product in the Trace process. Plasma etch utilizes ionized nitrogen fluoride ($NF_3$), oxygen, and argon gases. Nitrogen trifluoride is a toxic, nonflammable, compressed gas packaged in cylinders at high pressure. It is also an oxidizer that can cause ignition or enhance combustion particularly at temperatures exceeding 400°F. It is odorless, but may contain contaminants that can impart a musty odor (Air Products, 1997).

Hydrogen Fluoride

Hydrogen fluoride (HF) gas is created a byproduct of the plasma etch process. Hydrogen fluoride is a colorless gas that is created when fluorides combine with hydrogen. Fluorides are everywhere throughout the environment, but at very low levels that are not believed to be harmful. At high levels, hydrogen fluoride gas can harm the lungs and heart and can cause death. Even at low levels, this gas can irritate eyes, skin, and lungs. Hydrogen fluoride gas has not been classified to be carcinogenic (ATSDR, 1993).

Hydrogen Cyanide

Hydrogen cyanide (HCN) gas has the potential to be formed in the Trace plating line in the gold plating section. Some suspension assemblies may call for certain portions of the product to be electroplated with gold. The only way to plate with gold is to use cyanide salts. Cyanide salts are used in this process and there is a potential for them to mix with other compounds and form hydrogen cyanide gas. Hydrogen cyanide gas can be formed in one of two ways. First, if the rack of material that is moving through the plating line from one bath to another should go directly from an acid wash bath to a gold plating bath. This would cause the parts to not be rinsed thoroughly and some residual acid would be left on the parts. When the acid comes into contact with the cyanide salt solution, hydrogen cyanide gas would be formed. Second, if acid should be spilled into the cyanide salt solution by any means, hydrogen cyanide gas would be formed.

Hydrogen cyanide gas is a colorless gas with a bitter, almond-like odor. Some individuals can first smell it at 0.6 ppm. However, smell cannot be relied upon as an indicator that hydrogen cyanide is present in the air, because not all people can smell hydrogen cyanide. The effects of cyanide may vary from person to person depending upon things such as health, family traits, age, and sex. Exposure to high levels of cyanide for a short period harms the central nervous system, respiratory system, and cardiovascular system. Short-term exposure to high levels of cyanide can cause coma and/or death. Brief exposures to lower levels result in rapid, deep breathing; shortness of breath; convulsions; and loss of consciousness. These short-term effects go away with time because cyanide does not stay in the body. In some cases, quick medical treatment can revive a person who has been poisoned by cyanide (ASTDR, 1989). The EPA has determined that cyanide is not classifiable as a human carcinogen (ASTDR, 1997).

## Summary

This review of literature has examined three main areas as they relate to the successful operation of the Chemical Release Response Team (CRRT) at HTI-Eau Claire. Those areas are: OSHA and EPA regulations that require emergency response plans, job competencies of those members of the CRRT, and a brief basic review of the ten chemicals most likely to present a hazard to those responding to a chemical spill. Chapter 3 will outline the process used to analyze the current chemical spill protocol at HTI-Eau Claire.

# CHAPTER 3

## Methodology

### Introduction

The purpose of this study is to evaluate the current chemical spill response protocol in place at Hutchinson Technology in Eau Claire, Wisconsin. The three main objectives are to 1) compare/contrast current training requirements, for those employees who volunteer to be members of the Chemical Release Response Team, with regulatory requirements and/or acceptable industrial practices, 2) identify basic knowledge-related competencies of individuals who are members of, as well, as leaders of, the Chemical Release Response Team, and 3) identify HTI and chemical manufacturer specific information with respect to chemicals in this study.

### Method of Study

A review of literature was completed to identify the federal regulations that have requirements for emergency response plans. Regulations from the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) were examined. Those that apply to HTI-Eau Claire were discussed in greater detail, including emergency response plan components and training requirements. The most attention was given to OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard. The review discussed 1) what types of facilities are covered by HAZWOPER, 2) what personnel it aims to protect, 3) emergency response plan components, 4) incident command system design and operation, and 5) personnel training requirements.

Information was also collected in two other areas key to the operation of the Chemical Release Response Team (CRRT). Members of the CRRT are typically from one of three departments within the facility. Competencies and training requirements for their regular jobs were discussed with a supervisory representative from each of the three departments. In addition, a basic chemical background was given for each of the ten chemicals that pose the greatest potential of exposure for members of the CRRT who could respond to a release emergency.

This information will be used to analyze current training guidelines, CRRT readiness, and chemical spill procedures. Current training guidelines will be compared with regulatory requirements in areas such as: frequency, content, applicability, and length.

## Procedures Followed

The following procedures were followed to conduct this research.

1. A meeting was held with the site Safety Administrator and Safety/Security/Industrial Engineering Manager to determine focus of this study.
2. The purpose of the study and its' objectives were developed.
3. The purpose of the study and its' objectives were approved by the site Safety Administrator.
4. A review of literature was completed with a focus on regulatory requirements with respect to emergency response plans, job competencies of Chemical Release Response Team members, and basic chemical

information about those chemicals most likely to be encountered by responding members of the CRRT.

5. Current training guidelines will be compared with regulatory requirements.

6. Roles of CRRT members from each of the three departments will be outlined.

7. The ten chemicals with the greatest potential for CRRT member exposure will be analyzed to approximate spill potential and severity.

8. Current chemical spill procedures will be evaluated to assess ease of use, completeness, and usability.

# CHAPTER 4

## Results of the Study

Objective 1: Training Guidelines vs. Regulatory Requirements

As discussed earlier in Chapter 2, OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard details the training required by those who respond to emergencies involving chemicals. These training requirements are in effect for those employees who respond to controlling a spill that could result in an emergency situation. The amount of training specified is based on the duties and functions to be performed by each responder. For the response to fall under the requirements of HAZWOPER the spill must be more than "incidental" – it must have emergency consequences. Those spills which are considered nuisance spills or minor releases and do not require immediate attention, to protect employees, are not considered emergencies. Incidental releases are limited in quantity, exposure potential, or toxicity and present minor safety or health hazards to employees in the immediate work area or those assigned to clean them up. Employees who are familiar with the hazards of the chemicals with which they are working may safely clean up an incidental spill. The properties of hazardous substances, such as toxicity, volatility, flammability, explosiveness, corrosiveness, etc., as well as the particular circumstances of the release itself, such as quantity, confined space considerations, ventilation, etc., will have an impact on what employees can handle safely and what procedures should be followed. Additionally, there are other factors that may mitigate the hazards associated with a release and its remediation, such as the knowledge of the employee in the immediate work area, the personal protective equipment (PPE) at hand, and the pre-established standard operating procedures for responding to releases of hazardous substances (DOL, 2000). For HAZWOPER to apply, the release or situation must pose an emergency. The following is a list of situations that would, most likely, be considered emergency situations requiring an emergency response effort:

1. High concentrations of toxic substances
2. Situation that is life or injury threatening
3. Imminent Danger to Life and Health (IDLH) environments
4. Situation that presents an oxygen deficient atmosphere
5. Condition that poses a fire or explosion hazard
6. Situation that requires an evacuation of the area
7. Situation that requires immediate attention because of the danger posed to employees in the area (DOL, 1991).

An ordinary spill that can be safely handled by the workers in that area is not an emergency. Such employees must have the proper PPE and training to clean up the spill as required by other OSHA standards. As outlined in Chapter 2, OSHA standards such as Process Safety Management and Hazard Communication would apply.

If employees are required to respond to spills that have the potential for becoming an emergency, than all of the provisions of HAZWOPER paragraph (q) are applicable. HAZWOPER requires the use of an incident command system (ICS) to control the operations of a spill response emergency (DOL, 1996b). HTI-Eau Claire has implemented the ICS not only for emergencies involving chemical releases, but also medical and severe weather/fire evacuations. So, members of HTI-Eau Claire’s

Emergency Management System (EMS) Brigade are also familiar with the workings of the ICS. This is especially important in chemical release situations, because members of the EMS would be available to help in areas other than spill clean up in the event of a chemical emergency. HAZWOPER requires training for five levels of command under the ICS: first responder awareness, first responder operations, hazardous material technician, hazardous material specialist, and on-scene incident commander.

The first responder awareness level workers are those who typically discover the spill and need to notify the appropriate personnel. The training required for these workers include how to recognize what hazardous substances are, the risks associated with them, the need for additional resources, and how to make appropriate notifications to the communication center (DOL, 1996b). This training can easily be incorporated into the Hazard Communication training all employees receive. Employees at HTI-Eau Claire receive Hazard Communication training as required by OSHA on an annual basis. Training includes information such as: what types of chemicals are used at HTI-Eau Claire, what hazards are associated with them, how to protect themselves when working with chemicals, how to respond in case of emergencies, and how to find out more information on a specific chemical (through the use of Material Safety Data Sheets).

First responder operations level workers are those who are trained on how to protect themselves and others by containing and/or controlling the spill from a safe distance without actually trying to stop the spill. Their responsibility is to act from a safe distance to stop the spill from spreading and minimize employee exposures (DOL, 1996b).

Hazardous materials technician level workers are those who respond to releases or potential releases for the purpose of stopping the release.  The assume a more aggressive role than a first responder at the operations level in that they will approach the point of release in order to plug, patch, or otherwise stop the release of a hazardous substance. Hazardous materials technicians must receive at least 24 hours of training equal to the first responder operations level plus have training in the following areas:  facility emergency response plan, use of field survey instrumentation, Incident Command System, chemical personal protective equipment use and selection, hazard and risk assessment techniques, chemical control/containment, chemical and toxicological terminology, decontamination, and incident termination (DOL, 1996b).

Hazardous materials specialist workers are those who respond with and support the hazardous materials technicians.  Their duties are essentially the same as the hazardous materials technician except that they have a more specific knowledge of the various substances they area likely to respond to.  Hazardous materials specialists must have at least 24 hours of training equal to the technician level plus have training in the following areas:  facility emergency response plan, use of field survey instrumentation, state emergency response plan, chemical personal protective equipment use and selection, hazard and risk assessment techniques, chemical control/containment, decontamination, site safety and control plan, and chemical/radiological/toxicological terminology (DOL, 1996b).

On-scene incident commander workers are those who assume control of the incident scene.  They must receive at least 24 hours of training equal to the first responder operations level plus have training in the following areas:  Incident Command

System, facility emergency response plan, hazards and risks of personnel working in chemical protective clothing, local emergency response plan, state emergency response plan, and decontamination (DOL, 1996b).

Members of the CRRT have received 32 hours of training on-site through the use of a Chippewa Valley Technical College (CVTC) instructor. This instructor utilized the training materials developed by the Environmental Protection Agency (EPA) on Hazardous Materials Incident Response Operations (EPA, 1993). This training included 24 hours of training to the Hazardous Materials Technician level and 8 hours on the operation of the Incident Command System. The training was formatted as follows:

- Day 1 Hazard Recognition
  Air Monitoring Instruments I
  Air Monitoring Instruments II
- Day 2 Toxicology
  Respiratory Protection: Air Purifying Respirators
  Respiratory Protection: Supplied-Air Respirators
  Levels of Protection and Chemical Protective Clothing
- Day 3 Site Entry and Reconnaissance
  Radiation Survey Instruments
  Decontamination
- Day 4 Response Organization

Refresher training or skill demonstration must take place on an annual basis. This training must be at least 8 hours in length and cover subject areas to maintain the responders' competencies (DOL, 1996b). Members of the CRRT at HTI-Eau Claire receive refresher training for 12 hours annually. The 12-hour block is broken up into 3 4-hour blocks. This refresher training enables CRRT members to keep their Hazardous Materials Technician certification. As with the initial 32-hour training, this training is done by a CVTC instructor certified to teach this specific course. Refresher training topics include chemical related terminology, air monitoring equipment operation, HTI-Eau Claire chemical specific information, level "B" chemical suit scenario (or other "hands-on" scenarios), and question/answer sessions. In the future, refresher training may include review of past chemical spill/releases. After a chemical spill/release has been mitigated and cleaned up, the incident is reviewed to outline those things that went well and those that could be improved upon. This would be discussed in further detail with the entire class in the next refresher session.

Additional training, beyond the HAZWOPER training discussed above, must be provided to those employees who clean-up chemical spills. The training must cover the applicable requirements of the following OSHA standards: 1910.38 – Employee emergency and fire prevention plans, 1920.1200 – Hazard communication, and 1910.134 – Respiratory protection (DOL, 1996b).

Objective 2: Chemical Release Response Team (CRRT) Member Roles

Members of the CRRT come from mainly three departments at HTI-Eau Claire. These departments include Component Maintenance, Water Systems, and Chemical Services. The job specific training that personnel receive in each department was discussed in Chapter 2. The following will outline what each department's personnel role is in chemical release response as members of the CRRT.

Component Maintenance Technicians install and service the manufacturing equipment used in the Photo Etch and Trace processes. Their role in chemical release response tends to be quite hands-on. These technicians would be the first ones on the scene and the initial ones sent in to assess the release situation. They are the personnel that deal with the manufacturing equipment on a daily basis and, therefore, are likely to be more knowledgeable on the operation of the equipment. They are relied upon to troubleshoot and repair the equipment causing the chemical release.

Water Systems Technicians control the processes of water and waste treatment and manufacture of deionized and reverse osmosis water. Their expertises are in water and waste treatment and, therefore, are relied upon to treat or dispose of the waste products from the release/spill event.

Chemical Services Coordinators transfer, store, distribute, label, and ship chemicals at HTI-Eau Claire. They also aid Component Maintenance personnel in cleaning out production process equipment. They are relied upon to be the “experts” when it comes to the chemicals used on site and the associated hazards. By nature of their job, they have the most frequent interaction with the chemicals and, therefore, are assumed to be the most knowledgeable about the chemicals.

Objective 3: Chemical Spill Potential/Severity and Current Spill Procedures

HTI-Eau Claire receives chemicals in various sizes, from 1-gallon containers to 55-gallon drums, 300-gallon totes, to several thousand-gallon tanks filled by tanker truck. Some of the chemicals received in bulk include chlorine, nitric acid, sulfuric acid, sodium hydroxide, hydrochloric acid, ferric chloride, and nitrogen trifluoride. These bulk chemicals are transported to the facility’s lower level Chemical Bulk Storage room from the tanker truck unload station through dedicated pipelines located in a tunnel specifically designed for this purpose. The exception is bulk liquid chlorine which will be discussed specifically later. The Chemical Bulk Storage room has both large tanks for bulk storage and racks for other smaller containers. The room has a series of trenches and pits, coated with an impervious chemical resistant polymer to act as a containment system in the event of a spill.

Nitric Acid

Nitric acid is received in bulk and transferred from the tanker unload station outside the building to the Chemical Storage Room in the basement through a hard-piped system. The most likely release of nitric acid would be a large leak from a tanker truck parked and unloading. The unload area is constructed as a containment system capable of containing 10% more than the volume of a full tank truck. Therefore, assume the worst-case release to be 2000 gallons of nitric acid in a pool covering an 800 square foot area. This would involve an evacuation for a 0.1-mile radius (realistic scenario) or 0.4-mile radius (worst case scenario). The realistic scenario would only involve evacuation of the employees at the plant (LEPC, 1999). The bulk nitric acid is transferred to point of use on the other side of the building via cart through the hallways. A spill could occur during this transfer process. Concern was voiced at this process, during the HAZWOPER refresher training session, due to lack of drains in the hallways and the presence of a greater number of personnel in that area. Concern was also voiced at the process of using an elevator to transport the nitric acid to the main floor from the basement. The floor of the elevator is metal and nitric acid creates hydrogen gases when it comes into contact with metal. Personnel transporting nitric acid via the elevator have to be sure that all containers are securely closed and have no leaks at time of transport. Personnel at this time of transfer do not have respiratory protection available for their use. At present time, nitric acid use levels in the facility are quite low.

Nitric acid was reviewed at the most recent HAZWOPER refresher training session. Students were asked how they would respond to a spill of nitric acid. Answers varied from flushing with copious amounts of water to using sorbent materials. Pros and cons of each method and situations where each would be preferable were discussed. The characteristics, hazards, personal protective equipment (PPE) needed, and incompatibilities were also discussed.

Sulfuric Acid

Sulfuric acid is received in bulk and is transferred from the tanker unload station outside the building to the Chemical Storage Room through a hard-piped system. The most likely release of sulfuric acid would be identical as the nitric acid scenario described above. The worst-case release would be 2000 gallons of sulfuric acid in a pool covering an 800 square foot area. This would involve an evacuation for a 0.1-mile radius (both realistic and worst case scenarios). Both scenarios would only involve evacuation of the employees at the plant (LEPC, 1999). Bulk sulfuric acid is hard-piped from the bulk storage tank in the Chemical Storage Room to point of use in Water Systems. It also is hand pumped from the bulk tank into portable containers and drums. The portable containers are then transported in the elevator to point of use in the Assembly Water Systems Room or the plating line in the Trace Bay. The same transfer/transport concerns as the nitric acid discussed previously hold true for the sulfuric acid.

## Chlorine

Chlorine is shipped and stored in one-ton cylinders. The storage area consists of two covered bunkers, each with four one-ton cylinders, located in the vicinity of the tanker unload area. One cylinder is placed in service at any given time. The safety features for this system include the capability to scrub one ton of chlorine from a contained incident in the closed bunker system. The most likely release scenario would be a release of one ton (2000 pounds) of chlorine from a cylinder damaged during handling outside the bunker or mechanical malfunction of the bunker cover at the time of a leak in the bunker. This would involve evacuation for a 10-mile radius (worst case scenario) or a 1.6-mile radius (realistic scenario). The worst-case scenario would involve a population of approximately 80,000 people, while the more realistic scenario would involve evacuation of approximately 7,340 people (LEPC, 1999). As stated in Chapter 2, the manufacturing processes that utilize the chlorine are currently shut down and, therefore, there is no chlorine present on-site at the facility. HTI-Eau Claire has an extensive monitoring system for chlorine detection and has a thorough procedure on chlorine alarm response. These are not being discussed or evaluated at this time since no chlorine is presently on site.

## Hydrochloric Acid

Hydrochloric acid is received in bulk through the tanker unload station and piped down to the Chemical Storage Room. It is transferred upstairs, in concentrated form, to the point of use in the Assembly Water Systems Room. The hydrochloric acid is used in deionized water bed regeneration and is transported to point of use via a 220-liter portable cart. Spills could occur in this transfer/transport process.

Hydrochloric acid was discussed at the most recent HAZWOPER refresher training session. Students were asked how they would handle a spill of hydrochloric acid. They discussed the process of neutralizing the liquid with lime and flush with copious amounts of water. Chemical characteristics, proper PPE, and other precautions to be taken during a spill were also discussed at this time.

Ferric Chloride

Ferric chloride is received in bulk and is transferred from the tanker unload station outside the building to the Chemical Storage Room through a hard-piped system. It is then hard-piped to point of use in the Photo Etch process. This process is currently shut down and there is no transfer of ferric chloride taking place.

Cupric Chloride

Cupric chloride is received in barrels. The barrels are transferred to the pedestal area of the basement via forklift to be used in the Photo Etch process. This process is currently shut down and there is no transfer of cupric chloride taking place.

Sodium Hydroxide

Sodium hydroxide is received in bulk through the tanker unload station and piped down to the Chemical Storage Room. The bulk sodium hydroxide is pumped into barrels or smaller portable containers. The portable containers are transported to the point of use via carts. Portable containers are used in the Boiler Rooms and Water Systems areas. Sodium hydroxide is also hard-piped to the Water Systems and pedestal areas of the basement. Spills/releases could occur in the transfer/transport process or in failure of valves/piping in the hard-piped system.

Sodium hydroxide was discussed at the most recent HAZWOPER refresher training session. Students were asked how they would respond to a spill of sodium hydroxide. Answers varied from flushing with copious amounts of water to using portable pumps to pump to another container. Proper PPE to be used, precautions to be taken, and chemical specifics were discussed. Information on and experiences with sodium hydroxide were discussed between students and instructor.

Nitrogen Trifluoride

Nitrogen trifluoride is received in cylinders and stored in a locked cage in the Chemical Storage Room. Cylinders are used on the main floor in the Trace Bay. Cylinders are transferred from the Chemical Storage Room to the point of use behind a specific plasma etcher via a cylinder transfer cart. Each cylinder is changed out every 1 to 2 weeks. Personnel performing the cylinder change use a portable nitrogen trifluoride detector to detect leaks. They do this on the new cylinder before and after the cylinder change is performed. If they detect a leak in the cylinder, they place a “snorkel” (ventilation ducting) over the top of or next to the cylinder until the leak can be controlled.

If a cylinder should leak at a time other than cylinder change-out, there is an extensive nitrogen trifluoride gas detection system in the Trace Bay (behind the plasma etchers) and Chemical Storage Room. There are two levels of alarms: Level 1 Alarm and Level 2 Alarm. A Level 1 Alarm is triggered when the monitoring system detects a level of 3.0 ppm. A Level 1 Alarm serves as a warning that a problem exists that needs to be addressed before it becomes a problem. The system will automatically call the Component Maintenance Technicians via phone. A Level 2 Alarm is triggered when the monitoring system detects a level of 10.0 ppm or one of the many "chemical pull station alarms" (similar to a fire pull station alarm) has been activated. A Level 2 Alarm indicates that a problem exists which requires immediate attention. If a Level 2 Alarm is activated, the Emergency Management Services (EMS) Brigade is called and the area of alarm is evacuated. If the alarm is behind the plasma etchers, the entire Trace Bay will be evacuated. If the alarm is in the Chemical Storage Room, the entire basement will be evacuated. There is a detailed procedure on how the alarms work and are to be responded to.

Hydrogen Fluoride

As discussed previously in Chapter 2, hydrogen fluoride is created as a byproduct of the plasma etching process. There is an extensive hydrogen fluoride gas detection system in place in the Trace Bay. Monitors are located at the opening of each plasma etcher door, behind each group of 4 plasma etchers, scrubber area/wastewater treatment area in the basement, and at some general locations throughout the Trace Bay. A Level 1 Alarm is triggered when the monitoring system detects levels of hydrogen fluoride at any of the monitoring locations to be equal to or greater than 3.0 ppm. If the alarm is at the front of an etcher door, a strobe is activated on the etcher and the operator will close the etcher door. The operator will then contact a Trace Manufacturing Support Technician who will determine the HF level and proceed according to the HF Alarm Procedure based on the level determined. If a Level 1 Alarm is at one of the other monitoring locations, the system will call the Trace Manufacturing Support Technicians via phone. A Level 2 Alarm is triggered when the monitoring system detects levels of hydrogen fluoride at the any of the monitoring locations of equal or greater than 6.0 ppm. The procedure for a

Level 2 Alarm is quite thorough and involves calling the EMS Brigade to facilitate evacuation of the entire Trace Bay or other affected area(s).

Hydrogen Cyanide

As discussed previously in Chapter 2, hydrogen cyanide (HCN) gas has the potential to be formed in the Trace plating line in the gold plating section. Some suspension assemblies may call for certain portions of the product to be electroplated with gold. Cyanide salts are used in this process and there is a potential for them to mix with other compounds and form hydrogen cyanide gas. Hydrogen cyanide gas can be formed in one of two ways. First, if the rack of material that is moving through the plating line from one bath to another should go directly from an acid wash bath to a gold plating bath. This would cause the parts to not be rinsed thoroughly and some residual acid would be left on the parts. When the acid comes into contact with the cyanide salt solution, hydrogen cyanide gas would be formed. Second, if acid should be spilled into the cyanide salt solution by any means, hydrogen cyanide gas would also be formed.

Inside the Trace plating line there is no device to monitor for the formation of hydrogen cyanide gas. Hydrogen cyanide vapor has a smell of bitter almonds that some individuals can first smell at about 0.6 ppm. Employees are left to rely on their sense of smell to warn them of the presence of hydrogen cyanide gas. However, this could become a problem because this smell may not alert everyone to the fact that hydrogen cyanide is present in the air. Some individuals cannot smell hydrogen cyanide (ATSDR, 1989). Component Maintenance Technicians do have access to a portable hydrogen cyanide monitor to use to detect levels of hydrogen cyanide during a release event.

## Summary

The comparison of current training requirements in place and federal regulatory requirements showed where HTI-Eau Claire was meeting or exceeding the regulatory requirements. In this comparison process, refresher training was also analyzed. This analysis identified an opportunity to make improvements in the content of future refresher training sessions. Furthermore, it indicated a need for additional information for CRRT members in areas such as chemical hazards, EMS duties, and proper spill procedures and the implementation of practice drills to improve CRRT readiness. Discussions about chemical spill/release potential and severity highlighted a number of issues. These issues include a potential lack of agreement among CRRT members on how to most efficiently clean up a spill, lack of written documentation as it relates to spill response procedures, and deficient integration/cooperation between the CRRT and the Emergency Management System personnel.

# CHAPTER 5

# Conclusions and Recommendations

## Restatement of the Problem

Even in facilities with a strong safety and health program, incidents can still occur in spite of efforts to prevent them. Therefore, proper planning for emergencies is necessary to minimize employee injury and property damage. The effectiveness of responses to emergency situations would appear to be affected by the amount of planning and training performed. This would seem to hold true for emergencies such as fires, severe weather, toxic gas releases, and chemical spills.

The purpose of this study is to evaluate the current chemical spill response protocol in place at Hutchinson Technology in Eau Claire, Wisconsin. The objectives of this study are to:

1. Compare/contrast current training requirements, for those employees who are members of the Chemical Release Response Team, with regulatory requirements and/or accepted industrial practices.
2. Identify basic knowledge-related competencies of individuals who are members of, as well as leaders of, the Chemical Release Response Team.
3. Identify HTI and chemical manufacturer specific information with respect to the chemicals in this study.

## Method of Study

A review of literature was completed to identify the federal regulations that have requirements for emergency action plans. Regulations from the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) were examined. Then, job-training requirements of Chemical Release Response Team (CRRT) members from three departments were discussed. Also, HTI-Eau Claire and manufacturer specific chemical information was outlined for the 10 chemicals that CRRT members are most likely to respond to.

## Conclusions

The conclusions of this study will be summarized as they relate to the objectives outlined.

### Objective 1: Training Guidelines vs. Regulatory Requirements

In the past year, HTI-Eau Claire has progressed in the area of training personnel to respond safely and effectively to releases/spills of chemicals. Instructors certified to teach the requirements of OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) have been brought in to teach the members of the CRRT. The instructor of the initial course utilized the Hazardous Materials Incident Response Operations training developed by the EPA. This training covered the training topics required by the HAZWOPER standard in a 32-hour training session. Within that training period, an 8-hour training session on the Incident Command System (ICS) was also given.

Refresher training is also required by the HAZWOPER standard. Two 4-hour refresher sessions have been held (July 2000 and December 2000). The current plan is to have members of the CRRT attend 3 4-hour refresher sessions (for a total of 12 hours) on an annual basis. The HAZWOPER standard requires only 8 hours of refresher training annually. HTI-Eau Claire has met the initial training requirements and is going above and beyond the number of refresher training hours required by the HAZWOPER standard. However, during the most recent refresher training session, CRRT members in attendance discussed areas that they felt were lacking in the current system. Some included the use of "drills" to practice their skills, agreement among members on the most efficient way to clean up a specific chemical, and integration with the Emergency Management System personnel.

Objective 2: Chemical Release Response Team (CRRT) Member Roles

Having properly trained personnel ensures that all members of the CRRT have their specialty and are trained appropriately, whether that specialty is in waste treatment, equipment maintenance, or chemical handling. All three of the departments with personnel on the CRRT (Water Systems, Component Maintenance, and Chemical Services) essentially use on-the-job training for training their new employees. Each department has some sort of training checklist that they use to document all new employee training. This helps to ensure that all subjects are addressed. All departments also have specific job pre-requisites that should be met prior to hire into that department.

Objective 3: Chemical Spill Potential/Severity and Current Spill Procedures

Three of the ten chemicals discussed in this study have written release procedures. They are chlorine, nitrogen trifluoride, and hydrogen fluoride. These chemicals have gas-monitoring systems that detect when a release has occurred. The alarm response procedures are very lengthy and thorough. The other seven chemicals in this study have no specific spill/release procedures written. Material Safety Data Sheets (MSDS) are available to all employees as required by OSHA's Hazard Communication standard. However, this contains only the “bare bones” general spill information. There are no facility specific procedures available to CRRT members. In addition, MSDSs tend to be long and, therefore, it may be confusing to locate information. As discussed in the most recent HAZWOPER refresher training session, responders have to “think on their feet” when a spill/release occurs on how to handle the situation. There even has been evidence of conflicting views on what would be the proper way to clean up a spill of a certain chemical.

## Recommendations

The current chemical specific spill/release protocol has made progress in the last year but is still lacking in some areas. Recommendations for improving the current protocol are:

1. Continue with the current plan of utilizing 3 4-hour refresher training sessions.
    a. Include HTI-Eau Claire specific chemical information.
    b. Ask CRRT members what they would like to see in the training sessions.
    c. Review past incidents and critique response.
2. Begin performing surprise “drills”. This would benefit CRRT members by having them learn to act without much planning time, work together as a team, and utilize their skills acquired in training.

3. Perform "drills" with Emergency Management Services (EMS) Brigade personnel because the CRRT and EMS will need to function together in a real emergency and it gives each team an opportunity to learn what the other team does.
4. Have training with the Eau Claire Fire Department and their HAZMAT contingency.
5. Hold informational meetings, short in length, on a monthly or bimonthly basis (when no refresher training session is scheduled) to discuss one chemical in depth.
    a. Include discussion on proper personal protective equipment, acute and chronic hazards, symptoms of overexposure, first aid, spill cleanup, storage, use, and equipment function.
    b. Utilize "table-top" scenarios to allow CRRT members to practice their response skills.
6. Develop short (1-2 pages) chemical specific spill protocol for each of the ten chemicals discussed in this study.
    a. For the three chemicals that have the lengthy alarm procedures developed, develop shortened versions to post in the EMS room.
    b. Utilize the members of the CRRT in the development of these procedures and in their review.

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