IMPLEMENTATION OF A CHEMICAL MANAGEMENT PLAN

AT GE ENGINE SERVICES

By

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PREFACE

This thesis report was developed and implemented at GE Engine Services to ensure compliance with State and Federal regulators and ensure employee safety. Although GEES has an effective Environmental, Health, and Safety Program, improvements were needed to accurately track and adequately manage chemicals. Accurate chemical tracking was needed at GEES in order to meet annual chemical reporting requirements, thus ensuring regulatory compliance. Though managing chemical purchases, use, and disposal was critical to ensure compliance, the most critical issues are employee education, MSDS accuracy, and MSDS availability, all of which impact employee safety.

The specific goals of the Chemical Management Plan are to (1) implement procedural changes on how GEES obtains and manages chemicals, (2) establish chemical management ownership and annual goals, (3) implement software programs to aid in chemical tracking, (4) create a system to manage inventory quantities, (5) establish contractor controls, and (6) culturally change the way GEES manages chemicals. It was necessary to illustrate to GEES Management that good chemical control equals good business.

I would like to sincerely thank my graduate committee, Dr. Will Focht (chair and research advisor), Dr. James Lawler, and Dr. Wayne Turner. I must also thank, Steve Sawyer, GEES's EHS Manager, for his commitment to creating chemical management improvements.

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NOMENCLATURE

ACL	Approved Chemical List
CAA	Clean Air Act
CAS	Chemical Abstract Service
CCP	Chemical Cost Profiler
CEP	Corporate Environmental Program
CERLA	Comprehensive Environmental Response Compensation and Liability Act
CFR	Code of Federal Regulations
Chemical Sweep	Physical Inventory of all Chemical at GEES
CMP	Chemical Management Program
CRB	Chemical Review Board
CWA	Clean Water Act
DOT	Department of Transportation
EDM	Electrical Discharge Machining
EH & S	Environmental, Health and Safety
EHS	Extremely Hazardous Substance
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
GEAE	GE Aircraft Engines
GEES	GE Engine Services
HAZCOM	Hazard Communication Training
IATA	International Air Transportation Association
LEPC	Local Emergency Planning Committee
NPDES	National Pollution Discharge Elimination System
PCB	Polychlorinated Biphenyl
PO	Purchase Order
POTW	Publicly Owned Treatment Works
PPE	Personal Protective Equipment
RCRA	Resource Conservation and Recovery Act
R & D	Research and Development
RFQ	Request for Quote
RQ	Reportable Quantity
SARA	Superfund Amendments and Reauthorization Act
SERC	State Emergency Response Committee
TPQ	Threshold Planning Quantity
TSCA	Toxic Substance Control Act

CHAPTER ONE

INTRODUCTION

GEES Chemical Management Challenge

GE Engine Services Inc. (GEES) has not established a comprehensive chemical management system, though portions have been in place for several years. This has produced several problems that undermine the profitability and management of GEES Operations.

First, though GEES, Inc. has maintained a purchasing and waste disposal recordkeeping system, these data were not retrieved and used for any meaningful purpose. No system existed that could be used to identify inventory turnovers and thus avoid unnecessary chemical purchases. The purchasing department considered chemical prices but failed to account for environmental impacts of excess purchases. Most chemicals that are used to machine engine hardware have fixed shelf-lives – consequently, excess chemicals often were discarded as expired material, which, in turn, increased waste (often hazardous) disposal costs. Other costs and inefficiencies were caused by failing to obtain important handling, safety, and environmental information (e.g., from Material Safety Data Sheets, MSDSs) prior to allowing the use of a chemical in a work area, which increased the likelihood of mishandling, mislabeling, improper disposal, and increased risks to worker safety. Finally the old system created several opportunities for the import of untested and unapproved chemicals, such as free samples and small purchases from local suppliers, which created other hazards, inefficiencies, and administrative difficulties.

In today's industrial setting, more and more companies are finding it difficult to achieve and remain in compliance with safety and environmental regulations. The Occupational Health & Safety Act (OSHA) and the Environmental Protection Agency (EPA) and their state agency counterparts have promulgated hundreds of pages of regulations prescribing proper chemical tracking, chemical awareness training, and chemical selection, use and disposal. The problem facing industry is how best to track each chemical throughout it's lifecycle. How can a facility that routinely handles more than 1000 chemicals accurately and continuously track each one through all stages of its handling - from its purchase to its final disposition?

The Hazard Communication Program (29 CFR 1910.1200 (a)(2)) was developed by OSHA to ensure that employees working with chemicals are familiar with the hazards associated with their usage. Each employer must ensure that all employees who are involved in the handling, use, and disposal of chemicals are properly trained. Despite sincere efforts to provide adequate training, problems still persist at GEES, for example, its maintenance of complete and accurate MSDS inventories.

The chemical management problem at GEES is traceable to the serious deficiencies in chemical inventories and tracking systems, which erodes profits, pose unnecessary risks to workers and the environment, and results in the deterioration of productivity. Though GEES has developed and implemented OSHA Hazard Communication and solid and hazardous waste management programs, they either do not address all of the chemicals handled at GEES or they address only a few of the many steps involved in their handling. In addition, GEES's chemical management system failed to adequately address not only commonly used chemicals but also infrequently used chemicals such as new products, samples, and chemicals brought on-site by maintenance employees purchased at local retail outlets.

Importance of GEES'S CMP

To ensure that chemicals are used before their expiration dates, a chemical lifecycle tracking system has been incorporated into chemicals management. Several reasons for this focus are apparent.

First, the health and safety of the employees who are using the chemicals must be safeguarded. Employees who use chemicals in their jobs need to be familiar with the associated health and physical hazards. They should be thoroughly familiar with the proper use and maintenance of appropriate personal protective and monitoring equipment, the potential health effects of over-exposure, the appropriate emergency and remedial actions that must be taken to respond to over-exposure or to workplace and environmental releases, and reporting such incidents. If employees have access to updated MSDSs and other relevant sources of chemical hazard information, chemical exposures can be minimized, if not prevented.

Second, regulatory compliance tracking and assurance is mandatory. Both OSHA and EPA require industry to track the use and fate of chemicals and chemical releases accurately.

Third, OSHA promulgated safety rules in accordance with the 1986 Hazard Communication Act to ensure that employees are familiar with the dangers of the chemicals with which they work. The hazard communication (HAZCOM) requirements included therein require a comprehensive training program to be administered to all employees involved in the use of chemicals. Each employer must maintain complete and accurate MSDSs for each chemical that is used in the workplace. Each employee must also be familiar with the hazards associated with the chemicals and know how to protect themselves against those hazards. The EPA requires that industries provide certain information on chemical quantities, locations, and handling procedures, as well as the amounts and types of chemicals being released into the environment under the Community Right-to-Know provisions. EPA also requires that local emergency response authorities be

provided adequate information to allow an effective and coordinated response to emergencies created by unauthorized releases of chemicals that can threaten the community.

Finally, the Resource Conservation and Recovery Act (RCRA) requires tracking and proper management of chemical wastes. RCRA authorizes EPA rulemaking to ensure the environmentally sound handling of chemical by-products and wastes, including labeling, reporting, and employee training, as well as waste generation, transportation, storage, treatment and disposal. Each chemical used at a facility must be analyzed if the waste could be classified as hazardous based on exhibiting a characteristic of a hazardous waste (as defined in 40 CFR 261 Subpart C).

Third, costs associated with chemical purchasing, handling, inventory turnover, and waste management should be controlled to improve operational efficiency. Although most companies consider purchasing costs, many fail to manage inventory quantities effectively. Waste disposal costs, such as chemical by-products, are often inadequately accounted for and may also contribute to complaints concerning worker safety and environmental protection.

For all these reasons, the development of a CMP at GEES was necessary. This report discusses this plan. In the next section, the organization of this report is presented.

Organization of the Report

The report is organized as follows. Chapter One discussed GEES's Chemical Management Challenge. Chapter Two, "Evaluation of GEES Software Systems," describes the current software systems at GEES and the problems that needed solution in order to achieve an effective chemical management program. Chapter Three, "GEES Chemical Management Program Goals," Chapter Four, "Chemical Restrictions," Chapter Five, "CMP Impact On GEES Compliance," Chapter Six "CMP Chemicals and Cost," Chapter Seven, "Procedures/Implementation," and Chapter 8, "CMP Management Theories" discuss the Chemical Management Program designed herein to address the problems discussed in Chapter 1. Chapter Nine, "Summary and Concluding Comments" presents a brief discussion of the implications of this research.

CHAPTER TWO

EVALUATION OF GEES SOFTWARE SYSTEMS

Approved Chemical List

The Approved Chemical List (ACL) is an electronic chemical tracking system that was created by GE's Aircraft Engines (GEAE) Division in Evendale, Ohio. The ACL contains a complete list of chemicals that have been approved for each site within the Division. The system is maintained with support from GEAE, an outside contractor, and a contact person at each site. The ACL contains an electronic copy of each MSDS for each GEAE facility.[1] This system was developed to ensure HAZCOM compliance and accurate chemical reporting.

The problems that GEES faced with the ACL Program were system support, implementation, and employee availability. When the system was created, little or no training had been conducted and GEES's systems group had no designated support to trouble-shoot ACL program problems. Furthermore, in order to establish a database, a copy of each MSDS had to copied and sent to the outside contractor and scanned into the database. This process was so tedious that no one at GEES was willing to commit to following it. Another shortfall of the system was the lack of its availability to the shop floor. When the ACL system was established, it was available only to EHS professionals. The replacement of paper copies of MSDSs with electronic copies was accomplished but unfortunately, these were not readily available to employees on the floor who work with the chemicals. This limited the effectiveness of the ACL to provide complete MSDS management and received much criticism at GEES facility.

Compass System

The Compass System is a software database that was implemented at GEAE and then transmitted to smaller aircraft engine sites. At GEES, the Compass Software System is used in issuing and tracking purchase orders, scheduling preventive maintenance, archiving data reports, making requisitions, tracking transactions, and maintaining equipment histories. This system was implemented because it tracks most of the functions that an industrial facility performs.

Though Compass performs tasks that are important to the Chemical Management System, such as the tracking of purchase orders, data reports, requisitions, and transactions, it fell short in others. Shortfalls identified at GEES were lack of system support (local and business level), inadequate system knowledge, and incomplete management tracking. The Compass support system is also limited in its ability to accommodate a high employee turnover rate. For the last two years, GEAE reorganizations have made it difficult for GEES to located qualified Compass

[1] The ACL system is available for viewing on GEES's Environmental Health and Safety homepage.

System experts. Downsizing within GEAE has adversely affected the GEES knowledge base, which has limited GEES ability to utilize fully Compass System capabilities. With deficient support and system knowledge, poor management of chemicals and data processing resulted.

GEES, Inc - Strother Homepage

The GEES, Inc. - Strother homepage was established at Strother to serve several different functions. The topics currently located on the homepage are (1) quality, (2) operations, (3) environmental, health and safety (EHS), and (4) other. The Environmental, Health and Safety section contains links to various EHS topics. The first of these is GEES's EHS Manual. The electronic version of the manual contains in-plant procedures and government regulations that must be followed in order to maintain compliance. The second is the " Safety of Site" linked page, which contains a copy of the monthly safety newsletter used to report on accidents, shop safety tips, and health topics. The third link is the Approved Chemical List (discussed above) that contains a copy of each MSDS on each chemical used at GEES. GEES has identified the two shortfalls in the Strother homepage: inadequate system support and limited availability. System support is needed to update EHS information, which must be kept current with ever changing EHS requirements. Furthermore, the Strother homepage is only available to salaried employees. This is helpful from a management standpoint, but the hourly employees who perform the work also need access to obtain quick and accurate information about EHS procedures, safety tips, and MSDSs.

CHAPTER THREE

GEES CHEMICAL MANAGEMENT PROGRAM GOALS

Compliance and Safety Goals

The main two goals of the Chemical Management Program (CMP) are EPA and OSHA compliance and employee safety. Most CMP procedures are not mandated by state or federal requirements, but are nevertheless considered by GEES as good business practices. Compliance, along with assuring the safety and health of each GEES employee, are the main functions of the GEES's Chemical Management Program. Compliance is also necessary to avoid penalties and injunctions. GEES provides jobs for many people so it is critical that they be a good neighbor. Being a good neighbor implies achieving and maintaining compliance, avoiding damage to the environment, and providing a safe workplace for employees. The two main goals of the CMP are thus closely related. If GEES is in compliance with applicable regulations, employee safety will necessarily result. The CMP goals of ensuring employee safety and regulatory compliance are excellent tools to assess the effectiveness of its being a good neighbor while achieving profitability.

Procedural Goals

Procedural goals of the CMP were established to ensure compatibility with GEES's Environmental Health and Safety program and GE's Corporate Environmental Program (CEP). GEES's procedural goals are:

(1) Establishment of a chemical tracking system to ensure compliance with annual chemical reports and where, who, and how the chemicals are being used,

(2) Creation of minimum/maximum chemical inventory levels to reduce inventory and cost and to avoid shelf-life expiration and subsequent disposal,

(3) Establishment of a Chemical Review Board to ensure that only approved chemicals are used at the facility,

(4) Implementation of the chemical approval cycle to ensure that all chemicals are approved for usage (in conjunction with Chemical Review Board),

(5) GEES implementation of the on-site ACL to ensure accurate and complete MSDS coverage,

(6) Provision of ACL access to all employees to enable their ready access to relevant chemical information,

(7) Creation and implemention of DOT/IATA and TSCA shipping procedures to provide direction on GEES chemical shipments,

(8) Creation of chemical and chemical sample restrictions to eliminate the use of banned chemicals,

(9) Development of a chemical cost profiler to accurately assess the true cost of chemicals,

(10) Creation of in-plant chemical controls to efficiently and safely move, store and dispose of chemicals), and

(11) Creation of in-plant chemical sweeps to remove outdated or banned chemicals from the facility.

Management Goals

GEES CMP also addresses three management goals: establishment of CMP accountability to improve compliance, commitment of management to incorporate the CMP into routine business practice at GEES, and facilitation of a cultural change that motivates employees to understand that the CMP is intended to create a safe working environment. All GEES employees must be trained on CMP procedures. Employee commitment is absolutely essential to program success.

Chapter Seven will provide detailed information on how chemical management changes were created and implemented to allow GEES to meet its CMP goals.

CHAPTER FOUR

CHEMICAL RESTRICTIONS

Banned and Red Flagged Chemicals

To reduce the usage of toxic chemicals at GEES, the "Banned" and "Red Flagged" Chemical Lists were developed. The Banned Chemical List consists of chemicals that are not approved for any use at GEES. These chemicals are either extremely toxic or are banned by EPA, OSHA, or state regulators. Purchasing requests for chemicals that contain any of the chemical ingredients on the Banned Chemical List are automatically rejected by the Chemical Review Board and sent back to the original requester stating that they must identify a substitute chemical. Although GEES has not finalized the Chemical Review Board's role, a detailed explanation can be found in Chapter Five.

The Red Flagged Chemical List consists of chemicals that can be approved at GEES but only with strict management controls. This list includes chemicals, such as industrial solvents, that are the focus of waste minimization programs under RCRA. If these solvents are not stored, used, and disposed of properly, GEES could face both safety and environmental enforcement by local and state regulators. Thorough review must be conducted before chemicals on this list can be brought into the facility. This pre-purchase chemical review will be further discussed in Chapter Seven. To review the chemical lists discussed above, see Appendices B (Banned Chemical List) and C – (Red Flagged Chemical List).

Chemical Sample Acquisitions and Maintenance Acquisitions

Unapproved chemical acquisitions at GEES have been a compliance nightmare. Little or no controls existed that prevented process engineers and maintenance employees from acquiring chemical samples from local vendors. For example, a process engineer may stumble upon a new cleaning chemical advertised in a technical magazine that offers free chemical samples. The process engineer would simply fill out the card provided by the magazine and wait for the chemical to arrive. Maintenance would typically identify a chemical that they need for a particular job and drive into town and purchase it from a local vendor. The chemicals would be bought using petty cash from the maintenance cash fund, which had been originally established to purchase hardware items like bolts, nails, and screws. The main reasons for non-controlled chemical acquisitions were lack of appropriate training, accountability, and procedures.

To eliminate these two activities, an emergency chemical approval system was developed. This was done by amending the integrated supplier's management contract to control chemical purchases from local vendors. Now, any employee who needs emergency access to a chemical

can contact the integrated supplier and request it. The supplier will contact the appropriate local vendor and request a MSDS and forward it to the Chemical Management Coordinator. The Coordinator (or designated backup) will then review the MSDS information. If the chemical is rejected, the supplier will be notified and another chemical will be located. If the chemical is approved, the supplier will be responsible for pick-up and delivery of the chemical. The entire chemical approval cycle takes less than eight hours and will eliminate the possibility of unapproved chemicals entering the facility via samples or maintenance.

GEES also realizes that this new procedure will require a cultural change. This is being accomplished through the training of all impacted employees and the elimination of the petty cash fund from the maintenance department. Resistance was encountered, but once employees realized the ease and speed at which the chemical emergency system works, the change has been generally accepted and the number of complaints has declined.

Another benefit from the new system is that GEES no longer has to contend with Department of Transportation regulations associated with transporting chemicals to the facility. The integrated supplier assumes the responsibility of safely transporting the chemical to the designated employee/building.

Periodic inspections and chemical sweeps are conducted to ensure that the new system has eliminated the problem of uncontrolled chemical purchases.

CHAPTER FIVE

CMP IMPACT ON GEES COMPLIANCE

GEES Compliance

Table 1 provides a comparison of the compliance program elements to the environmental regulatory programs that are impacted by changes in chemical handling procedures at GEES. This table reinforces the message that proper chemical management (including choices of chemicals and methods of handling) is critical to GEES environmental and safety compliance.

TABLE 1

COMPLIANCE ACTIVITIES IMPACTED BY CHEMICAL CHANGES

COMPLIANCE PROGRAM ELEMENT	GEES REGULATORY PROGRAM							
	CERCLA	CWA	DOT	RCRA	CAA	EPCRA	TSCA	OSHA
Training			X	X			X	X
MSDS Management	X					X		X
Inventory Records	X				X	X		
Production & Use Records	X				X	X		
Export							X	
Solid/Hazardous Waste Management		X	X	X		X	X	X
Waste Water Discharge		X		X		X		
Air Emissions	X				X	X		X
Spill Reporting	X	X	X					

Most of the program elements listed in Table 1 have been well established for many years at GEES. The four regulatory program elements that were deficient have been improved by the Chemical Management Program. These are the Toxic Substances Control Act (TSCA), Occupational, Safety and Health Act (OSHA), Hazardous Materials Transportation Act (HMTA), and Emergency Planning and Community Right-to-Know Act (EPCRA).

CMP TSCA Compliance

The Toxic Substances Control Act regulates the manufacture, import, export, processing, use, distribution, and disposal of chemical substances and requires appropriate recordkeeping and reporting of information related to these activities. It is intended to strengthen the EPA's information-gathering authority and to establish a program to anticipate and prevent risks due to new chemicals and significant new uses of toxic chemicals.

The main impact of TSCA on GEES's Chemical Management Program is the requirement for EPA notification of the export of chemicals on customer field trips. Under TSCA Section 12, for those chemicals that are specifically regulated under TSCA Section 6 (such as asbestos and PCBs) that are exported to a foreign country, notification to the appropriate EPA regional office is required. The notification informs the foreign country that a regulated material is entering.

Foreign shipments were a serious regulatory concern for GEES. Flight-line mechanics are dispatched periodically to customers all over the world. Mechanics take with them various tools, test equipment, and unfortunately, small amounts of chemicals. In the past, this was not much of a problem, but since the business has grown and the customer base enlarged, they are more often sent to customers located out of the United States. More recently, given the increasing volume of foreign transport of chemicals, GEES briefly considered but rejected banning these transports on field trips. Instead, GEES created a field trip chemical kit for its mechanics.

To create the kit, the chemicals that were absolutely critical in completing field trip repairs were identified by interviewing the mechanics to establish a critical chemical list. With some negotiation with the mechanics, they were able to create an accurate list. Since TSCA does not have limited quantities exemptions, any quantity is subject to notification. Figure 1 illustrates what is included under TSCA requirements, what is excluded, and what is considered an "article."

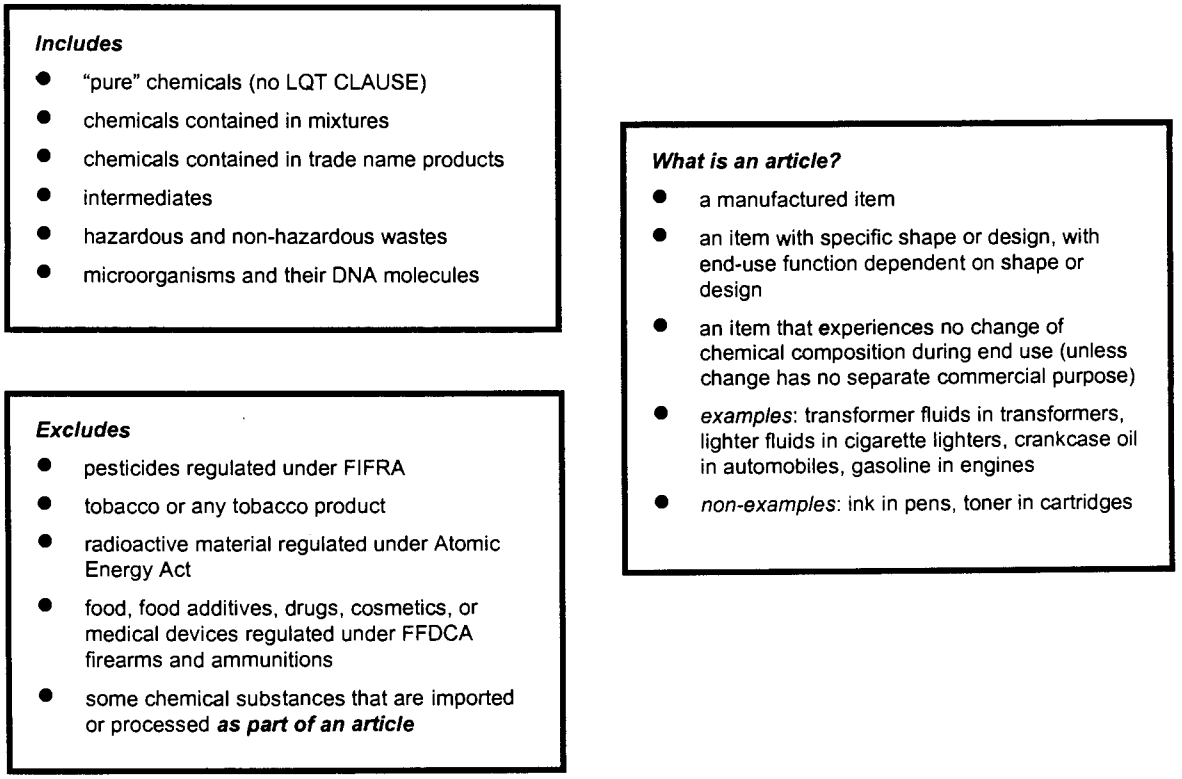

FIGURE 1. WHAT IS A CHEMICAL SUBSTANCE SUBJECT TO TSCA?

With the help of GEES's TSCA Coordinator, necessary notification forms have been completed and submitted to the EPA. GEES expects to receive notification by the end of the second quarter of this year and the maintenance department is currently constructing the chemical kits.

If a new chemical need arises that is currently not included in the chemical kit, the TSCA Coordinator will work with the engine mechanics and team leaders and the GEAE International Trade Compliance organization (url: http://www.ae.ge.com/org/legal/ITC/Index.html) to ensure that all chemicals are accurately declared.

CMP OHSA Compliance Impact

One OSHA requirement that was identified by GEES that needed compliance improvement was Hazard Communication Program (HAZCOM), specifically Material Safety Data Sheet maintenance. The HAZCOM standard (29 CFR 1910.1200(a)(2)) was developed by OSHA in 1986 to ensure that employees working with chemicals are familiar with the hazards associated with their use. Several of the industries that GEES talked with have paper MSDS systems in place to manage chemicals, but none had an electronic system such as this one. The new system provides complete MSDS coverage for each chemical, including updates, quick electronic access to all employees, and greatly increased compliance with the HAZCOM standard. More details on the MSDS maintenance system can be found in Chapter Seven.

CMP DOT/IATA Compliance Impact

The US Department of Transportation was created to regulated chemicals in commerce that are transported within the United States. GEES is subject to DOT regulations when shipping hazardous waste. DOT requires that all employees involved in shipping hazardous waste be certified to do so. All members of the Chemical Handling Team have been trained and are certified.

The International Air Transportation Association regulates chemicals shipped via aircraft. IATA requires different shipping names than DOT and has restrictions that are more stringent on what can be shipped. Previously, when GEES shipped chemicals via highway or air, no established procedures were followed. DOT/IATA requirements were not completely understood by the shipping department. This caused confusion when shipping chemicals to our customers for them to complete repairs and when shipping chemicals for field trip activities. These two issues tie directly into the Chemical Management Program because they deal with the management, packaging, and shipment of chemicals.

No matter why or how a chemical is shipped, GEES now realizes that all chemicals must properly label and package when shipping off-site. In conjunction with recent DOT / IATA training, they

have developed the following process for both DOT and IATA which must be followed prior to shipping chemicals.

DOT Shipping Procedure (within the US)

- A current MSDS is provided to the Chemical Management Coordinator for review.
- The Chemical Management Coordinator reviews the MSDS and identifies the proper DOT shipping name.
- The proper shipping name is located in Table 5.2 of 40 CFR Part 279.
- The Chemical Management Coordinator and the Shipping Facilitator review chemical packaging requirements. These are found in 49 CFR Sections 173.201, .202 and .203 (non-bulk packaging).
- Once the proper shipping name, proper packaging, and proper paperwork are complete, the chemical is shipped via ground transportation. (Note: only a certified chemical transporter can be used).

IATA Shipping Procedure (within the US)

- A current MSDS is provided to the Chemical Management Coordinator for review.
- The Chemical Management Coordinator reviews the MSDS and identifies the proper IATA shipping name.
- The proper shipping name is located in the IATA Manual, Section 4.2, "List of Dangerous Goods."
- The Chemical Management Coordinator and the Shipping Facilitator review chemical packaging requirements. GEES determines if the chemical must be shipped passenger or cargo aircraft.
- Once the proper shipping name, proper packaging, and paperwork are complete, the chemical can be shipped via air transportation.

  (Note: only a certified chemical transporter can be used).

If GEES field trip mechanics must ship chemicals to a domestic work site, GEES determines if ground transportation can be used and if so, this is done. If the field trip destination is located outside the US or if domestic transport must be by air, the chemical kit will be utilized to comply with IATA and TSCA requirements. Fortunately, most of the chemicals that GEES ships can be sent via ground transportation, which typically are exempted from DOT regulations by its limited quantities clause.

CMP EPCRA Compliance Impact

In 1986, Congress enacted the Superfund Amendments and Reauthorization Act (SARA). Most of the provisions of SARA were incorporated directly into the pre-existing Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980 through which the Superfund program is operated. However, Title III of SARA established a totally new program: the Emergency Planning and Community Right-to-Know Act (EPCRA). Congress enacted EPCRA to help local communities plan for emergencies, improve chemical safety, and protect the environment. EPCRA contains four major provisions that have been listed in Table 2 along with the EPCRA section that mandates the provision and citations for regulations developed pursuant to these provisions.

TABLE 2

EPCRA PROVISIONS AND CITATIONS

EPCRA Provision	Statutory Mandate	Regulatory Citation
Emergency planning for chemical releases	EPCRA Section 301-303	40 CFR 355: Emergency Planning and Notification
Emergency notification of chemical releases	EPCRA Section 304	40 CFR 355.40: Emergency Release Notification
Hazardous chemical inventory reporting	EPCRA Sections 311-312	40 CFR 370: Hazardous Chemical Reporting and Community Right-to-Know
Toxic chemical release reporting	EPCRA Section 313	40 CFR 372: Toxic Chemical Release Reporting and Community Right-to-Know

Since the EPCRA program deals with chemicals that are manufactured, processed, used, or stored on-site, the Chemical Management Program will have a positive impact on several of the GEES EPCRA requirements discussed below.

Section 301 CMP Compliance Impact

Section 301 requirements of the emergency planning component of SARA Title III apply to any facility at which an amount of an "Extremely Hazardous Substance" (EHS) equal to or in excess of its Threshold Planning Quantity (TPQ) is present. Extremely Hazardous Substances are identified in a list containing more than 300 chemicals and represent those chemicals that exhibit highly acute toxicity. Each Extremely Hazardous Substance has a specific TPQ that, if equaled or exceeded, triggers the EPCRA regulatory requirements.

Section 311 CMP Compliance Impact

This section requires facilities to submit to the State Emergency Response Commission (SERC), the Local Emergency Planning Committee (LEPC), and local fire departments, a one-time report

containing either all of its non-exempt MSDSs or a single list of all non-exempt chemicals listed by hazard category. This section also requires facilities to annually review and update the original list when a new or previously unreported chemical substance is introduced into a facility.

Section 312 CMP Compliance Impact

This section of EPCRA requires facilities to report to the SERC, LEPC, and local fire departments an annual inventory of their non-exempt hazardous chemicals in excess of their respective regulated thresholds. These reports are submitted on Tier I or Tier II forms. The difference between the two forms is the level of detail (Tier II forms require more specific information on each reportable hazardous material; Tier I forms report information about chemicals grouped by hazard category). In Kansas, state regulators recommend that facilities to complete a Tier II form because it provides more information to the SERC and LEPC.

Section 313 CMP Compliance Impact

This section requires facilities to report environmental releases of certain toxic chemicals to state and federal regulators. A Toxic Chemical Release form (Form R) must be submitted for each toxic chemical manufactured, processed, or otherwise used in quantities exceeding specified thresholds. Facilities are required to complete a Form R for each chemical that is manufactured in quantities greater than 25,000 pounds, processed in quantities of greater than 25,000 pounds, or otherwise used in quantities greater than 10,000 pounds.

The new software programs that were implemented as part of the Chemical Management Program will greatly enhance the current EPCRA reporting system. The Approved Chemical List will provide GEES with more accurate and complete chemical storage quantities needed to comply with Section 301 and 311 of EPCRA. Annual reports will no longer be as complicated due to the new ACL software program. The Approved Chemical List will be the main tool used to ensure that an updated and accurate list is provided to regulatory agencies. Annual reviews using the new software program will be performed by the Chemical Coordinator to identify new or previously unreported chemical substance introduced into the facility. Furthermore, GEES will be able to use the new chemical tracking database to prepare the annual Tier II report. Biweekly or monthly reports on chemical inventories will be provided via Microsoft Access® to the Chemical Management Coordinator, who is responsible for completing the Tier II reports. The chemical tracking system can provide accurate and complete chemical inventory reports.

CHAPTER SIX

CMP CHEMICALS AND COST

GEES Chemicals Managed by CMP Procedures

To understand the scope of the Chemical Management Program, it is important to define what is covered by the plan. A chemical is any item (solid, liquid, or gas/vapor) that is:

a. used or consumed in the manufacturing, research and development, testing, or assembly process (e.g., acetone used in metal cleaning, machining oils, and lubricants);

b. incorporated into a final product (e.g., cured composite in composite blades);

c. used or consumed in the maintenance of facilities and equipment (e.g., WD-40, ammonia cleaners, bleach, paint, and paint thinner);

d. raw materials that when handled can cause potentially hazardous emissions (e.g., parts being machined resulting in toxic metal dust);

e. any material shipped on-site with a Material Safety Data Sheet (MSDS); and

f. any material requiring an MSDS.

In summary, any items requiring an MSDS may be any liquid, gas, solid, or powder that in normal use has the potential to cause a physical hazard or release of toxics to the environment.

The following materials are also considered chemicals requiring an MSDS for purposes of GEES's chemical management plan.

- Substances used in machinery (oils, coolants, greases, lubricants, and fuels)
- Substances used in the manufacturing process (composite materials, solvents, mold releases, paints, varnishes, acids, gases, wire, weld, EDM, glues, metal and ceramic powders, solder, and insulation)
- Substances used for plant cleanup, facilities maintenance, equipment maintenance, and janitorial services (paints, floor dry, parts cleaners, etc.)
- Surface preparation materials (aluminum oxide, grit blast media, etc.)
- Raw materials (steel, raw stock, metals, etc.)
- Non-article office-use materials (white-out, copier toner, liquid paper, etc.)

GEES Chemicals Not Managed by CMP Procedures

For purposes of GEES's Chemical Management Plan, several items are items that will not be managed under the chemical management program.

Chemicals or materials that are considered "conditionally exempt" from requiring an MSDS are:

- Substances integral to a piece of equipment that GEES do not change or require refilling (PCBs in transformers and acids in batteries, unless maintenance is performed)
- Substances that are part of the building or structure and have not been removed (asbestos and floor tiles fiberglass insulation)
- Articles used in an office setting (paper, clips, transparencies, pens, etc.) unless they are a part of one's duties and result in exposure (e.g., photocopy machine operator)
- Plastic parts made by GEES or shipped to GEES for subsequent assembly
- "Clean" cardboard and pallets
- Wastewater discharged under POTW pre-treatment or NPDES authorization
- Metal articles (rotors, drill bits, etc.) unless they are machined or ground at the facility
- Personal items (cosmetics and foods)

If in doubt, all employees are to assume that the item is a chemical and proceed accordingly or they can contact the GEES Chemical Management Coordinator.

Cost of Chemicals

The cost of all GEES designated chemicals will be accurately tracked through the Chemical Cost Profiler (CCP). The chemical cost sheet that GEES has developed goes beyond the basic purchase cost by including compliance, training, and management costs associated with buying and using chemicals.

In developing the CCP, a Best Practice from the GE Engine Services facility in Ontario, California was modified to associate a cost with each chemical. Cost profiling focuses not only on the purchase costs of chemicals but also the hidden costs of chemical usage. The CCP will allow GEES to track and analyze all costs associated with chemical management. Based on these findings, GEES can target areas for improvement.

For example, the total cost of chemicals includes a cost for the following:

1) unit cost;

2) cost of ownership (warehouse space, inventory taxes, insurance, obsolescence, spillage, permits, utilities, actual cost of material in inventory, etc.);

3) cost of acquisition (preparation and review of Request For Quotes (RFQ), order processing and transmission, certification, accounts payable, procurement negotiations, etc.);

4) cost of delivery (freight, premium freight for expediting, on-site distribution, waste and container disposal, packaging and repackaging, etc.);

5) cost of receiving/handling (labor, lift trucks, special storage and delivery equipment, training costs, MSDS management, etc.);

6) cost of application and usage (direct labor, equipment, misapplication costs, utilities, physical hazard liability, shutdowns and restarts in the event of shortage, etc.);

7) cost of disposal (fees, waste collection, recycling coordination, disposal containers, storage, recordkeeping/reporting, training, permits, regulatory fines, site remediation costs, etc.); and

8) cost of compliance (labor, utilities, permits, fees for air pollution control devices, waste water treatment, solid and hazardous waste treatment, monitoring and maintenance, training for Hazard Communication and Personnel Protective Equipment (PPE), training for emergency preparedness and response, training for DOT Hazardous Materials Transportation, etc.).

An example of a Chemical Cost Profiler can be found in Table 3, which will be used to help identify elements associated with the total cost of chemicals. With this resource, a list of the 20 most expensive chemicals at GEES will be prepared. These cost elements will be calculated on a plant-wide and area-specific basis allowing GEES to identify the chemical elements with the greatest impact on total cost. The integrated supplier and the Chemical Management Coordinator are responsible for completion of this task by the end of the third quarter 1998.

The CCP addresses several items that had not previously been considered at GEES, such as the cost of inventory -- not just purchase cost but also inventory turnover time. In slow markets, inventory can lose value. Thus, it is important to keep only the inventory that is necessary to complete the job task. GEES has a goal this year of turning inventory over 20 times; by using the newly implemented inventory levels established within the CMP, this goal can be met.

TABLE 3

CHEMICAL COST PROFILER

Cost Element	Cost
Unit Cost:	
Price of material (minimum buys/pkg size)	
Inventory turns/GE Spec	
Cost of Ownership:	
Warehouse/facilities data	
Utilities	
Insurance/security	
Materials handling labor	
Permits/reporting	
Cost of material invested in inventory	
Cost of Acquisition:	
Sourcing	
P.O. processing	
Order transmission	
Receiving	
Paperwork matching	
Discrepancy resolution	
Certificate of analysis and test costs:	
Procurement specification costs	
Taxes	
Chemical Review Board labor	
Cost of Delivery:	
Inbound freight	
Outbound freight (delivery costs):	
Truck costs	
Traffic manager	
Premium freight for expediting	
Waste and container disposal	
Special handling (e.g., dry ice, etc.)	
Material packaging costs	
Repackaging labor costs	

TABLE 3

CHEMICAL COST PROFILER
(continued)

Cost Element	Cost
Cost of Delivery (continued)	
Obsolete inventory costs:	
Product value depreciation	
Disposal	
Incorrect material delivery	
Spill cleanup	
Cost of Receiving/Handling	
Onsite warehouse space	
Onsite crib space	
Office space	
Labor for receiving	
Labor for material handlers	
Lift trucks	
Internal delivery carts	
Waste transport vehicles	
Special transport vehicles	
Labeling equipment	
Training costs:	
40 hour RCRA	
MSDS management	
EH&S support (local and group)	
Waste handling personnel	
Health and safety equipment	
Cost of Application and Usage	
Application/specification engineering	
Direct labor	
Allocated overhead	
Equipment/maintenance of equipment	
Performance/product quality/liability	
Premature equipment failure	
Building costs	

TABLE 3

CHEMICAL COST PROFILER
(continued)

Cost Element	Cost
Utilities:	
Drying	
Rinsing/flushing	
Heating	
Cooling/refrigeration/freezing	
Physical hazard liability:	
Employees/training/personal protective equipment	
General public	
Environment	
Equipment/containment	
Lack of supplies costs:	
Production efficiency losses	
Shutdowns and restarts	
Cost of Disposal:	
Disposal fees	
State/local specific hazardous waste fees	
Disposal container costs	
Storage costs/90 day and SAP	
Recordkeeping/reporting	
Training	
Permits and other regulatory fees	
Regulatory fines	
Profiling/segregating	
Packaging/labeling	
Transporting	
Other intangibles	
Cost of Control:	
Air pollution control devices:	
Labor, utilities, permits, fees	

TABLE 3

CHEMICAL COST PROFILER
(continued)

Cost Element	Cost
Waste water treatment:	
Labor, utilities, permits, fees	
Solid waste treatment:	
Labor, utilities, permits, fees	
Hazardous waste treatment	
Labor, utilities, permits, fees	
POTW charges and fees	
Monitoring costs/inspections	
Maintenance and repair/preventive maintenance	
Training	

Along with the CCP, newly established minimum and maximum chemical levels that have been installed into the Compass System will further reduce chemical costs. The chemical inventory levels were created by forming a team of all interested parties and reviewing historical chemical usage data to establish accurate inventory levels. With inventory reduction in mind, the team was careful not to lower quantities too low in order to avoid a production stoppage. Monthly reports from the chemical tracking system will be used to monitor chemical usage, which will indicate if the inventory levels need to be adjusted.

The new chemical levels also impact chemical costs associated with excess inventory, which leads to higher chemical reporting fees and waste disposal costs. High reporting fees result from exceeding EPRCA reporting thresholds. Furthermore, hazardous waste generation often occurs because GEES was storing excess chemical after its shelf-life had expired. Another cost associated with excess inventory is warehouse storage space. The new chemical levels will aid in reducing over purchasing and thus free valuable floor space for additional engine parts and tooling. Other cost savings, such as those associated with chemical tracking, will be discussed in detail in Chapter Seven.

CHAPTER SEVEN

PROCEDURES/IMPLEMENTATION

New Chemical Approval Process

The CMP includes a protocol for the approval of new chemical use. The approval system is now an integral part of the "normal" purchasing procedures. A "new chemical approval request" form must be completed before a new chemical can be purchased. Figure 2 illustrates the form that GEES is now using to approve chemicals. The form illustrates the critical elements of concern and divides the approval process into three stages.

Part A - Completed by the requester

Part B - Completed by the Chemical Management Coordinator

Part C - Completed by the Chemical Review Board

The person requesting the chemical completes part A of the Approval Form. This section directs the requester to identify the name and manufacturer of the chemical. The requester then determines if the chemical is included on the Approved Chemical List. If so, a current (less than 3 years old) MSDS must be on file.

If the chemical is not on the Approved Chemical List, the person requesting the chemical completes the site-specific screening section and delivers supporting documentation, including the MSDS, via plant mail or by hand to the chemical management coordinator. The coordinator then completes Part B and transmits the form to the Chemical Review Board.

Chemical Review Board

To ensure the thorough evaluation of all aspects of the new chemical's impact on the facility, GEES has established a Chemical Review Board to review new chemical approval requests. The Chemical Review Board reviews the form and completes Part C of the Chemical Approval Request Form in which it states its decision on the acceptability of the particular chemical. Approval is based on the considerations identified in Part C. If the chemical appears that the chemical is not forbidden, does not represent a duplication, meets all quality control requirements, will not adversely impact the health and safety or environmental compliance at GEES, then and only then will it be approved.

The Board either will meet collectively or individually for each approval; each member (or alternate) must be involved in each approval. Current Board members and their professional backgrounds are shown in Table 4. The board meets at least once a month as the need arises. Common issues that the Board addresses are also noted in Table 4.

NEW CHEMICAL APPROVAL REQUEST

The following information must be provided to purchase new materials for each work area. Obtain MSDS, attach this form and Submit to the Chemical Management Coordinator.

A. To be Complete by Requester:

1. Material Name :_____
2. Synonym/s :_____
3. Manufacturer:_____
4. Does the chemical already appear on GEES's Approved Chemical List? Yes No
5. What date is on MSDS?_____Is the MDSD file date < 3 years old Yes No

   If No, obtain new MSDS and continue. If Yes to both questions, stop here!
6. Country of Origin (to determine import implication)_____
7. Chemical Formulation for each component: (Attach mandatory MSDS and provide the following:
   a. Chemical Name: _____
   b. CAS Number: _____
   c. Concentration in Chemical:

   _____

   _____

   _____

   _____
8. Estimated annual use:_____
9. Maximum anticipated inventory of chemical:_____
10. Does the chemical have a limited shelf-life? Yes No If so, what system will be used to ensure shelf-life is not exceeded.

_____

_____

11. Packaging requirements for chemical:_____
12. Storage location/type of storage for chemical:_____
13. Any Health and Safety warnings on MSDS? Yes No
14. Purpose of Chemical:_____
15. Identify location/facilitator for area where material will be used:_____
16. How is chemical to be used?_____

_____

17. Ultimate disposition of chemical:_____

_____

B. To be completed by Chemical Management Coordinator

1. Does the chemical already appear on GEES's ACL Yes No
2. Is it on the Forbidden and Red Flagged list? Yes No
3. Is there an acceptable substitute already being used on-site? Yes No

   If so, please give the name of the substitute: _____

C. To be completed by the Chemical Review Board

1. If the chemical is on the ACL for other sites, have they had any problems with the use of the material? Yes No

   If so, please describe problems and resolutions, if any: _____

   _____

   _____

2. Is the chemical regulated under the CAA, CWA, RCRA, EPCRA, TSCA, Yes No

   If so, please list all that are applicable: _____

   _____

   a) Any environmental compliance issues? _____

      _____

      _____

   b) Any waste disposal issues? _____

      _____

      _____

3. Any health and safety issues? _____

_____

_____

4. Will the chemical meet product quality control specifications?

   a) Military Specification Yes No

   b) Certification of Analysis Yes No

   c) Certification of Manufacture Yes No

5. If not, give options for substitution resolution: _____

_____

_____

FIGURE 2. NEW CHEMICAL APPROVAL REQUEST FORM

TABLE 4

COMPOSITION OF CHEMICAL REVIEW BOARD

- Environmental Specialist: waste, water, and air compliance assessments
- Industrial Hygiene Specialist: chemical exposure and TSCA health assessments
- Safety Specialist: fire and explosion hazard and spill response assessments
- Quality Specialist: production quality assurance and control assessments

ACL Electronic Database and Website

The ACL serves as an important chemical management tool because it requires GEES to obtain ACL approval before a chemical is ordered. If the chemical is not listed in the ACL, the chemical cannot be purchased without prior approval by GEES's Chemical Review Board. In addition to site approval, approval on a building-specific basis adds additional environmental, health, and safety benefits.

Limiting the type and quantity of chemicals entering the plant is important to ensure that (1) regulatory compliance requirements are not triggered, costs of chemical purchases are minimized, and costs of on-site management are minimized.

GEES has worked with the Chemical Review Board and other GE Aircraft Engine facilities to develop a website that includes site-specific Approved Chemical Lists (ACLs) for easy electronic access and review by all sites. GE Aircraft Engines, located in Evendale, Ohio, maintains the website. Through the website, any GEAE site can determine which sites are using which chemicals. If GEES is considering the use of a chemical which is on the ACL, but has not yet been approved for use at a particular facility, the Chemical Management Coordinator can contact the sites that are using the chemical. However, even if the chemical is being used by other GEAE sites, GEES must still evaluate the new chemical's potential impact on regulatory compliance and chemical management at its facility.

In creating the GEES-specific database of all currently used chemicals, each MSDS was copied and sent to an outside contractor for scanning into the ACL. This effort was monitored to ensure that all currently used chemicals had an MSDS sheet input into the ACL. After scanning was completed, spot-check inspections were conducted to insure that the list was accurate. If a new chemical is approved by GEES, it must be added to the electronic ACL database. This is accomplished by providing the information to the EHS chemical management coordinator (Tami Norwood). The information is added to the ACL within two days.

Currently, the ACL is available only to Environmental, Health & Safety Team; However, GEES has allocated money to place computer terminals throughout the facility by May 1998. This will eliminate the need to store paper copies of MSDSs and provide fast, accurate electronic copies that is accessible to each employee on the shop floor. The ACL has also been designed to ensure that GEES has a current MSDS for each chemical, thereby ensuring HAZCOM compliance.

MSDS Maintenance

Accurate, up-to-date, and accessible MSDSs are required for any chemicals handled on-site. As stated previously, an MSDS must be submitted before a new chemical can be considered by the Chemical Review Board. Typically, obtaining and submitting the original MSDS is the responsibility of the chemical requester. After approval of the chemical, the MSDS is immediately entered into the database. Periodic MSDS audits is the responsibility of the Chemical Management Coordinator (Tami Norwood). Anytime a chemical is ordered, the "purchasing gatekeeper" (Ferguson Inc.) ensures that the MSDS is on file. The following is a listing of general guidelines developed for updating MSDSs:

- All MSDSs should be no more than 3 years old
- MSDSs must be updated with any new formulation
- A new MSDS is required anytime the chemical is procured from a different manufacturer
- All storage and use areas must have access to electronic copies of the MSDS for each chemical in the area (accomplished by locating designated MSDS computer terminals throughout the GEES facility)

Chemical Tracking System

Another software system is GEES's inventory management system called COMPASS. This system has been managing GEES's inventory materials since 1993. To provide a complete chemical management program for GEES, a chemical tracking software program that was compatible with COMPASS needed to be located. Several chemical tracking systems were identified that could be integrated into COMPASS. With the help of a GE Aircraft Engine COMPASS expert, it was discovered that the current system could in fact provide chemical inventory reports without software augmentation. With little additional investment, GEES's Systems Department developed a software program to perform chemical tracking. GEES now has the capability to create daily, weekly or month reports that accurately reflect chemical inventory levels, usage, inventory costs, and chemical transactions. This capability provides information on where, when, and how much of the chemical is being used in the facility.

The chemical tracking system has been further modified to set minimum and maximum chemical levels to aid in compliance with annual chemical reporting requirements such as those in EPCRA Sections 301, 311, and 312 and Form R (313). Annual chemical usage reports can now be generated by simply querying COMPASS for a report that can be generated from a Microsoft Access® database. GEES no longer needs to spend countless hours manually collecting chemical information for Federal and State chemical reports. For example, transaction reports can provide data that reflects inventory usage; chemicals with low or no usage can be identified to determine if the chemical minimum and maximum levels need to be altered or if the chemical can be eliminated from inventory. This electronic report will be placed on the shared access drive that provides the Chemical Management Coordinator with real-time chemical monitoring. In summary, data generated from the chemical tracking system can be used to target areas for continued improvement.

Chemical Sweeps and Inventories

Annual plant-wide chemical sweeps will be conducted, beginning in 1998. A chemical sweep is a physical inventory of all chemicals at GEES and involves manual searches and the recording of all chemicals found in each work area. The physical inventory is used to screen out duplicative, undesirable, overstocked, and expired chemicals and to evaluate the effectiveness of the Integrated Supplier (Ferguson). Another benefit of chemical sweeps is that the reduction of redundant small purchases of chemicals allows larger common purchases that will decrease overall purchase costs and the administrative overhead associated with MSDS management, environmental reporting, and related activities. In addition to identifying redundant chemical purchases, the chemical sweep can also identify instances of uncontrolled chemical purchases, such as local hardware store purchases. This information can be used to further improve chemical management at GEES and to reduce costs.

Overstocked chemicals will be consolidated and, if unopened, will be returned (if possible) or redistributed (if needed) elsewhere in the plant. At a minimum, the overstocked chemicals will be identified and amendments made to COMPASS inventory levels to prevent future overstocking.

Expired chemicals located during the chemical sweeps will be evaluated for possible shelf-life extension. It may also be possible to identify other uses for these chemicals if the expiration date is non-critical. In either case, if there is a valid use of the chemical, the date will be adjusted on the container and in the chemical database. If needed, restrictions will also be clearly marked on the chemical container due to the date extension. The integrated supplier and the Chemical Management Coordinator will work together to determine the cause of chemical shelf-life exceedances; minimum and maximum chemical inventories will be amended accordingly.

A Microsoft PowerPoint® presentation (see Appendix B) has been developed to train chemical sweep team members on sweep methods.

In-Plant Controls

To enhance in-plant chemical control, GEES implemented the "integrated supplier" concept in 1994. This allowed GEES to dedicate on-site purchasing personnel to specialize on hardware and tooling purchases. Ferguson, Inc. was contracted to handle all expendable shop supplies. Their initial contract with GEES required Ferguson only to maintain adequate inventory levels and ensure that chemical specifications were met. As a result of the CMP project, and with GEAE's involvement, GEES renegotiated the Ferguson contract to require support of on-site chemical management. GEES now uses Ferguson to perform chemical control, procurement control, inventory management, and inventory control. Figure 3 further details the services that Ferguson provides for GEES.

With full implementation of the new chemical management program and the services of the integrated supplier, chemical management at GEES is evolving into a mature and effective program.

Other In-Plant Controls

In-plant controls, such as chemical handling, storage and distribution, are critical to the safe and efficient movement of chemicals from receiving to end use. By implementing in-plant controls, other aspects of the chemical management program are reinforced. These include chemical purchasing, inventory control, and employee commitment.

Chemical Handling

Another method to control the distribution of chemicals within the GEES facility is the Chemical Handling Team. The team consists of employees that have been trained in the movement of all chemicals used at the Facility. At GEES, the Chemical Handling Team consists of one receiver, two chemical handlers, and the Chemical Management Coordinator. The hourly associates on the team receive, transport, and store all chemicals on site. The team has reduced chemical exposure by:

- minimizing the number of employees handling chemicals,
- ensuring spill clean-up and reporting,
- preventing chemical distribution to unauthorized areas, and
- ensuring that chemicals are labeled and stored in approved containers.

A. Chemical Control

1) Review approved chemical list or "sanitize" existing list to eliminate unnecessary and redundant chemicals.
   - Authorize chemical acquisition by work center or authorized used
   - Authorize chemical acquisition by quantity and packaging
   - Specify labeling
   - Ensure current MSDS on file for every chemical

2. Work with GEES to eliminate "unofficial" chemical purchase and use.
3. Identify and validate chemical product alternatives where appropriate.
   - Get GEES approval of product substitutions
   - Meet military specifications where

B. Procurement Control

1. Rationalize (reduce number of) suppliers.
   - Reduce administrative cost
   - Increase volume with individual suppliers
2. Implement commodity buying strategy.
   - Purchase at best value for total chemical life cycle (may not be best per unit price)
   - Reduce order cycle time
3. Provide appropriate response to emergency, stock, and specialty orders.

C. Physical Inventory Management

1. Rotate stock and use shelf-life-limited chemicals in timely fashion.
2. Minimize and eliminate on site storage of chemicals.
3. Liquidate excess or obsolete inventory.

D. Waste Stream Management

1. Remove, reduce, recycle, and/or resell excess chemical inventory, with EHS approval.
2. Remove, recycle, or return empty drums and other containers.

FIGURE 3. GEES INTEGRATED SUPPLIER DUTIES

The team has been trained and is familiar with the lifecycle of each chemical, the by-products/waste that will be generated through the use of each chemical, how and where each chemical should be stored, chemical-to-chemical compatibilities, and chemical quantities. The team also works closely with Ferguson to ensure that inventory chemical levels stay within the designated minimum and maximum quantity limits.

The Chemical Handling Team is also familiar with chemical users and processes in the shop, which prevents employees from receiving chemicals that are not approved for use in their work area. Figure 4 provides examples of the responsibilities of GEES Chemical Handlers.

Ordering

- Assesses quantities on hand
- Develops order report
- Orders approved chemicals only
- Records purchase orders from order reports

Receiving/Storage

- Receives deliveries
- Checks ACL and MSDS
- Verifies quantity and accuracy
- Unloads deliveries to storage location
- Records chemicals
- Ensures compliance with applicable record-keeping requirements
- Inspects storage areas (weekly)
- Maintains spill containment systems

Replacement/Distribution

- Receives chemical requests
- Records quantity of chemicals
- Delivers chemicals
- Collects used chemicals and containers
- Stores chemicals and containers
- Dispenses chemicals and labels

Disposal

- Weekly inspection of Hazardous Waste Satellite Areas
- Records wastes received
- Segregates and stores wastes
- Checks for leaks
- Moves containers to loading/unloading area for shipment
- Loads truck with containers
- Ensures compliance with applicable DOT requirements
- Sends documentation to EHS

FIGURE 4. GEES CHEMICAL HANDLER DUTIES

In-Plant Distribution Procedures

Although the safe distribution of chemicals can encompass a variety of EHS areas, key chemical management activities at GEES are discussed below.

Receipt of Chemicals

Chemicals are received through one designated receiving area. When a chemical arrives on-site, the receiver verifies that the chemical is an approved chemical (i.e., compares against the Approved Chemical List). This screening procedure ensures that unauthorized chemicals do not enter the facility. Chemical receipt also involves recording quantities of chemicals and materials purchased/procured and comparing these to established minimum and maximum inventory levels.

In the event an unauthorized chemical is delivered, the following steps will be taken:

- The chemical will be received and quarantined temporarily in the receiving area.
- The receiver will notify the requestor and the Chemical Management Coordinator of the arrival of the material.
- The requester must call the supplier and obtain the MSDS. In addition, the requester must review the MSDS with the Chemical Management Coordinator and obtain Chemical Review Board approval.
- The requester must show the receiver a copy of the MSDS and the completed New Chemical Approval form. Only then, will the receiver deliver the chemical.

Segregation and Storage of Chemicals

All chemicals will be stored in appropriate containers that include appropriate secondary containment. For example, 55-gallon drums must be stored on spill pads. The chemical storage containers and containment areas must be inspected weekly to assure technical and legal compliance. Access to storage areas is limited to authorized personnel (i.e., chemical handlers).

Transfer, Loading, and Unloading

The risks associated with the transfer, loading and unloading of chemicals include leakage from defective containers and deteriorated hoses, inadequate training, and improper equipment – all of which can result in personal injury or accidents.

To avoid these incidents, GEES has implemented the following chemical control tools.

- Weekly inspections of transport equipment
- Weekly inspections of chemical/hazardous waste storage areas
- Weekly inspections of portable spill pallets used to transport raw materials and hazardous waste
- Weekly inspections of secondary spill equipment for all in-plant chemical/hazardous waste storage areas
- Annual training on spill containment and emergency response procedures
- Assure fully trained and equipped Emergency Response Team
- Annual training on HAZCOM and waste management procedures

Hazardous Waste Shipments

Packaging and shipment of materials going off-site must follow national and state Hazardous Materials Transportation regulations found in 49 CFR Parts 100 to 177. All of the members of the Chemical Handling Team have been trained in both DOT and RCRA regulations. Annual RCRA training and biannual training on DOT is performed by an outside consultant. Each member is

familiar with the chemical shipment procedures discussed in Chapter Five. They are also familiar with the requirements of hazardous waste, packaging, labeling, and transportation requirements. GEES has several other resources available like Chemtrec (1-800-424-9300) for emergency response and GE's CEP Hazmat Hotline (1-800-381-0664), operated by Radian International, for chemical information.

Management Support

GEES's Chemical Management Plan has become a coordinated effort among several operational units. This is necessary due to the complexity and interactive nature of program objectives: cost reduction, compliance assurance, and minimization of liability. Management support ensures that communication among operational units occurs. At GEES, Inc. the program is supported by the Service General Manager and Team Leaders. GEES has dedicated a person to serve as the Chemical Manager Coordinator (see Table 5).

Management support is also important to obtain employee commitment, which has been lacking in the past. Commitment is enhanced with a sense of program ownership. For example, the Chemical Management Coordinator and the EHS Team Leader own the chemical processes.

Established Goals

To drive and maintain the new Chemical Management Program, GEES believed it was necessary to develop specific goals. Goals were established with the aid of the EHS Department to ensure consensus among program participants. The goals and commitments developed for 1998 are also listed in Table 5.

GEES will update goals and commitments on a as needed basis by the Chemical Management Coordinator. These goals and designated ownership will provide the road map for the Chemical Management Program.

Ownership

GEES has also developed software program ownership that supports the Chemical Management Program. All too often in large companies, a system is installed but is not adequately supported, e.g., training, maintenance, and trouble-shooting. Table 6 provides a listing of some of the computer support systems available to GEES, Inc.

TABLE 5

GEES CHEMICAL MANAGEMENT COMMITMENT*

Site Name: GE Engine Services, Inc.		
Commitment of Personal	**Names**	**Time (%)**
Chemical Management Coordinator	Tami Norwood	50
EPCRA Coordinator	Tami Norwood	25
TSCA Coordinator	Jim Nethercott	15
Hazardous Waste Coordinator	Jim Nethercott	50
Hazardous Material Driver	Bill Carlisle	100
Hazardous Material Driver	Brent Eves	50
Goals	**Person Responsible**	**Budget**
Reduce the number of chemicals	Tami Norwood	$10,000
Reduce EPCRA/Form R Chemicals	Tami Norwood	$10,000
Reduce Waste Generation	Jim Nethercott	$20,000
Significant Budget Commitment	**Person Responsible**	**Budget**
ACL Computer assess to all employees	Tami Norwood	$30,000
Conduct Chemical Sweep April 1998	Tami Norwood	$65,000
EHS Manager Confirmation		
Printed Name: Steve Sawyer	Signature:	Date:
Chemical Management Coordinator	Printed Name: Tami Norwood	
Signature		Date:

Note: Form must be updated as needed but at least annually.

Outside Contractors

In the past, outside contractors performed work on-site without notifying the EHS Department. This occurred because a disconnect between the Purchasing and EHS Departments interfered with timely communication. This caused safety and environmental problems at the facility. For example, the EHS Department would receive complaints from the shop employees such as "If contractors are not following the safety, environmental, and chemical rules, why do you expect me to?"

TABLE 6

COMPUTER SYSTEMS AND CONTACTS ACCESSIBLE TO SITE STAFF

SITE NAME: GE Engine Services, Inc. - Strother

DATE: 9-27-97

COMPUTER SYSTEM	PURPOSE	CONTACT NAME	CONTACT PHONE	LOCAL EXTENSION
GEAE Helpline	Phone service for troubleshooting	N/A	(513) 243-HELP	346, 395
GEAE Approved Chemical List (ACL)	Maintains database of chemicals approved for use at specific sites; maintains MSDS information	Janet Grau, Kathy Howell	(513) 243-9293	346 395 665
MSDS Review	Provides read-only files of MSDSs	Janet Grau, Kathy Howell	(513) 243-9293	346, 395, 665
Local Computer (Site-Specific) Systems*	Chemical tracking software, Provide troubleshooting service	Mark Propps	(316) 442-3600	468
Purchasing	Back-up responsibility for chemical orders	Sharon Ellis	(316) 442-3600	460
Ferguson - Integrated Supplier	Responsible for chemical orders**	Ross Hicks	(316) 442-3600	704

To eliminate interdepartmental communication breakdowns and employee complaints, GEES has developed the Contractor Pre-work Safety Review, which is used to discuss the facility's safety and environmental rules, along with a complete review of all chemicals used. For an outside contract employee to work at GEES, he or she must meet with the Chemical Coordinator. After the meeting and before starting work, the contractor must sign the Contractor Safety Review sheet (see Figure 5) on which the contractor certifies that they have read and am familiar with GEES's safety requirements. Only then is the contractor allowed to proceed with the work. Furthermore, the GEES project engineer is also responsible for the contractor's safety while working on-site and is required to sign the form located in Figure 6 "Contractor Checklist." If inclement weather develops, the project engineer is also responsible for ensuring that his contractors are notified.

Finally, all contractors are responsible for training their own employees on HAZCOM, OSHA, and any other regulations that may be applicable. GEES has the right to stop work or change contractors if EHS rules are not being followed.

CONTRACTOR SAFETY RULES

These safety rules apply to all contractors who perform work on GEES Company property. Contractors are required to review, sign, and comply with these instructions as a condition of the contracts placed with them. If the facility or Business has developed standard contractor instructions, file a copy in this tab.

1. All health, safety and environmental laws and regulations adopted in this jurisdiction are applicable and shall be complied with when working on GEES property.
2. All contractors and subcontractors must have valid Worker Compensation and Certificates of Insurance (or local equivalents) before starting work.
3. Contractors must provide an MSDS (or local equivalent) to the Project Engineer and EHS Team Leader for each chemical, compound or substance brought into the plant.
4. Before starting work, safety precautions shall be discussed with and approved by the Project Engineer and EHS Team Leader.
5. Appropriate safety protection must be worn at all times when working on GEES property.
6. When work is performed in confined spaces, appropriate confined space procedures will be followed. Safety equipment and training are mandatory.
7. Contractors will provide all necessary training, personal protection equipment, monitoring devices, safety equipment, and attendant(s). Additionally, contractors will supply documentation on training of its employees before bringing them on-site.
8. Contractors must handle any wastes or residues in accordance with local environmental regulations. Coordination with the EHS Team Leader is required.
9. Contractors may not use GEES tools, moving equipment or stock room supplies to perform work without prior approval of the contracting engineer.
10. "No smoking" areas are clearly marked by signs. Smoking is restricted to designated areas only.

Having read and understood the above instructions, I _____,
(Name of contractor employee)

on (Date) _____ representing _____, agree to comply with the requirements stated. (Name of Contractor Company)

FIGURE 5. CONTRACTOR SAFETY RULES

CONTRACTOR CHECKLIST

GEES Project Engineers who oversee contractor activities must review the questions below with the contractor and answer "Yes" prior to the start of work.

Contractor has:

_____1. Reviewed the facility environmental, health and safety "Contractor Safety Rules" and informed employees assigned to the work-site of requirements.

_____2. Provided applicable MSDSs for products or processes that the contractor will use during the project.

_____3. Received copies of applicable MSDSs for chemicals that contractor employees are likely to encounter at the work-site.

_____4. Been informed of protective equipment and safety precaution requirements.

_____5. Been informed of daily storage practices to be observed (clean-up, proper storage of equipment, proper removal of waste and materials).

Contractor Contracting Engineer

Signature: _____

Date: _____

FIGURE 6. CONTRACTOR CHECKLIST

GEES CMP Implementation Impact on Employee Attitudes

The non-committal attitude that some GEES employees had concerning chemicals has been difficult to change, but the implementation of Chemical Management Program is helping change them. GEES is spending money and allowing ownership in chemical management and the employees are noticing. GEES support of the on-line MSDS access system lends further credence to GEES's commitment to controlled chemicals management.

Employees are also aware of the establishment of the Chemical Review Board. The Board has signaled that chemical use is hereinafter controlled. Initially, employees thought that the Board only restricted chemical usage, but later realized that the CRB was also vigilant about safety. Employees also believed that the Board further retard an already slow process, but it has proven to be quicker and more accurate in chemical approval than had been the case before the use of the new chemical request sheet and the Approved Chemical List (ACL). The new chemical request sheet eliminated the past problems of not knowing how to get a chemical approved and

the frequent form revisions and phone calls between the requester and the chemical management coordinator.

The Approved Chemical List also speeds up the process by providing accurate data on chemicals that are approved for GEES. In the past, GEES had no way of determining if the new chemical that had been requested was already present at the site. GEES was also duplicating MSDSs that were already present.

The chemical sweep scheduled for May 1998 has also changed some attitudes and encouraged cooperation from the shop employees. They realize that GEES management must be serious since the sweep will be time-consuming and expensive.

Among its "in-house controls," GEES has created a chemical handling team that is responsible for managing chemicals from cradle to grave. This commitment from GEES was well received by shop employees.

Employees are aware that compliance with the CMP must go beyond engineering controls to minimize chemical exposures and extend to effective chemical waste management. For example, new employees are required to have area-specific HAZCOM training before they are allowed to report to work. In addition, area-specific HAZCOM training is conducted annually by the EHS Team.

Employee training is enhanced through training on more than just HAZCOM and Area Specific HAZCOM. In 1998, the employees will receive training on the following new chemical management topics: (1) Chemical Management Manual, (2) on-line MSDS system, (3) Chemical Review Board, (4) chemical sweeps, (5) in-house controls and (6) chemical handler duties. With the new training package, management/shop support, software packages, and designated resources, employees understand that sound chemical management is more than just regulatory compliance.

CHAPTER EIGHT

CMP MANAGEMENT THEORIES

Management Theory

To ensure that the Chemical Management Program was well organized and manageable, several management theories were incorporated.

Demings "Out of the Crisis" Theory

Deming's "Out of the Crisis" theory prescribes the following 14 steps:

1. create constancy of purpose for improvement;
2. adopt a new philosophy;
3. cease dependence on inspection to achieve quality;
4. minimize total cost by working with a single supplier;
5. improve constantly;
6. institute on the job-training;
7. adopt and institute leadership;
8. drive out fear;
9. break down barriers between management levels;
10. eliminate slogans and targets for the work force;
11. eliminate numerical quotas;
12. eliminate the annual rating or merit system;
13. institute a program of education and self-improvement for everyone; and
14. use everyone in the company to accomplish the transformation.

The elements used to establish GEES's chemical program are:

1. adopt a new philosophy;
2. institute job-training;
3. adopt leadership;
4. break down barriers between management levels; and
5. use everyone in the facility to accomplish change.

GEES adopted a new philosophy that recognized that chemical management is good business for GEES. GEES has also instituted new on-the-job training that incorporates chemical management elements, thus taking training beyond routine HAZCOM training. By working with all levels of employees to create the new system, GEES is breaking through communication barriers between salaried and hourly employees. This work is still continuing.

However, some of Deming's points were not incorporated into GEES's chemical management program. These included elimination of (1) targets and numerical quotas, (2) inspection points, and (3) fear.

Numerical data is needed to identify shortfalls in the new system. If changes that have been implemented reduce overstocking and the expiration of shelf-life chemicals and inventory levels, GEES can quantify the amount of money the new system is saving. If the CMP saves company resources, increasing management support is anticipated.

GEES did not eliminate inspection to ensure quality. GEES must perform spot inspections of shop chemicals, audit MSDSs, and monitor purge levels to ensure that the established program is fully implemented and working.

In GEES's environmental, health, and safety department, it is general practice to monitor and audit potential areas of non-compliance. GEES uses fear on noncompliance as a motivational tool to adhere to GEES's EHS requirements. Employees know that the intentional disregard environmental, health, and safety regulations could mean criminal prosecution and company disciplinary action or termination.

GE Managerial Concepts

Another managerial approach incorporated into the CMP is one that GE is currently using throughout the company. This approach involves three key concepts to streamline processes. The first concept is "Action Workout" in which three things can happen: participants get a mental workout; they can take unnecessary work out of their jobs; or they can solve problems together (Andrews 1993.) The workout involves a group of 5 to 40 people picked by management from all ranks and functions. The group meets at a neutral location (i.e., hotel conference room) for three grueling days of work. During the first day and a half, the participants list complaints, debate solutions, and prepare presentations for the final day. The final day is spent with the boss. The boss, ignorant of what has been going on, comes back and takes a place at the front of the room. One by one, team spokespersons rise to offer their proposals. The boss can make only three responses: agree on the spot, say no, or ask for more information, in which case a team is chartered to get it by an agreed-upon date.

This concept was used to establish the minimum and maximum chemical inventory levels in the CMP. The workout team consisted of seven interested parties that worked together successfully to establish new chemical inventory levels.

The second concept was "Best Practices." This involves reviewing other top company's best management practices. GE has established a system that allows for their employees to share and learn best management ideas from other Fortune 500 companies, which has taught GE three

valuable lessons. The first is that other companies have much to teach GE. Second is the value of continuously improving processes, even is small ways, rather than undertaking radical change. The third is that processes need owners with people whose responsibility and authority reaches through the walls between departments (Andrews 1993). This theory was used at GEES to aid the development of the Approved Chemical List, Chemical Review Board, and Contractor Pre-work Safety Review. GEES fine-tuned these practices to meet their site-specific needs. This involved a complete review of the current system to identify resources needed to incorporate best practices.

The third concept is "Process Mapping." A process map is a flow chart showing every step, no matter how small, that goes into making or doing something (Andrews 1993). Elaborate maps often take months to complete and cover entire walls of conference rooms. GE has found that when a process is mapped, they have the ability to manage an operation in a coherent way from start to finish. This management process has enabled GE to meet and exceed customer demands of better quality and performance from GE products. This concept was used to detail the Chemical Approval Cycle, the DOT/IATA compliance procedures, and the Computer Tracking Software development. Each of these was mapped to identify its component steps. The process maps have simplified an otherwise complex system, allowing employees to quickly follow and complete process tasks. A copy the process maps can be found in Appendix G.

The Ten Commandments of Implementing Change Theory

Another concept that GEES uses to implement their chemical management program is the "Ten Commandments of Implementing Change" (Jick 1993). The ten commandments include the following steps:

1. analyze the current system and its need for change;
2. create a shared vision and common direction or goal;
3. separate from the past;
4. create a sense of urgency;
5. create a strong leadership role;
6. line up political sponsorship;
7. craft an implementation plan;
8. develop enabling structures;
9. communicate, involve people, and be honest; and
10. reinforce and institutionalize your changes.

All of these steps were used to create change in GEES new chemical management program. In establishing the new program, GEES analyzed the past system and adopt new procedures when

necessary. A new vision on how to manage chemicals properly has clearly separated the old program from the new. Current regulatory requirements aid in creating a sense of urgency and the new system is supported by a designated chemical management coordinator. The CMP, along with the procedures and tools that have been developed to implement it, are providing the enabling mechanism to facilitate change at GEES. Furthermore, they understand that the CMP will only be successful if it is adequately communicated through training and in-plant communications. Employees on the shop floor who use, handle, or manage chemicals have been involved in the establishment of the new chemical management program, which aids in institutionalization of the program.

By adopting these managerial steps has enabled GEES to implement the new system and change the way chemicals are managed. They realize that change in chemical management is difficult, but these steps have helped reduce the burden for both management and employees.

CHAPTER NINE

SUMMARY AND CONCLUDING COMMENTS

Summary

Though GE Engine Services, Inc. had a very effective environmental, health, and safety program, it did not have an efficient chemical management system. GEES's chemical management system lacked ownership, established goals, and management support. Other deficiencies within the old program were: (1) lack of a chemical approval system, (2) non-existent Chemical Review Board, (3) inadequate compliance assurance, (4) deficient in-house chemical controls, (5) inaccessible and redundant MSDSs, (6) inefficient chemical acquisition, (7) non-committal employee attitudes, (8) inadequate training, and (9) lack of a chemical tracking system.

With the implementation of this Chemical Management Program, all of these problems were addressed. With the Approved Chemical List (ACL) and Chemical Review Board, there is now established a chemical approval cycle and a Material Safety Data Sheet tracking system. The additional development of TSCA, DOT, and IATA chemical-shipping procedures has greatly enhanced GEES compliance with applicable requirements. The modification of the integrated supplier contract has eliminated the nightmare of unapproved chemicals entering the facility and has increased the accuracy of GEES's chemical inventory levels.

Revised training has changed the attitudes of GEES employees. All employees, both management and hourly, are realizing that chemical management is not only good business but provides a more enjoyable and safer work environment, thus increasing productivity. Moreover, the development and implementation of a real-time chemical tracking system that can track chemical inventory levels, shop transactions, and chemical costs and can provide weekly, monthly or quarterly reports is a boon to efficiency and compliance assurance. These reports will be used to reduce chemical cost and inventory control, and ensure compliance with annual Federal and State reporting requirements.

Other Impacts of the CMP

Beyond the CMP impact on chemicals at GEES, CMP chemical tracking can also be used to track non-chemical GEES inventory, such as drill bits, paper products, batteries, and light bulbs. Such items had not been previously tracked because no system was available. The CMP has provided a tool that can provide data on more than 2000 individual inventory items. This will aid GEES in meeting their 20-turn inventory goal by providing accurate data on high/low usage items. Currently, GEES is using the tracking system to reduce inventory costs associated with over-

buying. Furthermore, the newly established minimum/maximum levels will aid in eliminating these inventory concerns.

The tracking system has also provided GEES an accurate cost estimate of inventory items. Although GEES spends millions of dollars on shop supplies each month, an inventory cost on inventory was not available. The tracking system can produce a daily accounting report of the assets that are invested in shop supplies.

Concluding Comments

Although all of the goals that GEES has set out to accomplish with its Chemical Management Program have been attained, the company realizes that the continued investment of resources and management support is essential to long-term success. Only through a long-term commitment to the effective implementation of the CMP can the twin goals of increased profitability and decreased liability be sustained.

Future research is important to evaluate the success of CMP implementation. For example, a compliance audit should be conducted to ascertain the extent to which employees comply with CMP provisions. In addition, a cost-benefit analysis could productively determine the savings that were realized. Finally, the optimized CMP could be exported to other GE Divisions throughout the company.

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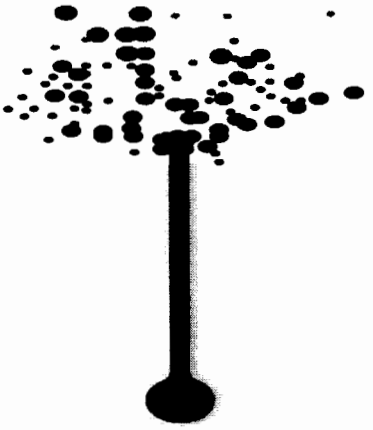
APPENDIX A: GEES CHEMICAL MANAGEMENT MANUAL

K. Prindable
S. Blue
S. Shelton
K. Tapia
J. Everett
M. O'Daniel
D. Buchanan

GE Aircraft Engines

GEES, Inc. - Strother



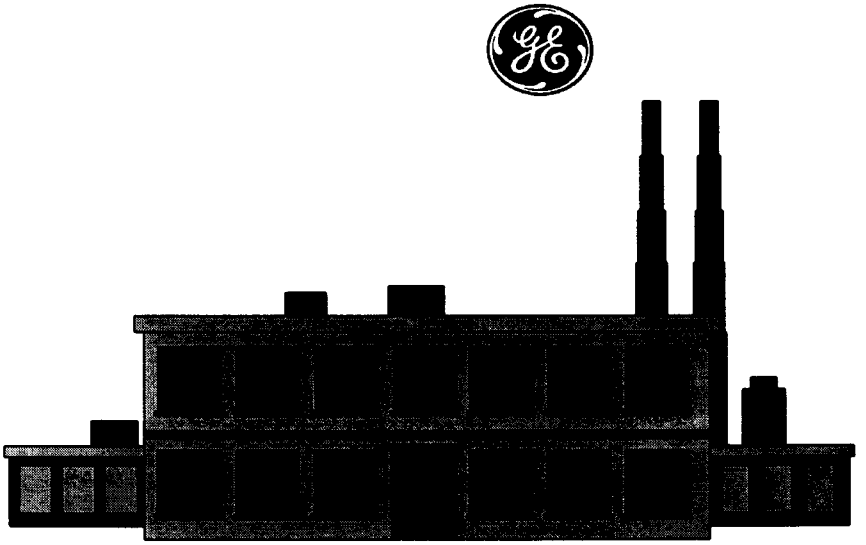
Chemical Management Manual

June 1997

TABLE OF CONTENTS

Chemical Management Manual

This manual has been established to formalize best practices for Chemical Management. It is an easy guide of reference to procedure manuals. All individuals who request/use chemicals at this facility should become familiar with this manual. By following the simple (why, what, who, where and how) format you will be able to reference the appropriate procedures/manuals.



I. Training

HAZCOM Training

A. Why

To educate employees about the chemicals they work with and the physical and health hazards known as "HAZCOM"

* HazCom is an OSHA Requirement

B. What

HazCom is: (Hazard Communication)

* MSDS
* Labeling
* PPE (Personal Protective Equipment) 
* Physical hazards
* Health hazards
* Waste Disposal
* Spill/Leak procedures
* Emergency Response
* Chemical handling

C. Who

Training needed for

* All employees (general training)
* All employees (Area Specific Chemicals)
* Facilitator

D. When

HazCom needed when:

* New employee
* New chemical
* Unfamiliar chemical
* Employee transfer
* Employee loan
* Periodic Training

E. Where

Training is needed:

* All areas of the shop
* EHS Manual C.6 - Hazard Communication
* Right-To-Know Stations

F. How

EHS coordinates general training.

Facilitator coordinates area specific training which includes employee transfers and chemicals new to the area.

Facilitator trained by EHS.

II. RCRA Training

A. Why

To educate employees of the proper handling, storage and disposal of hazardous waste

B. What

RCRA is: (Resource Conservation & Recovery Act)

* Labeling
* PPE 
* Physical hazards
* Health hazards
* Waste Disposal
* Spill/Leak procedures
* Emergency Response
* Chemical Waste Handling
* Chemical Waste Storage

C. Who

Training needed for

* All employees involved in Waste Activities.
* Facilitators/Associates where waste is generated by shop processes.

D. When

RCRA needed when:

* New employee
* Employee transfer
* Employee loan
* Annual Training

E. Where

Training is needed:

* All shop areas that generate hazardous waste
* SOP 5.20 (Strother Operator Procedure)
* Hazardous Waste Satellite Signs

III. Chemical Approval

A. Why

Identify management of chemicals from cradle to grave.

B. What

Educate Associates about chemical approval requirements. 

C. Who

* All Associates who:
  a. Request chemicals for procurement/engineering investigation
  b. Request sample chemicals
  c. Receive samples without requesting
* Contract Personnel
  a. Integrated Supplier - Ferguson
  b. Other Contractors (Bldg. Maint., Const., Support Services)
  c. Outside vendors

D. When

* Before Requesting/ Procurement
* Before requesting/ receiving samples
* Before Contractor work is performed

E. Where

* Chemical Management Manual (Procurement Section)
* Strother Operations Procedure 8.22 (Request for New Chemical Materials)
* EHS Checklist (EHS Manual Appendix D)
* Request for New Materials. Request Chemical
* Chemical Banned List (See Appendix A of Manual)
* Red Flag List (See Appendix B of Manual)

F. How

* EHS awareness training
* Review New Raw Material Flow Chart (See Appendix C of Manual)

IV. Emergency Response

A. Why

Employees/Environment & Safety

EPA/OSHA Requirement

B. What

A trained team that responds to unplanned chemical hazards.

C. Who

* EHS personnel
* Chem Clean Facilitators
* Maintenance Facilitator
* Plant Nurse
* Trained Associates

D. When

Initial Training

* 40 hour for emergency coordinator (on call list)
* 24 hours for remaining members

Annual Refresher

* 8 hours

E. Where

* Emergency Action Plan
* Contingency Plan
* EHS Manual B.2
* Current members list (See Appendix D of Manual)

F. How

EHS will coordinate all training

V. Procurement (Design Specification)

Determine need to buy 

A. Why

To standardize, limit the number and toxicity of chemicals brought into the facility.

To minimize the routes of entry, quantity, and toxicity levels of chemicals used in the plant.

B. What

Determine new buy versus in-house alternatives or less toxic alternative

C. Who

Propulsion Eng. (PE)

Process Quality Eng. (PQE)

EHS

Integrated System Supply (Ferguson)

Facilitators

Inventory Analysts

D. When

An unmet need arises or new requirement.

E. Where

EHS Change Management Checklist (See Appendix E of Manual)

Procurement New Raw Material Flow Chart (See Appendix C of Manual)

F. How

Use EHS Change Management Checklist (See Appendix E of Manual)

Review w/inventory analyst (PE & PQE) for possible alternates.

Review Shop Supply and engine accounts for equivalent chemicals

Obtain MSDS and have approved by EHS

Fill out EHS Change Management Checklist and New Raw Material Form

VI. Requesting

A. Why

To educate the requester on procedures to follow when requesting or accepting new materials, including samples.

B. What

Initiate formal request for material

C. Who

Propulsion Eng. (PE)

Process Quality Eng. (PQE)

EHS

Integrated System Supply (Ferguson)

Material Analyst

Facilitator

D. When

When need to purchase has been verified.

E. Where

EHS Change Management Checklist (See Appendix E of Manual)

GE Engine Services Sourcing Manual 600.030

GE Engine Services Sourcing Manual 600.530

Strother Operating Procedure 8.22

Strother Operating Procedure 6.2 (Materials & Services - Request & Purchase)

Strother Banned Chemical List (See Appendix A of Manual)

Strother Red Flag List (See Appendix B od Manual)

F. How

Have in place

EHS approved MSDS Sheet

New Raw Material Sheet w/MSDS #, EHS Change Management Checklist (See Appendix E of Manual)

Determine Min. Amount needed for the job and frequency of use or purchase (shelf life)

COMPASS Request or Request for Material (RFM)

Integrated System Supplier (Ferguson)

Include new shop supply or New raw material form and MSDS# as required. See section D above.

See New Raw Material Flow Chart (See Appendix C of Manual)

VII. Handling of Samples

A. Why

Samples must be handled the same as new raw material request

B. When

Samples received (non-requested and requested)

C. Where

GE Engine Services Sourcing Manual 600.030

GE Engine Services Sourcing Manual 600.530

Strother Operating Procedure 8.22

Strother Operating Procedure 6.2

D. How

Non-Requested

Call EHS (prior to opening if possible) to determine if possible the return to sender, with a letter stating no raw material can be received except on P.O.

Requested

Order samples through referencing Section F of Requesting (See page 9 of manual).

VIII. Purchasing

A. Why

To fill a determined need/RFM or Compass Request

B. What

Initiate formal purchase order

C. Who

Sourcing Associates

Integrated System Supplier

Blanket P.O. Utilizers

Petty Cash Utilizers (authorized users only)

D. When

Request is received and negotiations are complete

E. Where

GE Engine Services Sourcing Manual 600.030

GE Engine Services Sourcing Manual 600.530

Strother Operating Procedure 8.22

Strother Operating Procedure 6.2

Strother Operating Procedure "Petty Cash" 

F. How

Following procedures in Section E (See above).

IX. Receiving, Storage and Distribution

A. Why

To identify proper procedures to safely receive and store raw materials at Strother Facility.

B. What

Education of all associates involved in the process of receiving, storing, and handling of raw materials.

C. Who

Receiving Personnel

Fork lift Operators

Stockroom Personnel

Parts Handlers

Coordinators

EHS

Sourcing and Analysts

Outside Contractors

All Employees Who Use Chemicals

D. When

Chemical Life Cycle 

E. Where

Strother Operating Procedure 8.22 & 8.21

(Shelf Life Control Procedure QCWI AS-108)

Strother Operating Procedure 6.2

EHS B.7.3.5 & B.7.3.1

Strother Operating Procedure 5.2

GE Engine Services Sourcing Manual 600.530

GE Engine Services Sourcing Manual 600.030

Contingency Plan

F. How

Receiving needs to know HAZCOM (Annual Training)

Fork Lift operators needs to know RCRA

Receiving needs to check for MSDS and forward to EHS

Know your approved chemicals for the area

Know proper segregation of material (EHS Manual Section 7.3)

Forklift oper. to follow approved chemical routes.

- Transport during daylight hours
- Use proper handling, transportation equipment.

Dispose of chemicals with expired shelf life. Contact EHS or EHS Forktruck Driver.

Vendor samples need a Charge P.O. Number.

Any defective or leaking material shall not be received

or accepted. Contact Emergency Response Coordinator.

X. Chemical Use

A. Why

For safe handling and proper use of the chemicals.

B. What

Educate all associates involved in the use of chemicals

C. Who

All associates 

D. When

Any time when using a chemical in process

Disposal

Use

Handling

Transporting

E. Where to find data

EHS Manual C.6 (Hazard Communication)

Right-to-Know Stations

Approved Chemical List by Area

Shop Manuals, MI's, EI's & QCWI's

Shelf Life Procedure QCWI AS-108

F. How

HazCom Training - Area Specific

PPE Training 

Process Training (EHS Manual C6)

In process chemical storage procedure (EHS Manual C6)

RCRA Training

XI. Field Trip Chemical Use

A. Why

To identify proper procedures for taking chemicals on a Field Trip

B. What

Educate associates on the proper approval, ship (Department of Transportation) and Disposal/Return of Field Trip Chemicals (IATA)

C. Who

All associates who are involved in organizing/going on Field Trips.

D. When

When a Field Trip is required 

E. Where

Contact EHS - Approved Chemical List

Contact Shipping - Proper shipping of equipment/supplies

Contact TSCA Coordinator on TSCA Chemical Kit

F. How

CSM to review availability and restrictions of chemicals required at job site.

Field Trip associates to review F.T. Procedure for approved chemicals

1st Choice - Use chemical supplied by customer at site.

Leave chemicals at site.

2nd Choice - Transport only minimum qty. required.

Return unused chemicals to GEES.

XII. Bulk Chemicals Use (Fuel, Argon & Preservation Oil)

A. Why

To identify proper procedures to safely receive and store bulk chemicals into AEMC.

B. What

Education of all associates involved in handling/storage of bulk chemicals

C. Who

Receivers

Test Cell & Flight Line Associates

Facilitators in responsible Areas

Metallurgical Lab

Maintenance

D. When

Upon delivery

E. Where

QC Manual 6.3 Fuel & Lubricant Control (Storage,

Handling and Issue)

QC Manual 2.4 Fuel & Lubricant Control (Receiving)

QC Manual 2.4.1 Flight Line (Receiving) Fuel Control

QCWI AS-025

SOP 6.4 Commercial & Military use for testing and resale.

SPCC Plan

Contingency Plan

F. How

By following procedures indicated in the above section.

XIII. Contractors

A. Why

To inform contractors coming on site about AEMC EHS procedures.

B. What

To ensure that all measures are taken to eliminate hazards to people and/the environment.

C. Who

All contractors and sub-contractors on site at AEMC.

D. When

When utilizing contractors on site.

E. Where

SOP 8.21 (Contractors Safety Review)

EHS

Sourcing 600.090 (Sub-contracting of work on GE Property)

F. How

EHS to approve contractors chemicals before they are brought on site.

Meeting between Contractor and EHS before work is performed

Contractors must document that they have read and understood GEES - EHS Requirements

XIV. Waste Accumulation/Disposal

A. **Why**

Plant processes generate waste that must be managed according to EPA/KDHE requirements.

B. **What**

Hazardous & Non-hazardous waste generated by shop processes, surplusing of obsolete chemicals.

C. **Who**

All associates who work in shop processes that generates wastes.

All associates who handles/transport/store waste.

D. **When**

On going basis

E. **Where**

SOP 5.20 (Hazard Waste Management)

Contingency Plan

RCRA Training

Change Management Checklist (See Appendix E of Manual)

Significant Event Reporting (i.e. EHA Manual)

Pollution Prevention/Waste Minimization Plan

F. **How**

Track waste generated from shop processes

Proper management of non-hazardous & hazardous waste in satellite storage areas.

Weekly Satellite audits performed by EHS Forktruck Driver,

Weekly audits by facilitators of their satellite areas.

Annual RCRA Training for all associates who handle hazardous waste.

Periodic audits by KDHE.

GLOSSARY

CSM	Customer Service Manager
DOT	Department of Transportation
EHS	Environmental, Health and Safety
EI	Engineering Instructions
EPA	Environmental Protection Agency
HAZCOM	Chemical Hazard Communication
IATA	International Air Transportation Act
ISS	Integrated Systems Supplier (Ferguson)
KDHE	Kansas Department of Health & Environment
MI	Manufacturing Instructions
MSDS	Material Safety Data Sheet
PE	Process Engineer
PPE	Personal Protective Equipment (examples - gloves, goggles, mask...)
PQE	Process Quality Engineer
PM	Preventive Maintenance
QCWI	Quality Control Work Instructions
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RFM	Request For Materials
RFQ	Request For Quote
SOP	Strother Operating Procedure

APPENDIX B: RED FLAGGED CHEMICAL LIST

Red Flag Chemicals	
Chemical Name	CAS Number
1. 4-Methylene Dianili (MDA)	101-77-9
2. Vinyl Chloride	75-01-4
3. Methyl Ethyl Ketone (MEK, 2-Butanone)	78-93-3
4. Toluene	108-88-3
5. Toluene Diisocyanate (TDI)	584-84-9
6. Formaldehyde	50-00-0
7. Freon 12 (Dichlorodifouromethane)	73-71-8
8. Halon 1211	N/A
9. Halon 1301	N/A
10. Halon 2402	N/A
11. HCFC-21	75-43-4
12. HCFC-22	75-46-6
13. HCFC-31	N/A
14. HCFC-121	354-14-3
15. HCFC-122	354-11-0
16. HCFC-123	306-83-2
17. HCFC-124	N/A
18.HCFC-131	N/A
19. HCFC-132B	1648-08-7
20. HCFC-133A	N/A
21. HCFC-141B	1717-00-6
22. HCFC-142B	75-45-6
23. HCFC-221	N/A
24. HCFC-222	N/A
25. HCFC-223	N/A
26. HCFC-224	422-56-0
27. HCFC-225CA	507-55-1
28. HCFC-225CB	N/A
29. HCFC-235	N/A
30. HCFC-241	N/A
31. HCFC-242	N/A
32. HCFC-243	N/A
33. HCFC-244	63938-10-3
34. HCFC-262	N/A
35. Radionuclides	N/A
36. Benzene	71-43-2
37. Cadmium	7440-43-9
38. Beryllium	7440-41-7
39. Acetone	67-64-1
40. PD-680 Stoddard Solvent	64742-88-7

APPENDIX C: BANNED CHEMICAL LIST

Banned Chemicals for New Processes	
Chemical Name	CAS Number
1. Freon 113 (Trichlorotriflouroethane)	76-13-1
2. Asbestos (All Kinds)	1332-21-4
3. Arsenic	7440-38-2
4. Benzene	71-43-2
5. Cadmium	7440-43-9
6. Cadmium Fumes	1306-19-0
7. Carbon Tetrachloride (Carbon Tet.)	56-23-5
8. Trichloroethene (TCE)	79-01-6
9. Methylene Chloride	75-09-2
10. Ethylene Oxide	75-21-8
11. 1,1,1 Trichloroethane (Methyl Chloroform)	71-55-6
12. Beryllium	7440-41-7
13. Lead	7439-92-1
14. Ethylene Glycol Monomethyl Ether	109-86-4
15. Ethylene Glycol Monomethyl Ether Acetate	110-49-6
16. Ethylene Glycol Monoethyl Ether	110-80-5
17. Ethylene Glycol Monoethyl Ether Acetate	111-15-9
18. 2-Diethylene Glycol dimethyl Ether	111-96-6
19. Freon 11(Fluorocarbon 11, R-11)	75-69-4
20. Pechloroethylene (Tetrachloroethylene)	127-18-4
21. Radionuclides	N/A
22. Freon 114 (Fluorocarbon 114)	76-14-2
23. Freon 115 (Flurocarbon 115)	76-15-3
24. Freon 12 (Dichlorodifouromethane)	73-71-8
25. Freon 111 (1,1,1,2,2,-Pentachloroethane)	354-56-3
26. Freon 112 (CFC -112)	76-12-0
27. Freon 214 (CFC-214)	2268-46-4
28. Freon 215 (CFC-215)	4259-43-2
29. Freon 216 (CFC-216)	661-97-2
30. Freon 217 (CFC-217)	422-86-6

Chemical

Sweep Survival

Manual

Chemical Sweep Agenda

May 1998

7:45-8:15	Volunteers Obtain Supplies at Building 14
8:15-11:15	Chemical Sweep of Areas
11:15-12:00	Lunch (Provided)
12:00-12:15	Status Update in Bldg 14
1215-3:15	Chemical Sweep of Areas
3:15-3:30	Gather Inventory Sheets and Complete Sweep

Strother Chemical Management

Answers

- **What?** **Chemical Sweep**
  - Clean-up old/improperly stored chemicals
  - Inventory all Chemicals
- **When?** **May 1998**
- **Where?** **All GEES Buildings**
- **Why?** **To better inform you on:**
  - **Chemicals used in your area**
  - **MSDS**
  - **Labels**
  - **Locations**
- **How?** **Chemical Sweep Volunteers**

<u>Chemical Inventory</u>

- **Find every chemical in your work area (Tool boxes, Cabinets, Work Benches)**
- **List each chemical on the "Chemical Sweep Sheets".**
- **Fill out appropriate information on each chemical**

Chemicals that located on tools boxes need to be included, but be sure to ask permission! If you are aware of chemicals that are used in your area, but are not present during the sweep, be sure to include these chemicals on the sweep inventory forms.

Purge Chemicals

Criteria for Chemical purge items is as follows:

- **Expired** — **Can no longer be extended/exceed shelf-life**
- **Un-approved** — **Chemicals that should not be used in the area**
- **Banned** — **Freon, 1-1-1 Trichloroethane, Methylene Chloride**
- **Old** — **Have been around for years and not being used**
- **Unknown** — **Unless employees in the immediate area can identify them**

All chemicals identified as purge items should be removed from the area and placed into the designated areas. The outside vendor will periodically pick up these chemicals and properly package them for disposal.

Mislabeled Containers

- **Blank labels will be provided for mislabled or unlabeled containers**

- **Blank labels/markers will be located at designated staging areas**

- **If any questions arise, contact one of the Chemical Management Team Members**

- **We should not find a lot of unlabed containers**

<u>Only relabel containers after you verify what the chemical is!</u>

Staging Areas

- Bldg 4 South of Facilitator Office
- Bldg 5 Northwest corner of CFM56 rework Area
- Bldg 2/6 South wall of hall way leading to the test cell, by Mid America supply closet
- Bldg 9/19 South side of steam clean booth Bldg 19
- Bldg 22 Inside west rapid roll door, near brown partition
- Bldg 14 Northwest of restrooms, west of rapid roll door
- Bldg 15 Southwest of Ed Turner's office
- Bldg 16 Outside of building, south of main door
- Bldg 20 North wall by trash compactor

Each staging area will consist of two boxes on a pallet. One box will have supplies and the other will be used for purge items. A supply buggy will be used to provide containers and other needed items.

Support Help

- **Chemical Management Team Members will be present to answer questions/supervise**

- **The chemical purge vendor will provide needed containers/chemical identification**

- **Team Members are:**

Chris Adamson	**644**	**Sharon Blue**	**430**
Sharon Shelton	**404**	**Chuck Liebau**	**501**
Michelle O'Daniel	**288**	**Tami Norwood**	**346**
Kevin Prindable	**665**	**Jim Nethercott**	**395**

All questions should be directed to the Team Members.

Types of Chemicals

- **Liquids-Flammables**

  -fuels, alcohols, solvents, paints, epoxies

- **Non-Flammable Liquids**

  -coolants, adhesives, oils, lubricants, cleaners, acids, caustics, wax, developer, dyes, coatings, sealants, bonding agents, greases, solder, flux, paste, glue, penetrant, fixers, inks, abrasives, compounds, silicones, surfactants, dykems, blasting media, removers and foams.

- **Solids**

  -powders, grits, shot peens, dry inks, abrasives

- **Gases**

  -oxygen, nitrogen, hydrogen, argon, propane, acetylene, helium

Final Note

When you are done inventorying your work area, you may be asked to help in another location.

Happy Sweeping!

APPENDIX E: CHEMICAL TRACKING ACTIVITY STATUS

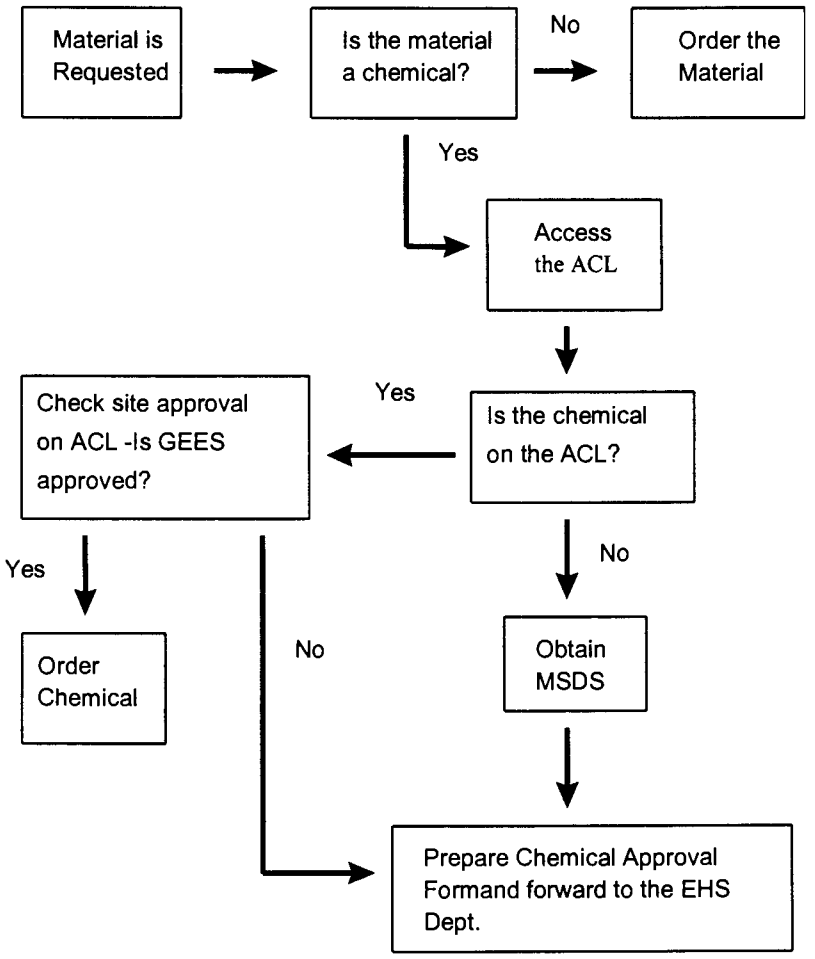
DESCRIPTION	LAST RECEIPT DATE	LAST ACTIVITY DATE	QUANTITY ON HAND
SOLVENT, AK225 ASAHIKLIN	12/13/96	12/13/96	2
MEDIA, TEFLONBEAD	04/19/93	12/5/97	10
GRIT, CERTS	00/00/00	5/2/97	0
DEVELOPER 4	12/17/93	6/30/97	4
ANTIBOND, M	06/14/95	6/18/97	0
PAINT	12/27/94	3/3/98	0
COMPOUND	05/02/94	8/16/96	0
NITRIC ACID, CERTS	00/00/00	8/27/96	5
INK, XEROX L	10/04/94	10/8/96	5
CLEANER,CIMCLEAN, CERTS	10/09/96	11/1/96	0
PENETRANT	00/00/00	10/10/96	0
LECTROETCH, 250A ELECTTOLYTE	05/21/96	3/31/97	0
SALT	01/14/98	1/20/98	10
MEDIA, SHOT, CERTS	08/19/97	8/19/97	1000
OIL	10/01/96	11/20/96	3
GRIT, CERTS	10/19/96	11/26/96	1000
CLEANER,FLOORSWEEP	10/05/96	12/19/96	10
GRIT, CERTS	12/27/96	8/7/97	6000
CHALK	05/18/93	1/20/97	9
HCL ACID	02/03/97	2/6/97	3

APPENDIX F: CHEMICAL TRANSACTION ACTIVITY STATUS

Stock Number	Description	Transaction Date	Transaction Quantity	Transaction Type	Badge Number
KC00066	INSECTSPRAY	8/23/97	-000000002	DISS	K2690
KC00066	INSECTSPRAY	9/26/97	-000000004	DISS	K2280
KC00066	INSECTSPRAY	8/23/97	-000000003	DISS	K2588
KC00066	INSECTSPRAY	9/2/97	-000000004	DISS	K2106
KC00066	INSECTSPRAY	8/23/97	-000000003	DISS	K1911
KC00066	INSECTSPRAY	6/13/97	-000000002	DISS	K1949
KC00066	INSECTSPRAY	8/23/97	-000000002	DISS	K2334
KC00066	INSECTSPRAY	6/13/97	-000000002	DISS	K2270
KC00066	INSECTSPRAY	9/6/97	-000000001	DISS	K1184
KC00066	INSECTSPRAY	7/16/97	-000000002	DISS	K2532
KC00066	INSECTSPRAY	8/23/97	-000000006	DISS	K2532
KC00066	INSECTSPRAY	8/19/96	-000000002	DISS	K2153
KC00066	INSECTSPRAY	8/23/96	-000000002	DISS	K1854
KC00067	CLEANER, CERTS	10/10/96	-000000001	DISS	K2687
KC00067	CLEANER, CERTS	11/17/97	-000000050	DISS	
KC00114	OIL CERTS	1/30/97	-000000001	DISS	K2657
KC00114	OIL, CERTS	11/6/96	-000000001	DISS	K1715
KC00114	OIL, CERTS	1/29/97	-000000001	DISS	K1715
KC00114	OIL, CERTS	6/23/97	-000000001	DISS	K1715
KC00114	OIL, CERTS	1/2/98	-000000001	DISS	K0704
KC00184	LUBRICANT	10/17/96	000000002	RCPT	
KC00184	LUBRICANT	12/5/96	000000005	RCPT	
KC00184	LUBRICANT	4/30/97	000000004	RCPT	
KC00184	LUBRICANT	5/22/97	000000005	RCPT	
KC00184	LUBRICANT	10/3/97	000000005	RCPT	
KC00184	LUBRICANT	10/16/97	000000005	RCPT	
KC00184	LUBRICANT	10/21/97	000000002	RCPT	
KC00184	LUBRICANT	11/28/96	-000000002	DISS	K2673
KC00184	LUBRICANT	12/1/96	000000002	RETN	K2560
KC00184	LUBRICANT	10/10/96	-000000005	DISS	K2579

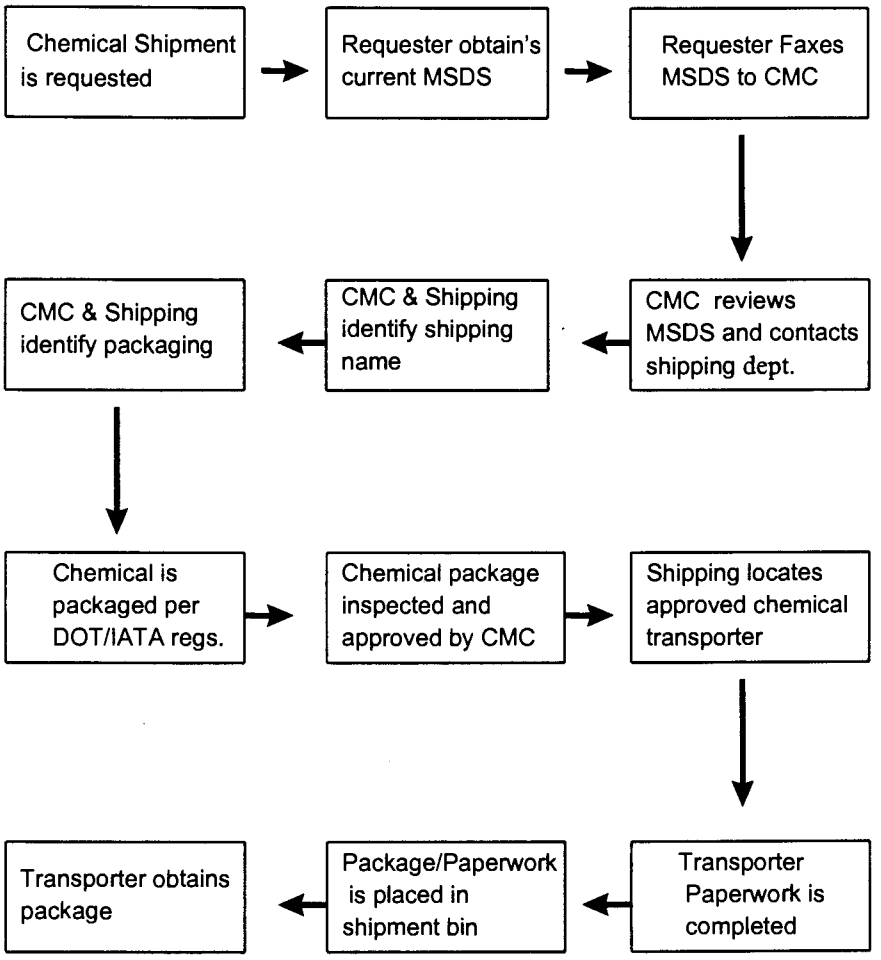
APPENDIX G: PROCESS MAPPING EXAMPLE

CHEMICAL REQUEST PROCESS



APPENDIX G (Continued)

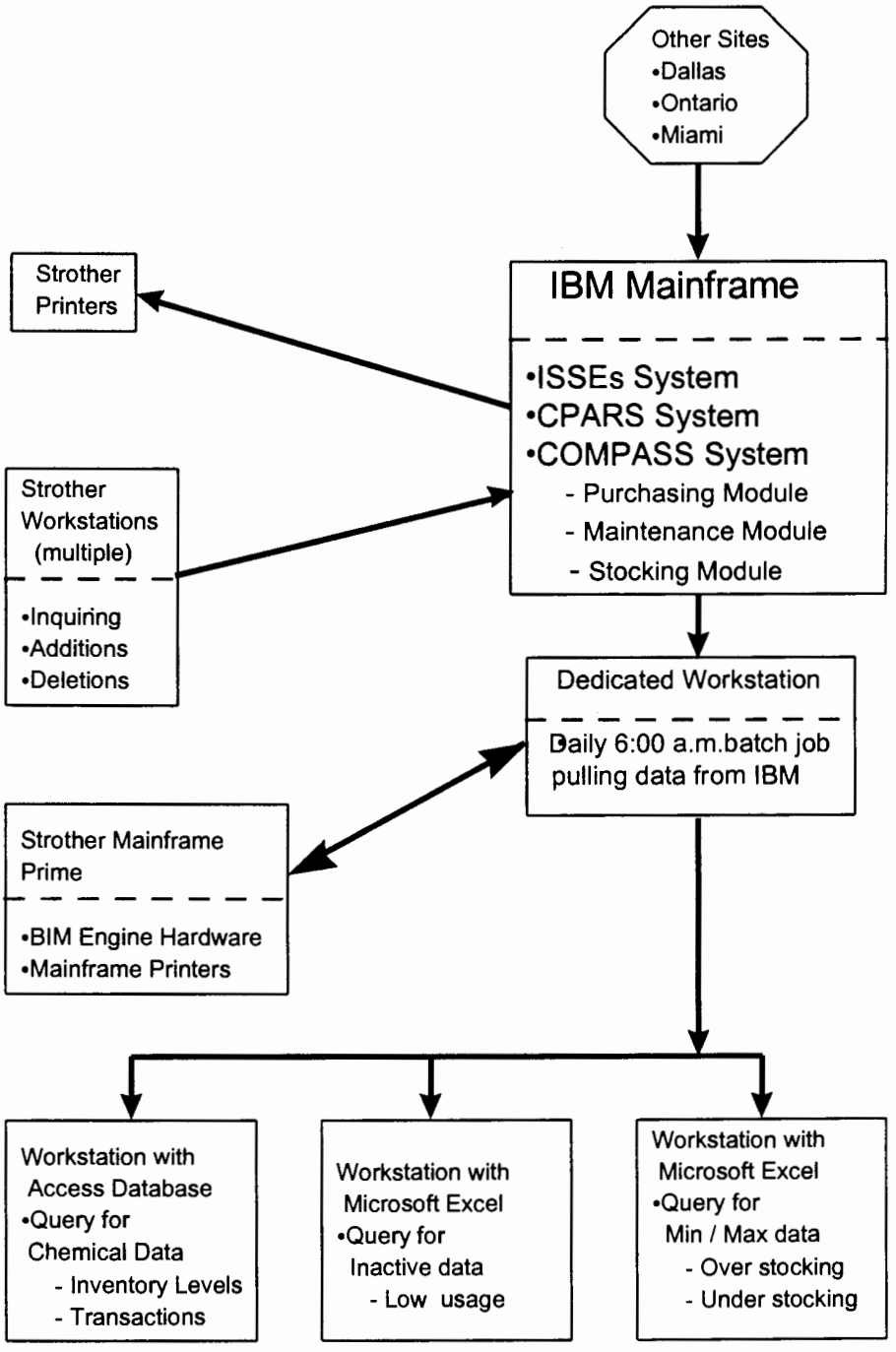
DOT/IATA Chemical Shipment Process



CMC = Chemical Management Coordinator

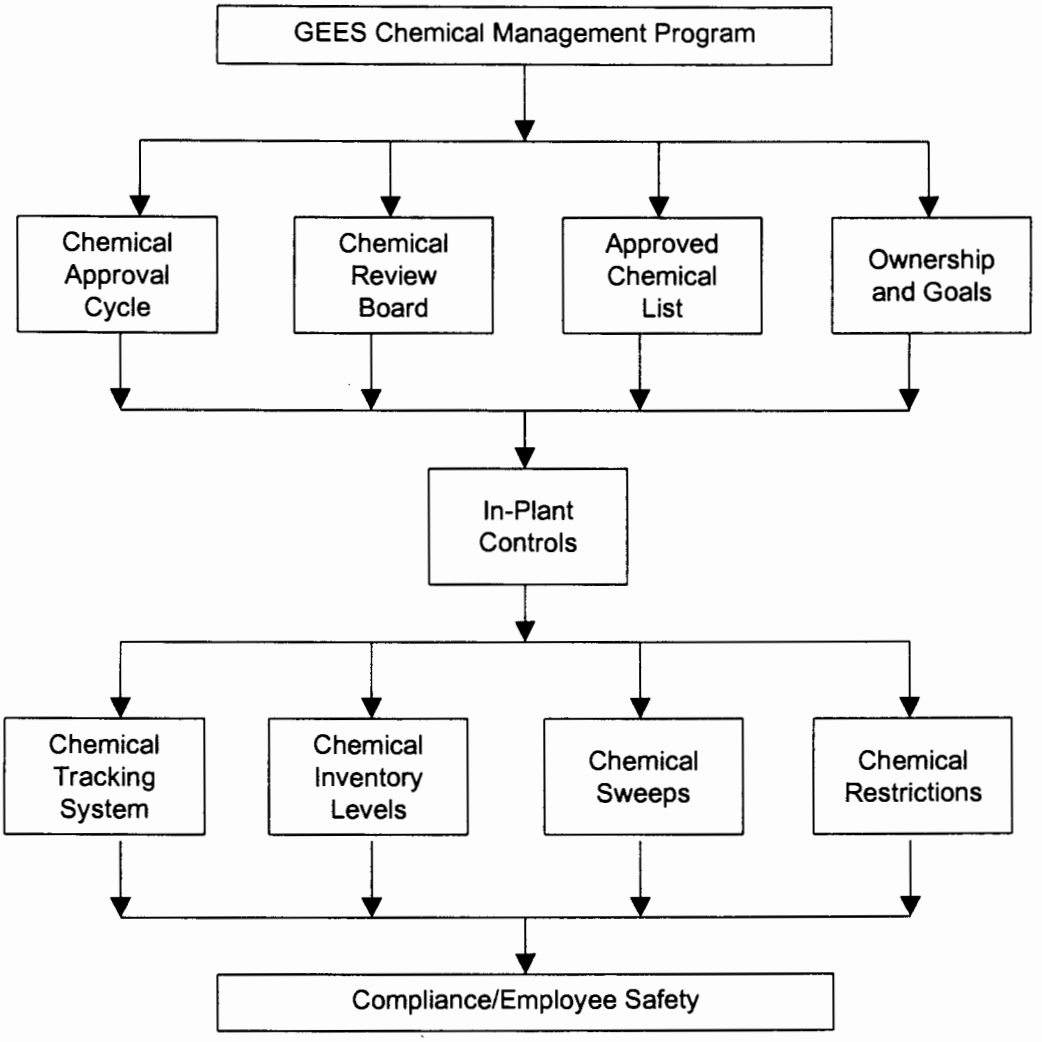
APPENDIX G (CONTINUED)

Chemical Tracking System



APPENDIX H

CHEMICAL MANAGEMENT PROGRAM TREE



VITA

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