Implementing Process Safety Management for Ammonia Refrigeration

A guideline for practical compliance with PSM / RMP regulations.

Created by the staff of the Garden City Ammonia Program in Garden City, Kansas.
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Reference: EPA’s 40CFR68 – Risk Management Plan / Program

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Additional sources of information on the companion CD, Internet and in print
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What does the Process Safety Information element require?
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How do most citations in this element come about?
Process Safety Information interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Process Safety Information Guidelines
Example: Process Chemistry Letter
Example: Electrical Classification Letter
Example: RAGAGEP Certification Letter
Example: Material and Energy Balance Letter
Additional sources of information on the companion CD, Internet and in print

Process Hazard Analysis

What is in the Process Hazard Analysis element?
How do I perform a Process Hazard Analysis?
How do I select a methodology?
How do I select a team?
Management has chosen a methodology and we’ve prepared a team; now how do we perform the PHA itself?
How do I report and track findings?
How often do I have to perform a PHA?
How do most citations in this element come about?
Process Hazard Analysis interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Process Hazard Analysis Guidelines
Additional sources of information on the companion CD, Internet and in print
Operating Procedures

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What is meant by Operating Phases in this element?
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Are there any other requirements?
How do most citations in this element come about?
Operating Procedures interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Operating Procedures Guidelines
Example: ROSOP 101 – Overall System Operation SOP
Example: RESOP 01 – Operation of Evaporative Condenser #1 SOP
Example: DOC-CERT – Revision tracking document
Additional sources of information on the companion CD, Internet and in print

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What is in the Employee training element?
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How do I train the people who are NOT operating the process?
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How often must this training be conducted?
How do I properly document this training?
Are there any national consensus standards for operator training?
How do most citations in this element come about?
Training interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Training Guidelines
Example: Form OT-1 Operator Training Certification Form
Example: Training Needs Assessment
Additional sources of information on the companion CD, Internet and in print
Contractors

What is in the Contractors element?
What Contractors are covered under this element?
What is required by the Contractor element?
How can I possibly document all of that?
How does this work in practice?
Do the CQ forms take care of all the documentation?
How do most citations in this element come about?
Contractor interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Contractor Guidelines
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Example: CQ-3 Form – Training Record
Example: CQ-4 Form – Evaluation and Approval
Example: CQ-5 Form – Contractor Completion Closeout
Example: CQ-6 Form – Contractor Evaluation
Additional sources of information on the companion CD, Internet and in print

Mechanical Integrity

What is in the Mechanical Integrity element?
What equipment is covered in the Mechanical Integrity element?
What do I need to do for each piece of equipment?
Documenting the Inspections, Tests and Maintenance
Correcting Equipment Deficiencies
Are there any other requirements?
What are some things I can do to aid my compliance efforts?
What are some good sources for Best Practices?
How do most citations in this element come about?
Mechanical Integrity interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Mechanical Integrity Guidelines
Example: Form MI-EL1 – Equipment List and MI Schedule
Example: System Walk-Through Form
Example: System Walk-Through SOP
Additional sources of information on the companion CD, Internet and in print
**Hot Work Permit**

What is in the Hot Work Permit element?
I already have a hot work program – do I need to do anything special under PSM?
I do not have a hot work program – what should I do?
How important are Hot Work permits?
How do most citations in this element come about?

- Hot Work Permit interaction Matrix
- OSHA’s PSM regulation pertaining to this element
- EPA’s RMP regulation pertaining to this element
- Example: Hot Work Guidelines
- Additional sources of information on the companion CD, Internet and in print

**Management of Change**

What is in the Management of Change element?
What is “Change” in this element?
What is required in this MOC element?
Management of Change flowchart
How should I document a “replacement in kind”?
Are there any other types of changes that can be made that aren’t generally done through a Management of Change procedure?
How should I document a “management of change”?
How does this work in the real world?
How can I handle “initial startup” or commissioning?
How do I handle very large changes?

- Are there any additional considerations for Temporary Changes?
- How should I handle a change that is to People, Procedures and Policies?
- What if I discover a change has occurred without a MOC?
- Why is this element generally considered the “hardest” to work with?
- The “change” being considered doesn’t have any safety and health impacts. Do I still need to perform a MOC?
- How long must I retain the MOC documentation?
- How do most citations in this element come about?

- Management of Change interaction Matrix
- OSHA’s PSM regulation pertaining to this element
- EPA’s RMP regulation pertaining to this element
- Example: Management of Change Guidelines
- Example: MOC 1 Form – MOC Documentation
- Additional sources of information on the companion CD, Internet and in print
Pre-Startup Safety Review

What is in the Pre-Startup Safety Review element?
What is required in the PSSR?
How should I document a PSSR?
What kind of information should I obtain?
How do most citations in this element come about?
Management of Change interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Additional sources of information on the companion CD, Internet and in print

Incident Investigation

What is in the Incident Investigation element?
Why should I investigate all near misses and process interruptions if I am not legally required to?
What is required of the investigation?
If there is no “right way” to document an investigation what are the example forms for?
What am I looking for in an incident investigation?
How do I conduct an incident investigation?
What about very minor upsets and near-misses?
What does a good recommendation look like?
Does every incident we investigate require us to re-file our 5-year accident history with the EPA?
How do most citations in this element come about?
Incident Investigation interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Incident Investigation Guidelines
Example: II-Short - Incident Investigation Short Form
Additional sources of information on the companion CD, Internet and in print

Emergency Planning and Response

What is in the Emergency Planning and Response element?
What is required by the EPA portion of this Element?
What is required by the OSHA portion of this Element?
How do I handle Incidental Releases?
How do I comply with Emergency Response / Hazwoper?
How do most citations in this element come about?
Emergency Planning and Response interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Emergency Planning Guidelines
Additional sources of information on the companion CD, Internet and in print
Compliance Audits

What is in the Compliance Audits element?
What is required by the Compliance Audit Element?
How can I perform an audit?
What becomes of the recommendations?
How does a regulatory audit differ?
How can I be prepared for an audit?
If we do internal audits (whether they are compliance audits or not) can OSHA use them against us?
How do most citations in this element come about?
Compliance Audits interaction Matrix
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Compliance Audit Guidelines
Additional sources of information on the companion CD, Internet and in print

Trade Secrets

What is in the Trade Secrets element?
Since nearly all Ammonia refrigeration systems do not have Trade Secrets, how do we address this?
How do most citations in this element come about?
OSHA’s PSM regulation pertaining to this element
EPA’s RMP regulation pertaining to this element
Example: Trade Secrets Guidelines
Additional sources of information on the companion CD, Internet and in print

Common Acronyms and Definitions

Closing Thoughts

What if I have a better idea?
How can I ever manage to pull all of this together?
Introduction

Subject: Letter to File - An Introduction
From: Garden City Ammonia Program
January 13, 2012

Too often in the Ammonia refrigeration industry the people tasked with creating and maintaining the Process Safety Management systems that cover our refrigeration systems are simply shown a collection of binders and told “Good Luck.” Most PSM practitioners we know have suffered this fate at least once in their careers and were nearly overwhelmed trying to make sense of reams of paperwork with little training and even fewer resources. GCAP set out to create this book as a guide that could be used as a basis of understanding for each new person “tossed to the wolves” in the PSM realm.

“Implementing Process Safety Management for Ammonia Refrigeration” was written for the exclusive use of Garden City Ammonia Program as a textbook for their Process Safety Management class and to outline a standard of educational material, guidelines, and best practices for the Ammonia industry. Brian D. Chapin was the project leader for the PSM/RMP book, with significant editorial input from Jeremy Williams and Randy Williams. Throughout the years we’ve all met hundreds of PSM practitioners and every one left at least one good idea with each of us; In some sense, the text presented here represents the collected wisdom of those hundreds of PSM practitioners operating thousands of facilities. Our focus is on real-world implementation; with due deference given to the practical needs of the facility, the requirements under the regulations and the challenges we face in an increasingly fast-paced and competitive business world.

Most of the PSM implementations in our industry rely on the IIAR’s Process Safety Management Guidelines for Ammonia Refrigeration and its companion Risk Management Program Guidelines for Ammonia Refrigeration. While we believe these books provided an excellent resource for their time, PSM implementation has continued to evolve rapidly in the years since they were published and they no longer reflect the “state of the art”. This book is an attempt to re-envision Process Safety Management implementation based on the experiences of the Ammonia refrigeration industry over the past 15+ years.

OSHA’s NEP or National Emphasis Program (and the fines that came with it) has served to highlight the deficiencies in the way Process Safety Management for Ammonia refrigeration is currently implemented. The NEP draws from PSM experience in the chemical process and petroleum refinery sectors, so we have adopted some of the ideas and approaches present in the excellent Center for Chemical Process Safety (CCPS) books to improve the system first presented by the IIAR considerably. We believe that the IIAR is still the appropriate source for information regarding the proper design, installation, maintenance, and operation of mechanical Ammonia refrigeration systems; however we turn to the CCPS and other organizations for guidance on how the Process Safety Management programs that cover these systems should be designed and implemented.
Introduction

While this book represents our best professional efforts, it should be viewed only as a guideline to implementation; the PSM & RMP regulations, the letters of interpretation from the regulatory agencies and the legal system hold the final say when it comes to compliance. Process Safety Management systems must continue to change to meet the challenges presented by evolving regulatory views and Recognized and Generally Accepted Good Engineering Practices (RAGAGEP) – we at GCAP will continue to update this book as a standard reference for Implementation of Process Safety Management for Ammonia Refrigeration.

The Process Safety Management examples in this book were designed around the federal PSM/RMP requirements; always consult with local inspectors as additional requirements may be specific to your locale.

While there are countless people who have contributed to this work, GCAP would like to specifically thank:

**Randy Williams**, CEO/Instructor of Garden City Ammonia Program who offered to pay the costs of hundreds of Freedom of Information Act requests to receive OSHA PSM Citations, without which it would not have been possible to produce the text. There’s also the 1,000’s of hours he dedicated to staff time in building this book. Randy was very influential in presenting the contractor’s, engineer’s, and operator’s point of view throughout the editing process.

**Jeremy Williams**, Manager/Instructor of Garden City Ammonia Program who consistently pushes to improve the quality of both the training and the training materials provided by Garden City Ammonia Program. Jeremy’s pursuit of excellence has been the cause of many rewrites, without which the quality of the works would not be what they are today.

**Brian D. Chapin**, Instructor at Garden City Ammonia Program who as project leader of this book spent close to 6 months researching, writing, editing, and organizing. Brian is dedicated to finding elegance in simplicity. Brian would like to specifically thank Sam Shannon, Larry Aleksandrich, John “Jack” Piho, and John Harris for their guidance, patience and expertise throughout his career.

**Tyler Ramos**, Instructor at Garden City Ammonia Program who offered keen insights into the unique needs of maintenance managers and technicians who are also tasked with PSM implementation.

**Bryan Haywood**, President of safteng.net LLC, a consulting firm with a focus on Petrochem PSM/RMP implementation who offered refinements throughout the text and routinely challenges the status quo when it came to our industry’s PSM practices. You can learn more about his firm at www.safteng.net
Introduction

The Ammonia Refrigeration Industry, - To all the great people who has shared their thoughts, concerns, suggestions, and most of all their expectations of the highest possible quality education and training.

GCAP Students, - Anyone who takes our classes at GCAP teaches us a little bit more about the Art and Science of Ammonia refrigeration. Without them, this book would not be possible. A list of PSM students and companies can be found at the end of GCAP’s PSM/RMP Awareness Video.

Other GCAP Staff, - Rachel Williams (Office Manager/Co-Owner), Steve Rucker (Boiler Instructor), Kristen Lundy (Office Director), and Serena Simmons (Training Coordinator).

OSHA & EPA Compliance Officers - As a rule, consummate professionals of the highest integrity who have dedicated themselves to the safety of employees, the public, and the environment. While certainly not infallible, the vast majority of compliance officers we have met have been truly interested in helping Ammonia facilities achieve compliance, not just because it was their job to do so, but also out of a genuine belief that it would help the facility operate their process safely.

We at GCAP thank you for investing your time in our Process Safety Management course. When you attend a GCAP course you are joining a family of over 9,000 Ammonia professionals throughout the world. Please always think of the GCAP team as a resource at your disposal when you have questions about PSM implementation or any Ammonia refrigeration topic.

Your ability to effectively coordinate, your dedication, your talents and your hard work will be the deciding factors in your PSM implementation. Process Safety Management is a “Team Sport” and while many teams have star players, everyone’s contribution is invaluable if the team is to reach their goals. The oft-repeated line “A bad system will beat a good employee every time” is absolutely true when it comes to PSM implementation so remember that the Process Safety Management system you implement in your facility must reflect both the unique needs of that facility and its personnel.

If you have any ideas on how to improve this work, we hope you will share them with us for consideration as additions to future editions; this book is considered a work in progress that will always be continuously improved.

Sincerely, Your friends and colleagues at:
Foreword

Foreword: How do I use this book?

Most of this book is designed to be read just like any other book: each chapter builds upon the last. Once you’ve gone through it though, you will find that you will reference it quite often to clarify your thoughts on compliance.

Each chapter ends with a list of references. These references provide valuable information that we simply cannot fit inside this book. You will note that these references are broken into three categories:

**Companion CD**

The companion CD that is provided with this book provides an additional 4,500 pages of reference material. Each chapter has appendices on the companion CD that is separated into unique directories. These directories will include example forms, guidelines and other supplementary information. Where space constraints allow we have included commonly used forms directly at the end of the text for each chapter.

**Internet References**

Organizations that offer information on the internet have been linked at the end of each chapter. You will find invaluable information on each topic if you research each one of the linked websites.

**Print References**

There are several published books that offer additional guidance on specific topics. Where we have found these published works of merit, we’ve provided the information necessary for you to obtain copies of them. The CCPS (Center for Chemical Process Safety) books should be of particular interest since we often see them used by OSHA and the EPA as RAGEGEP (Recognized And Generally Accepted Good Engineering Practices) for Process Safety Management implementation. The IIAR (International Institute of Ammonia Refrigeration) standards and bulletins on the design, installation, maintenance and operation of closed-loop mechanical refrigeration systems is also RAGAGEP and should be available for any PSM practitioner.
What are my responsibilities with the PSM program?

Your responsibilities will be spelled out in the guidelines of your program. As a general rule, there are certain responsibilities based on your position within your company:

**What if I am Facility Management?**
- Assign sufficient resources and qualified operators to ensure safe operating and acceptable mechanical integrity conditions are maintained.
- Assign a qualified supervisor to oversee and direct Industrial Ammonia Refrigeration System operations, maintenance and training.
- Involve Industrial Ammonia Refrigeration System operators in the various elements of this program.
- Request, as necessary, assistance from Company Engineering to execute the PSM Program and conduct effective audits.

**What if I am a Manager?**
- Train all Industrial Ammonia Refrigeration System operators in hazards of the Industrial Ammonia Refrigeration System process, safe operating procedures, and good engineering practices.
- Assign tasks based on operator’s level of knowledge.
- Monitor maintenance and operations activities to ensure they comply with good engineering practice.
- Ensure contractors are provided the information required by this program.
- Document the information, activities, inspections, etc required by this program.

**What if I am an Operator?**
- Actively participate in the PSM program.
- Exercise good engineering practices in the operation and maintenance of the Industrial Ammonia Refrigeration Systems.
- Comply with all safety procedures.

**What if I am a Human Resources Manager?**
- Hire qualified personnel to work with the Industrial Ammonia Refrigeration System
- Provide PSM overview indoctrination training for all new employees as part of the New Hire Safety Orientation training.

Again, your responsibilities will be spelled out in the guidelines of your program. Everyone involved with the process will have unique roles and responsibilities. You should become familiar with your Process Safety Management Program to understand your role and responsibilities.
Can I build an Ammonia refrigeration PSM program from this book?

The forms and guidelines that we’ve included on the companion CD can form the basis of a PSM program for your facility. Remember that you will need to customize them to reflect the unique needs of your facility and of your process.

Because these forms and guidelines rely on the understanding you gain from this book, GCAP requests that you have a copy of this book for every facility where you choose to implement a PSM program that is based on the provided examples.

What if I don’t have the budget or authority to get this accomplished?

Always remember that you can only be responsible for those things directly under your control. If you find issues that require resolutions outside of the scope of your job function, you need to make sure that you effectively communicate those issues to the people who do have the authority and budget to resolve the issue.
"If you do not change direction, you may end up where you are heading."
--Lao Tzu