

{CLIENT SITE} – {CLIENT COMPANY}

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MECHANICAL INTEGRITY PROCEDURES

PURPOSE

The Occupational Safety and Health Administration (OSHA) Process Safety Management (PSM) element and the corresponding Environmental Protection Agency (EPA) Risk Management Program (RM Program) regulation element relating to Mechanical Integrity is to ensure equipment is designed and installed correctly, in addition to being operated and maintained properly. The purpose of this Mechanical Integrity Program is to ensure that the refrigeration system components used to handle and store ammonia are properly designed, operated, and maintained.

SCOPE

This document summarizes how **{Client Company}** complies with the requirements of the PSM, Mechanical Integrity element, 29 CFR §1910.119 (j), and the EPA RM Program, Mechanical Integrity element, 40 CFR §68.73. A comprehensive maintenance and Mechanical Integrity Program comprises many elements. It consists of the specific pieces of equipment and system components that are to be maintained, the planned maintenance activities to be performed, inspections and follow-up, training and documentation, and quality assurance activities.

Specific system components included in the Mechanical Integrity Program include as a minimum, but are not limited to:

- Pressure vessels and storage tanks
- Piping systems (including piping components such as valves)
- Auxiliary safety systems (including relief and vent systems and devices, vapor detection systems, and ventilation systems)
- Emergency shutdown systems
- Controls (including monitoring sensors, alarms and interlocks)
- Pumps
- Compressors
- Condensers
- Evaporators

SCOPE (continued)

{Client Company} utilizes the services of outside experts, as needed, for testing, inspection, and preventative maintenance purposes for which they elect to not handle internally. {Client Company's} refrigeration technicians perform all testing, inspections and maintenance activities not assigned to outside experts.

REFERENCES

- A) OSHA 29 CFR §1910.119, *Process Safety Management of Highly Hazardous Chemicals*, Paragraph (j).
- B) OSHA Instruction CPL 2-2.45A, *Process Safety Management of Highly Hazardous Chemicals-Compliance Guidelines and Enforcement Procedures*, Sept. 13, 1994.
- C) IIAR Bulletin #109, *Minimum Safety Criteria for a Safe Ammonia Refrigeration System*.
- D) IIAR Bulletin #110, *Guidelines for: Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems*.
- E) RETA Industrial Refrigeration Course III - *Plant Maintenance*.
- F) RETA Industrial Refrigeration Course IV - *Plant Operations and Safety*.

IMPLEMENTATION OVERVIEW

For the most part, the PSM Program is a subset of the EPA RM Program regulation requirements. Recognizing this for the mechanical integrity requirements, and for improved implementation and program maintenance efficiency, this document has been implemented which combines both the PSM and EPA RM Program requirements. The overall compliance program is referred to as the "Process Risk Management Program".

Equipment maintenance activities and record tracking are incorporated in a Computerized Maintenance Management System (CMMS). The software currently being used is a PC based system - {CMMS NAME}. Refer to program documentation for complete details on maintenance schedules and records.

The main functions of the {CMMS NAME} software include:

- maintenance, inspection, and testing scheduling
- equipment lists/inventory
- maintenance procedures
- work order control
- database and inquiry system for maintenance record storage and retrieval

IMPLEMENTATION OVERVIEW (continued)

The CMMS and all maintenance activities are the responsibility of the Facilities Manager. Refer to the program documentation for detailed information on the software. Database information and maintenance records can be generated as needed.

PROCEDURES

{Client Company's} Mechanical Integrity Program is composed of written procedures for each of the elements of the program, including:

1. Equipment Inventory
2. Inspection and Testing Program
3. Training for Process Maintenance Activities
4. Quality Assurance

1.0 EQUIPMENT INVENTORY

- 1.1 All major pieces of ammonia refrigeration system equipment are inventoried. The inventory information is summarized in an equipment list generated by the CMMS that provides technical information and key equipment specifications for testing and maintenance scheduling for each piece or type of equipment. All of the information on the equipment lists is consistent with information found in the individual record file of each component and/or from the equipment manufacturer's reference manuals. Equipment lists are modified as equipment inventory information changes.
- 1.2 Record files for all equipment lists and documentation relating to specific components, which typically include instruction manuals, warranty records, spare parts lists, inspection and repair records, and any other relevant information are maintained for each specific component. These files are also referenced as the location where all inspection and testing forms and records from Section 2.0 below are maintained. In most cases, the majority of the instruction manuals and related manufacturer's information are grouped together in a few, large binders originally supplied by the system installation contractor, and are not kept in the individual component files. Refer to **Form MI-1** for a list of available reference manuals on the {Client Company's} ammonia refrigeration system and related components.

2.0 INSPECTION AND TESTING

- 2.1 For each piece of equipment or group of equipment, the following has been initially determined:
 - the type of test or inspection to be performed;
 - the frequency for each test and/or inspection; and

- the basis for the frequency (e.g. manufacturers' recommendation, industry standard, equipment specific history, etc.).
- 2.2 The testing and maintenance schedule developed for Step 2.1 above is communicated to the refrigeration technicians by the Facilities Manager. The Facilities Manager issues a job list for the refrigeration technicians detailing what needs to be done on what pieces of equipment and when generation of these schedules is based on the CMMS.
- 2.3 Each system component or subsystem (e.g. compressor, pump, recirculator, liquid transfer system, etc.) included in the inventory has a maintenance, inspection and testing history log kept in the individual record file or in the CMMS on which all activities are recorded. This log includes the results of all inspections and tests, and a description of all maintenance activities performed.
- 2.4 The maintenance, inspection, and testing history log contain information documenting each inspection and test that has been performed on a piece of equipment. The required information included on the form is:
- the date of the inspection or test;
 - the name of the person who performed the inspection or test;
 - the serial number of the other identifier of the equipment that is being inspected or tested;
 - a description of the inspection or test performed; and
 - the results of the inspection or test.
- 2.5 Information concerning type of test or inspection for specific pieces of equipment can be found in the vendor or manufacturer's recommendations. Refer to the equipment list provided by the CMMS or the manufacturer's equipment reference manual. **Form MI-1** is a list of available reference manuals on the ammonia refrigeration system and related components.
- 2.6 Any equipment deficiencies found during any inspections which are outside acceptable limits are corrected before further use, or in a safe and timely manner, when necessary means are taken to assure safe interim operation. Records of such deficiencies, when they are found and when they are corrected, are prepared and kept in the individual record file.
- 2.7 Personnel involved in the testing and inspection of systems covered by Process Safety Management are trained and/or certified to perform testing in accordance with established site or applicable industry standards.

When inspection and testing is performed by a contractor or a third party vendor, documentation of the procedure and copies of personnel qualification records will be included in the final report or be part of the contract employee training records. The PSM Coordinator will keep this information on file.

3.0 TRAINING FOR PROCESS MAINTENANCE ACTIVITIES

3.1 **{Client Company}** trains those employees involved in maintaining the on-going integrity of the process equipment in the following areas:

- an overview of the process and its hazards.
- the procedures applicable to the employee's job tasks.
- formal training classes.
- departmental or shop safety meetings.

{Client Company} verifies that the employee can perform the job tasks in a safe manner.

3.2 New refrigeration operating engineers are trained prior to beginning work at the site, and all receive additional training as appropriate for their current assignments. Training information is maintained in the employee's personnel file and in the PSM Coordinators' office.

3.3 All refrigeration-operating engineers are trained in **{Client Company's}** Safe Work Practices prior to starting work at the site (i.e. Hot Work, Lockout/Tagout, etc.).

3.4 All refrigeration-operating engineers are provided with access to all written Maintenance Procedures and manufacturer's equipment manuals.

4.0 QUALITY ASSURANCE

4.1 The ammonia refrigeration systems at **{Client Company}** were designed by, and installed under the supervision of persons who by reason of knowledge, training and experience are competent for the tasks. Such persons include:

- Experienced refrigeration contractors, possibly in combination with an engineering code authority, authorized inspection agency or property insurance underwriter
- In-house design/engineering/operations staff of the employer
- Consulting engineers, acting on behalf of the employer
- Refrigeration equipment supplier
- Refrigeration service vendors

4.2 It is **{Client Company's}** responsibility to ensure that the designers and contractors responsible for the construction and modification of the ammonia refrigeration system are qualified for their relevant responsibilities. **{Client Company}** follows the procedures outlined in the "Contractor Safety Procedures" guide when required. All documentation on contractors will be kept on file in the PSM Coordinators office.

4.3 Equipment specifications shall be generated by **{Client Company}** or in conjunction with the qualified contractor/design group. The following shall be submitted to the Facilities Manager and PSM coordinator for review/approval to

ensure equipment/facilities are installed properly and consistent with design specifications and/or manufacturer's instructions:

- design criteria
- operating conditions
- materials of construction
- fabrication standards
- inspections
- tests
- certifications (Form U-1A)
- equipment list
- equipment specifications
- valve list (location, drawing, size, type, manufacturer, model and connection)
- valve setup (equipment, valve positions – startup, normal, shutdown, etc.)
- material test reports
- all necessary Process Safety Information (PSI), see PSI procedure

This information will be kept on file in the PSM coordinators office.

- 4.4 Appropriate checks and inspections are performed to ensure that all ammonia refrigeration system components, including contractor-supplied items, are installed properly and consistent with design specifications and the manufacturer's instructions.
- 4.5 All essential records and documentation relevant to the ammonia refrigeration system obtained by **{Client Company}** are maintained by **{Client Company}** by the PSM Coordinator, and are readily available to those concerned with inspection, maintenance and operation.
- 4.6 **{Client Company}** ensures that all maintenance materials, spare parts, and ammonia refrigeration system components, including contractor-supplied items, are suitable for the application for which they are used and that any substitutes are equally suitable for the application for which they may be used. See 4.3 above.
- 4.7 All ammonia system repair requests are brought to the attention of the Facilities Manager or immediate Supervisor and recorded in the refrigeration technician's logbook. The Facilities Manager determines the urgency of the repair and schedules an appropriate time for the repair.

FORMS

The following forms are suggested for use. These forms are not required as part of this procedure so long as similar forms or documentation are kept which provide at least the equivalent amount of information to comply with the requirements of this element.

- Reference Document List (**Form MI-1**)
- Equipment List – Appendix A

Sample - www.industrydocs.org

{CLIENT COMPANY} AMMONIA REFRIGERATION SYSTEM REFERENCE INFORMATION LIST

Manufacturer	Revision Date	Title:	Description:	Additional Information
Frick	S70-301 IOM/Aug 2001	Instruction Operation Maintenance Manual RDB – Booster Rotary Screw Compressor	Compressor/Equipment Data; Service Manual	Located in Engine Room Office
Frick	S70-400 IOM/Aug 2001	Instruction Operation Maint. Manual RXF – Rotary Screw Compressor Models 12-101	Compressor/Equipment Data; Service Manual	Located in Engine Room Office
Frick	S700-600 IOM/May 2001	Instruction Operation Maintenance RWF – Rotary Screw Compressor Models 100 through 480.	Compressor/Equipment Data; Service Manual	Located in Engine Room Office
Frick	S90-010 O/APR 2002	Operation – Frick Quantum Compressor Control Panel Version 4.5x	Compressor Control Panel Service Manual	Located in Engine Room Office
RAM	Nov 00 / Rev. 2	Instruction and Maintenance	Refrigeration Duty Motors – Low and Medium Voltage Polyphase Motors	Located in Engine Room Office

FORM MI-1

Manufacturer	Revision Date	Title:	Description:	Additional Information
Frick	RWBII Plus Addendum /Nov 93	Addendum to Service Parts List for RWBII Plus	Rotary Screw Compressor Units with Plus Microprocessor Control Models 60 through 676	Located in Engine Room Office
Frick	S70-115 10M/ Jul 83	Instruction Operation Maintenance	Frick RWB II Rotary Screw Compressor Units	Located in Engine Room Office
Frick	S70-113 IOM Addendum 1/Apr 84	Installation Operation Maintenance	Rotary Screw Compressor Units with Plus Microprocessor Control Series – RWB	Located in Engine Room Office
Daily records and inspections		Daily records and inspections	The day to day readings from the equipment that monitors the ammonia system.	Located in Engine Room

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APPENDIX A
EQUIPMENT LIST