MECHANICAL INTEGRITY AND IIAR 6

PETER THOMAS, P.E. – RESOURCE COMPLIANCE


DO NOT PAINT


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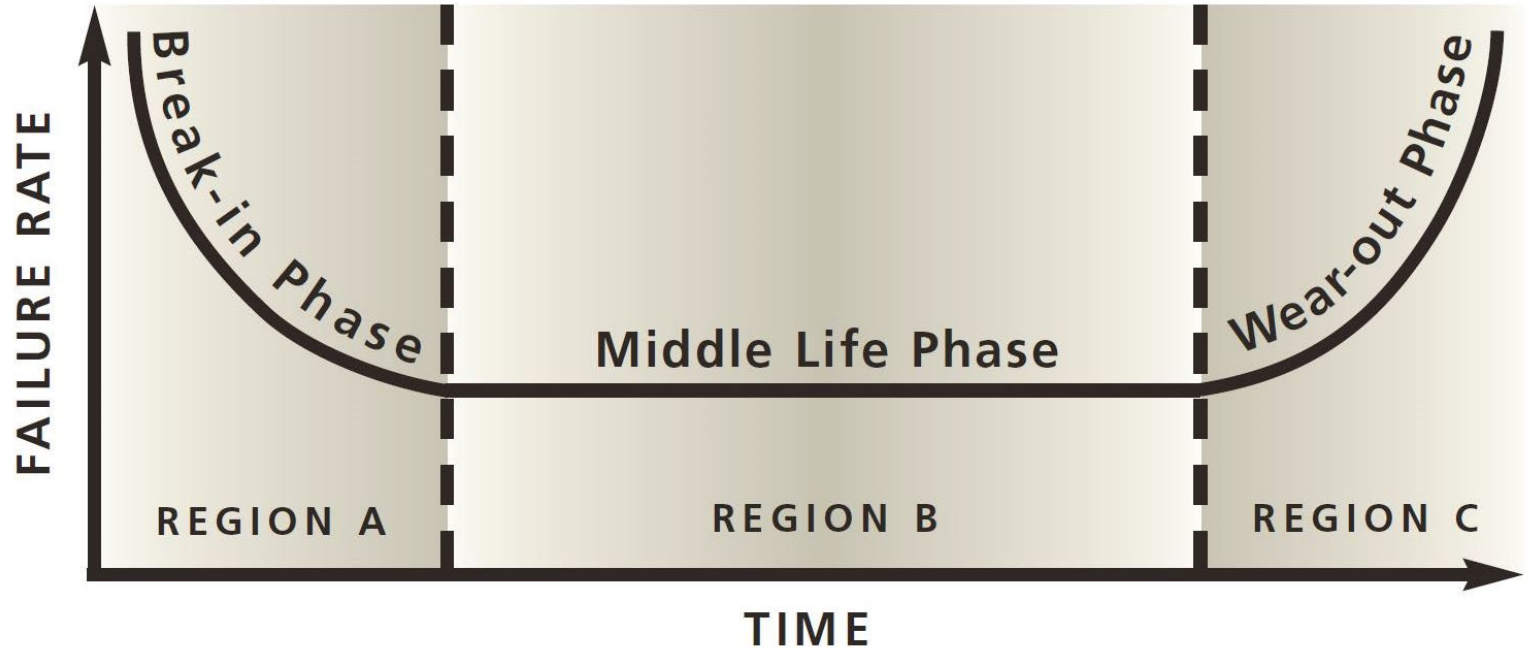
Anhydrous
Ammonia



EQUIPMENT LIFE CYCLE

Mechanical Integrity RAGAGEP References

Title 29 §1910.119(j)(4)(ii) Mechanical Integrity

- Inspection and testing procedures shall follow **recognized and generally accepted good engineering practices**.

Title 29 §1910.119(j)(4)(iii) Mechanical Integrity

- The frequency of inspections and tests of process equipment shall be consistent with applicable manufacturers' recommendations and **good engineering practices**, and more frequently if determined to be necessary by prior operating experience.

RAGAGEP Citations

ABATEMENT DOCUMENTATION REQUIRED FOR THIS ITEM

Date By Which Violation Must be Abated:	07/29/2016
Proposed Penalty:	$7000.00

Citation 1 Item 2 Type of Violation: **Serious**

29 CFR 1910.119(d)(3)(ii): The employer did not document that equipment complies with recognized and generally accepted good engineering practices (RAGAGEP's).

On or about i, the employer did not document that is complied with recognized and generally accepted good engineering practices (RAGAGEP) exposing employees to the hazards of inhalation of toxic ammonia and/or fire/explosion in the following instances, see A through E:

A. The employer failed to document compliance with RAGAGEP, such as IIAR Bulletin 114 "Identification of Ammonia Refrigeration Piping and System Components" Section 4.1 "Piping Markers" and Section 5.0 (a-d) "Marker Location", March 2014, as the employer failed to mark and/or label ammonia refrigeration equipment, including:

1. Engine Room 5, Evaporating Condenser, tower EC-1
2. Engine Room 6, Evaporating Condenser, tower EC-2
3. Engine Room 7, Evaporating Condenser, towers EC-1 and EC-2
4. Engine Room 8, Evaporating Condenser, towers EC-1, EC-2 and EC-3
5. Engine Room 11, Evaporating Condenser, tower EC-1, EC-2 and EC-3

B. Failure to document compliance with RAGAGEP, such as IIAR Bulletin 110 "Guidelines for: Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems" Section 6.6 Valves and Sensing Devices Subsection 6.6.1 Shut-off Valves, as the employer failed to change out ammonia refrigeration system safety relief valves prior to their 5 year due dates from the date of installation, including:

1. Engine Room 6, Heat Exchangers 1, 2 and 3. These are dual relief systems using Hansen Valves.

MI RAGAGEP Organizations

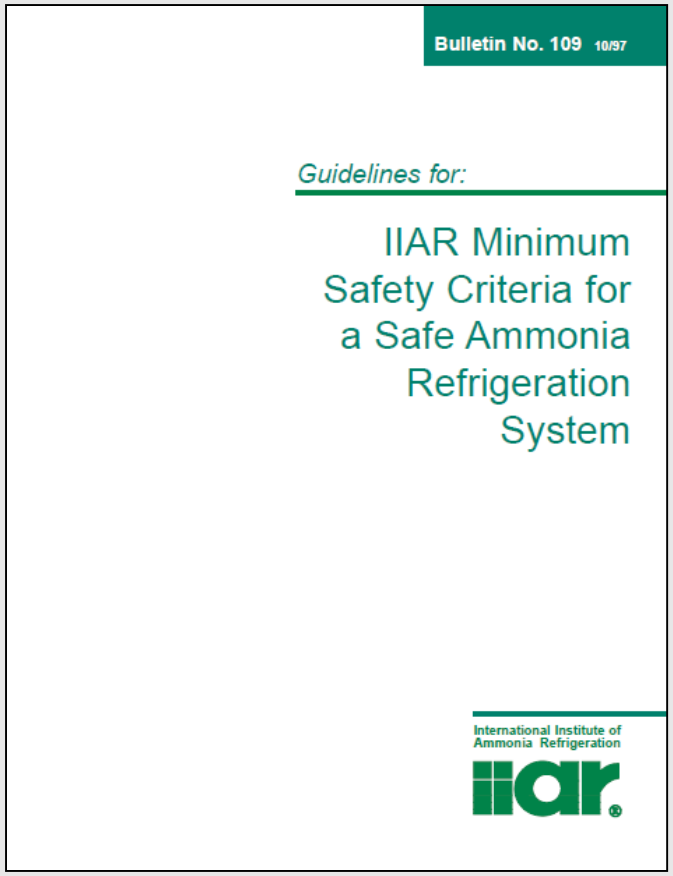
MI RAGAGEP Organizations

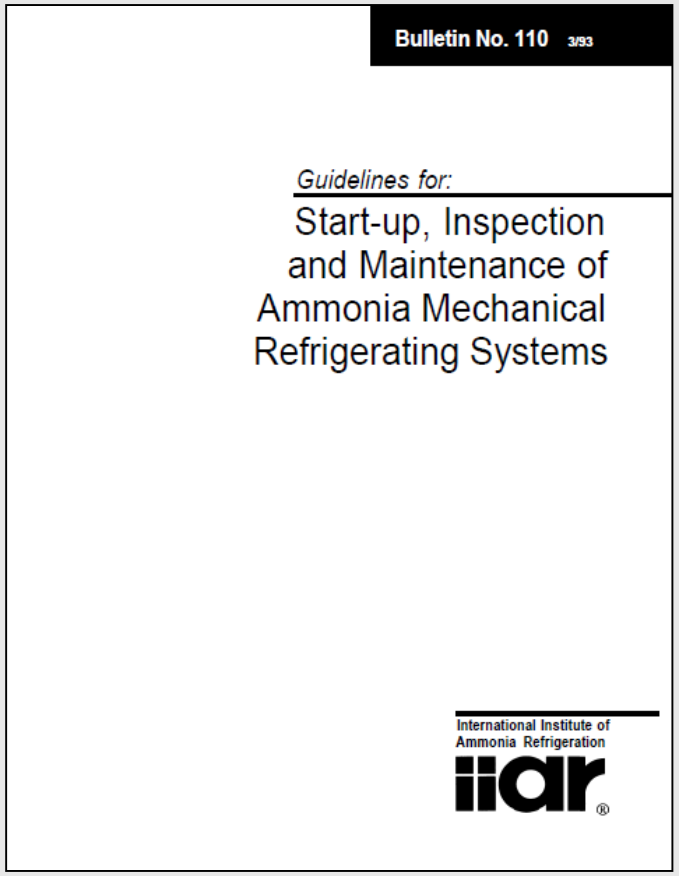
WHY STANDARD 6?

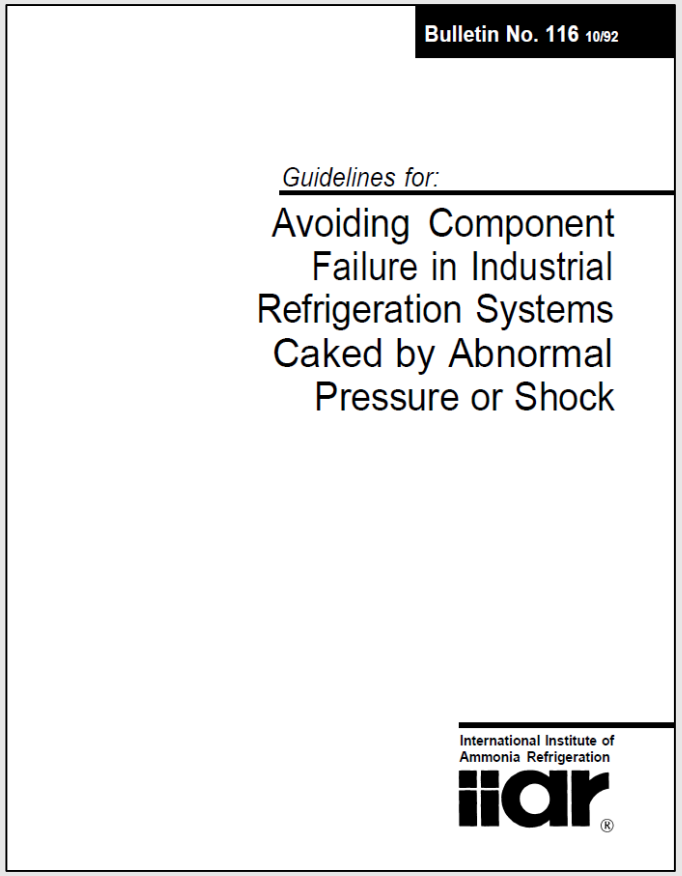
ITM

Inspection, Testing, and Maintenance

History of IIAR 6







International Institute of Ammonia Refrigeration

Ammonia Refrigeration Safety Inspection Checklist

ID Number: _____

PRESSURE VESSELS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Pressure Vessel

Vessel Location: _____

Vessel Identification Mark/No.: _____

Application

☐ High Pressure Receiver ☐ Intercooler ☐ Accumulator ☐ Oil Pot

☐ Pump Receiver, Low Temp ☐ Pump Receiver, High Temp ☐ Other (Describe) _____

Application Data

Normal Operating Pressure (psig): _____ Temperature (°F): _____

Vessel Size (Diam. x L/H, ft): _____ Normal Liquid Level (ft): _____

Normal Ammonia Inventory (cubic ft): _____

Design Capacity (Specify: Pumpdown, Surge Vol., TR, etc.): _____

Vessel Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Max. Design Working Pressure (psig): _____

Maximum Allowable Pressure (psig): _____ At (°F): _____

Minimum Design Metal Temperature (°F): _____ At (psig): _____

Test Pressure Applied (psig): _____

National Board No.: _____ ASME Certification Stamp? ☐ Yes ☐ No

Safety Relief Valve Data

Type: ☐ Dual ☐ Single ☐ None

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured or Recertified: _____ ASME Seal Unbroken? ☐ Yes ☐ No

Pressure Setting (psig): _____ Capacity (lbs. air/min): _____

Valve Connections: ☐ Inlet _____ ☐ Outlet _____ Pipe Size: ☐ Inlet _____ ☐ Outlet _____

Is Valve Properly Installed and Piped to Termination? ☐ Yes ☐ No

If No, Explain: _____

Visual Liquid Level Indicator

☐ Tubular ☐ Flat Armored ☐ Armored Bullseye ☐ High Pressure Industrial ☐ None

ID Number: _____

PRESSURE VESSELS

Requirement/Recommendation	Conforms	Recommended Action/Comments	Safety Status	Target Date
a) Nameplate legible and complete?	☐ Yes ☐ No			
b) Operating within limitations:				
1) Maximum pressure?	☐ Yes ☐ No			
2) Minimum temperature?	☐ Yes ☐ No			
c) Vessel ASME stamp legible?	☐ Yes ☐ No			
d) Certification drawings on file?	☐ Yes ☐ No			
e) Manufacturer data report on file?	☐ Yes ☐ No			
f) Does vessel have known alterations/modifications?	☐ Yes ☐ No			
1) If yes, was vessel recertified?	☐ Yes ☐ No			
2) Is revised data report on file?	☐ Yes ☐ No			
g) Relief valve:				
1) Proper type?	☐ Yes ☐ No			
2) Correct setting?	☐ Yes ☐ No			
3) Capacity correct?	☐ Yes ☐ No			
4) Installation correct?	☐ Yes ☐ No			
5) Piping to termination correct?	☐ Yes ☐ No			
6) Relief valve replaced or recertified within last 5 years of service?	☐ Yes ☐ No			
7) ASME seal unbroken?	☐ Yes ☐ No			
h) Tubular linear liquid level indicator (sight glass):				
1) Protected from traffic hazards?	☐ Yes ☐ No			
2) 360° guards?	☐ Yes ☐ No			
3) Internal check shutoff valves?	☐ Yes ☐ No			
i) Vessel properly identified? (Name, pressure level per IIAR Bulletin 114)	☐ Yes ☐ No			

j) Vessel condition (check one): ☐ no visible corrosion ☐ slight visible corrosion ☐ extensive corrosion ☐ unknown (insulated)

k) Insulation condition (check one): ☐ no vapor retarder leaks ☐ slight vapor retarder leaks ☐ extensive vapor retarder leaks ☐ not insulated

l) Relief valve condition (check one): ☐ clean, no visible corrosion ☐ slight external corrosion ☐ extensive corrosion

Are there any other conditions that might negatively affect safe vessel operation? ☐ Yes ☐ No

If yes, describe: _____

Bulletin No. 109 10/97

Guidelines for:

IIAR Minimum Safety Criteria for a Safe Ammonia Refrigeration System

International Institute of Ammonia Refrigeration

Bulletin No. 110 3/93

Guidelines for:

Start-up, Inspection and Maintenance of Ammonia Mechanical Refrigerating Systems

International Institute of Ammonia Refrigeration

iiar®

Revision to Bulletin 110

(Approved by IIAR Board of Directors June 19, 2007)

6.6.3 Pressure Relief Devices

Pressure-relief devices are generally one of two types: rupture discs or spring-loaded valves. Rupture discs are membranes that open at a set pressure and cannot reseal. Once ruptured, these devices must be replaced.

Spring-loaded relief valves open to relieve pressure when a set pressure is exceeded. After opening, these valves are designed to re-seat when pressure in the protected component drops below the valve's closing pressure. If a spring-loaded relief valve opens, the valve shall be replaced or recertified in a safe and timely manner. If re-seating is not complete, the valve shall be taken out of service immediately.

Relief valve vent lines shall be visually inspected annually to ensure that the vent line piping is intact and that vent outlets terminated to atmosphere are unobstructed and piped to prevent foreign matter from entering the vent line piping. If equipped, drip pockets shall be checked for water accumulation.

Pressure relief devices shall be replaced or recertified in accordance with one of these three options:

1) Every five (5) years from the date of installation.

   IIAR originally recommended (in 1978) that pressure relief valves be replaced every five years from the date of installation. This recommendation represents good engineering practice considering the design and performance of pressure relief devices; or

2) An alternative to the prescriptive replacement interval, i.e., five years, can be developed based on documented in-service relief valve life for specific applications using industry accepted good practices of relief valve evaluation; or

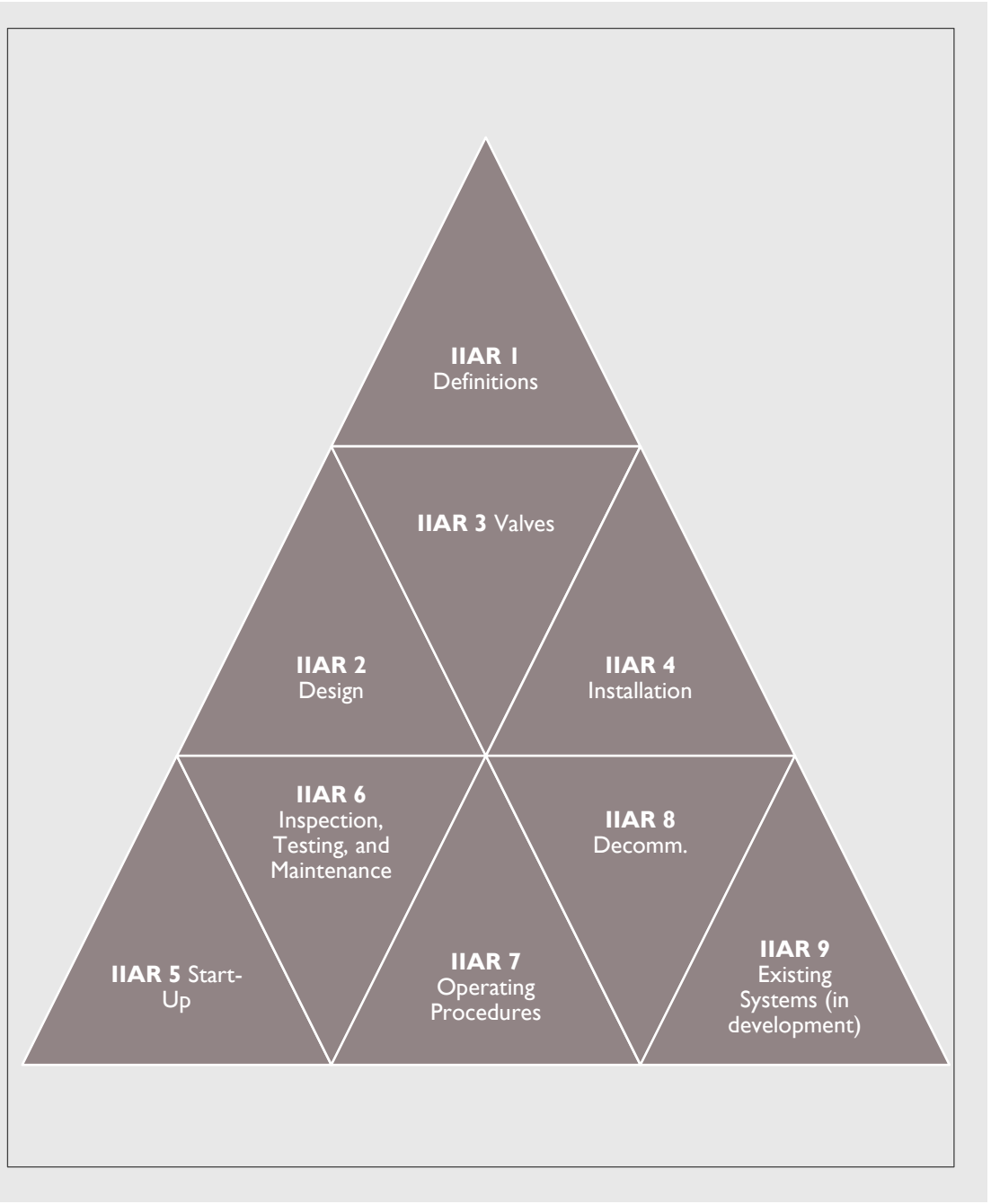
3) The manufacturer's recommendations on replacement frequency of pressure relief devices shall be followed.

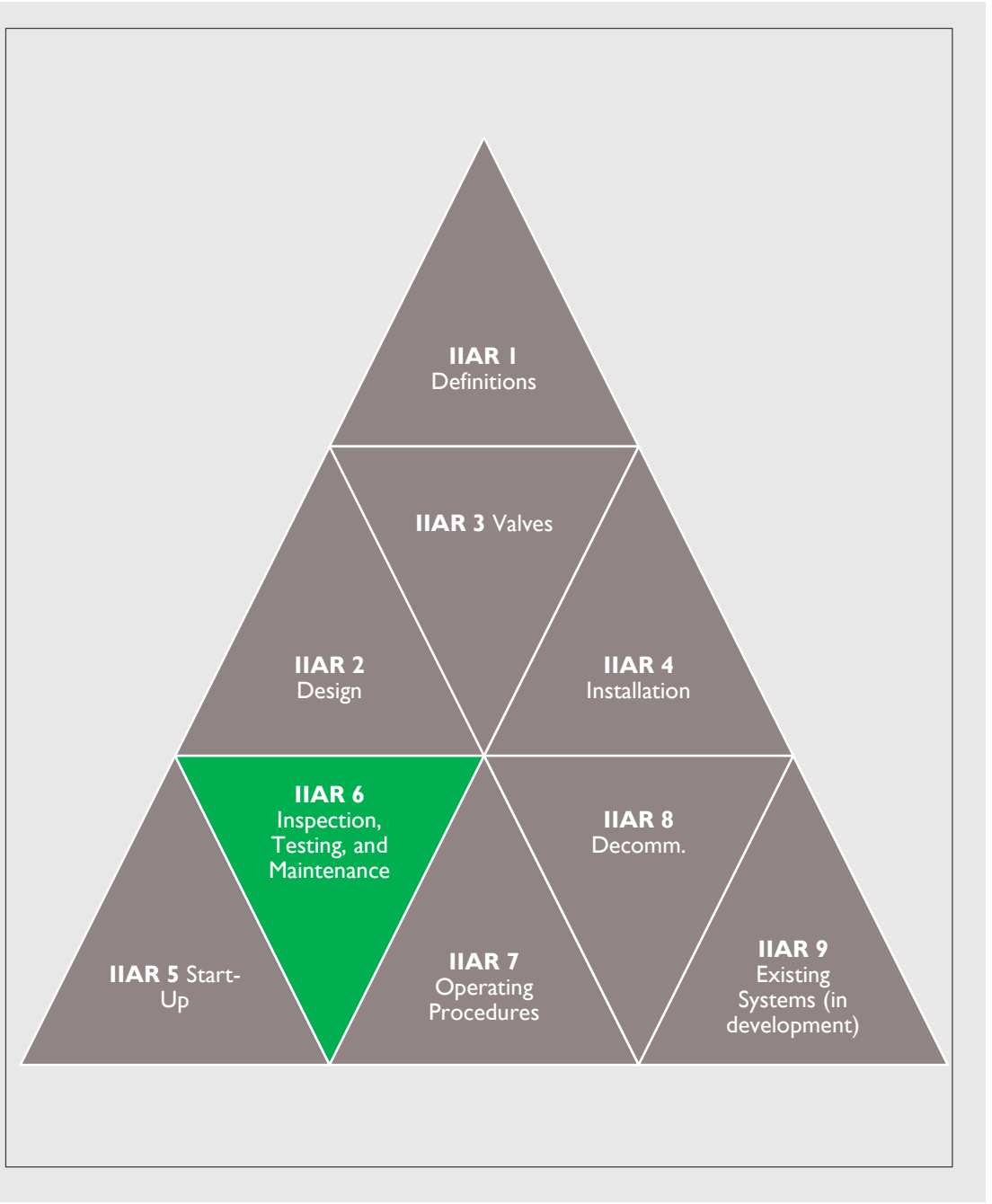
Exception: Relief devices discharging into another part of the closed-loop refrigeration system are not subject to the relief valve replacement practices.

All replacement pressure-relief devices shall be correctly selected in accordance with current editions of ANSI/IIAR 2 and ANSI/ASHRAE 15.

IIAR Bulletins

- IIAR Bulletin No. 110 §6.4.2 [emphasis mine]:
- *The system <u>should</u> be checked regularly for the presence of non-condensable gases which <u>should</u> be purged as necessary from the receiver(s) and/or condenser(s), <u>preferably</u> into a noncondensable gas remover or purger but <u>alternatively</u> into water. Where an automatic purger is fitted, its correct operation <u>should</u> be monitored. If there is a large accumulation of noncondensable gases the reason <u>should</u> be investigated and the cause <u>should</u> be corrected.*


IIAR 1
Definitions
IIAR 3 Valves
IIAR 2
Design
IIAR 4
Installation
IIAR 6
Inspection,
Testing, and
Maintenance
IIAR 8
Decomm.
IIAR 5 Start-
Up
IIAR 7
Operating
Procedures
IIAR 9
Existing
Systems (in
development)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development)

IIAR 6

Part 1 – General

- 1 – Purpose, Scope, and Applic.
- 2 – Definitions
- 3 – Reference Standards
- 4 – Program Administration

Part 2 – Program Requirement

- 5 – General
- 6 – Compressors
- 7 – Pumps
- 8 – Condensers
- 9 – Evaporators
- 10 – Vessels
- 11 – Piping
- 12 – Safety Systems
- 13 – Overpressure Protection Devices
- 14 - Purgers
- 15 – Ammonia and Secondary Coolants

Part 3 Appendices

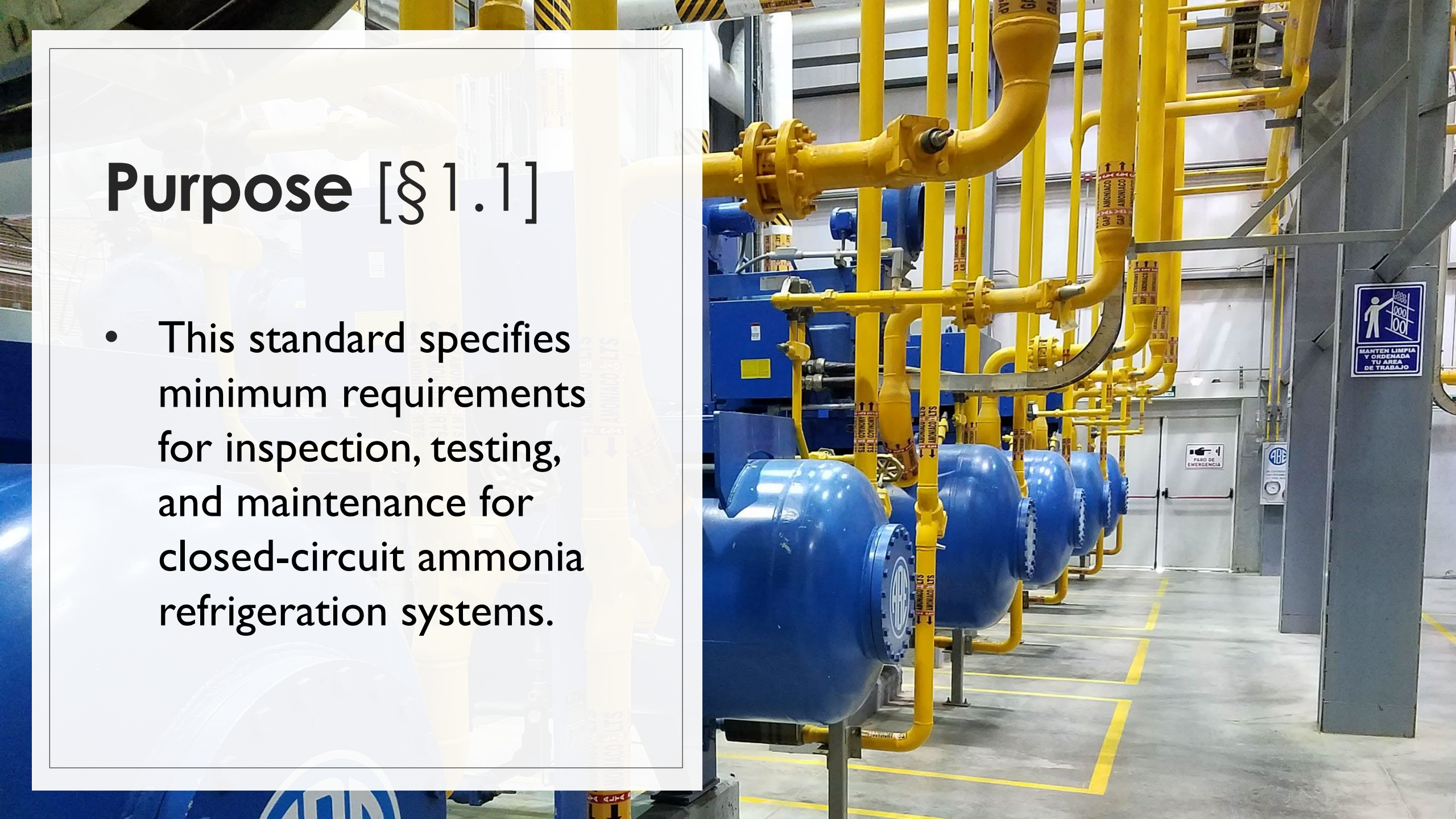
- A – Explanatory Material
- B – Safety Checklists
- C – Water Contamination
- D – Avoiding Abnormal Pressure/Shock
- E – Risk-Based ITM
- F - References

Compliance Schedule [§4.1.3]

- An owner shall be in compliance with this standard when it is adopted by the authority having jurisdiction (AHJ) or when it is adopted by the owner, whichever is first.

Purpose [§1.1]

- This standard specifies minimum requirements for inspection, testing, and maintenance for closed-circuit ammonia refrigeration systems.



Scope [§1.2]

- Record keeping, inspection, testing, and maintenance of closed-circuit ammonia refrigeration systems and ancillary equipment shall comply with this standard. This standard addresses equipment that is common to stationary closed-circuit ammonia refrigeration systems. Due to variations in system design and installation criteria, some systems will not include each type of equipment that this standard addresses.

Responsibility for Compliance [§4.1.1]

- The owner or owner's designated representative shall be responsible for overseeing and ensuring that inspection, testing, and maintenance is performed in accordance with the requirements of this standard.

IIAR 6

Part 1 – General

- 1 – Purpose, Scope, and Applic.
- 2 – Definitions
- 3 – Reference Standards
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Part 2 – Program Requirement

- 5 – General
- 6 – Compressors
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Part 3 Appendices

- A – Explanatory Material
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Type of Purging:

Ammonia Refrigeration Safety Inspection Checklist

PURGERS

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Automatic Refrigerated..... ☐

Manual Refrigerated ..... ☐

Manual, Non-Refrigerated ..... ☐

Equipment Data and Limits:

Manufacturer: _____ Model #: _____ Serial #: _____

Year Mfg.: _____ Design Pressure (psig): _____

Operating (psig /°F): _____ / _____ Normal Liquid Level: _____

Total Internal Vol: _____ Cu. Ft. Normal Ammonia Inventory (lbs.): _____

Material: ☐ Carbon Steel, ☐ Stainless Steel, ☐ Aluminum, ☐ Other: _____

Level Indicator Type: ☐ None, ☐ Armored Bullseye, ☐ Level Column w/Bullseye, ☐ Flat Armored, ☐ Level Column Only, ☐ Level Column w/ Veri/Techni Level

Relief Valve Data: ☐ **N/A**

Manufacturer: _____ Model: _____ Year Installed: _____

Assembly: ☐ Dual w/changeover valve ☐ Single Type of Relief Valve: ☐ Internal, ☐ External

Pressure Setting (psig): _____ Capacity (lbs. air per min/SCFM): _____ / _____

Purge Points:

Purge Point: _____ Purge Point: _____

Purge Point: _____ Purge Point: _____

Purge Point: _____ Purge Point: _____

Purge Point: _____ Purge Point: _____

Purge Point: _____ Purge Point: _____

Purge Point: _____ Purge Point: _____

Purge Point: _____ Purge Point: _____

Purge Point: _____ Purge Point: _____

Ammonia Refrigeration Safety Inspection Checklist

AMMONIA ABSORPTION SYSTEM

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Equipment Data and Limits:

Manufacturer: _____ Model: _____ Serial Number: _____

Year Mfg.: _____ Listed Certification: _____ Design Temp. (°F): _____

Voltage: _____ Phase: _____ FLA: _____ Design Press. (psig): _____

Absorber Data: (If ASME approved, use the Pressure Vessels Safety Inspection Checklist)

Material of construction: ☐ Steel, ☐ Stainless Steel, ☐ Aluminum, ☐ Other: _____

Absorbent Medium: ☐ Liquid-Vapor, Type Liquid: _____ ☐ Solid-Vapor, Type Solid: _____

Design Temperature (°F): _____ Operating Temperature (°F): _____

Generator (Desorber) Data:

Material of construction: ☐ Steel, ☐ Stainless Steel, ☐ Aluminum, ☐ Other: _____

Generator Heat Source: ☐ Gas, Type: _____, ☐ Electric, ☐ Waste Heat, Fuel Used: _____

Design Temperature (°F): _____ Operating Temperature (°F): _____

Rectifier Data:

Material of construction: ☐ Steel, ☐ Stainless Steel, ☐ Aluminum, ☐ Other: _____

Design Temperature (°F): _____ Operating Temperature (°F): _____

For other Ammonia Absorption System equipment or devices, use all applicable Ammonia Refrigeration System Safety Inspection Checklists such as Condensers, Heat Exchangers, Air-Cooling Evaporators, Pressure Vessels (for absorption vessel), Refrigerant Pumps (ammonia or secondary coolant), Pressure Relief Valves, Ventilation, General Safety, etc.

Are other applicable Ammonia Refrigeration System Safety Inspection Checklists used and attached? Yes ☐ No ☐

If No, explain:

_____

_____

_____

_____

_____

Ammonia Refrigeration Safety Inspection Checklist

SAFETY SYSTEMS

Location: ______________________ ID/Tag No.: ____________
Facility Owner: ______________________
Address: ______________________
Contact: ______________________ Phone: ____________
Inspector: ______________________ Date: ____________

Ammonia Detector Data: (Use as many copies of this sheet as necessary to document all detectors)

Detector Type: ☐ Catalytic Bead, ☐ Electro-chemical, ☐ Opto-acoustic, ☐ Semi-conductor, ☐ Infrared, ☐ Rupture Disc, ☐ Other: ____________
Manufacturer: ____________ Model: ________ Alarm Levels (ppm): ________ Quantity: ______
Location(s): ______________________

Detector Type: ☐ Catalytic Bead, ☐ Electro-chemical, ☐ Opto-acoustic, ☐ Semi-conductor, ☐ Infrared, ☐ Rupture Disc, ☐ Other: ____________
Manufacturer: ____________ Model: ________ Alarm Levels (ppm): ________ Quantity: ______
Location(s): ______________________

Detector Type: ☐ Catalytic Bead, ☐ Electro-chemical, ☐ Opto-acoustic, ☐ Semi-conductor, ☐ Infrared, ☐ Rupture Disc, ☐ Other: ____________
Manufacturer: ____________ Model: ________ Alarm Levels (ppm): ________ Quantity: ______
Location(s): ______________________

Machinery Room Ventilation System: (Use as many copies of this sheet as necessary to document all exhaust fans)

Continuous Ventilation Fan Data: Quantity: ________
Manufacturer: ____________ Model: ____________ Serial Number(s): ____________
ID/Tag Number(s): ____________ Air Flow (cfm): ____________ Year Mfg.: ____________
Material: ☐ Galv. Steel, ☐ Stainless Steel, ☐ Aluminum Belt Qty: ________ Belt Size: ________

Intermittent (Temperature Control) Ventilation Fan Data: Quantity: ________
Manufacturer: ____________ Model: ____________ Serial Number(s): ____________
ID/Tag Number(s): ____________ Air Flow (cfm): ____________ Year Mfg.: ____________
Material: ☐ Galv. Steel, ☐ Stainless Steel, ☐ Aluminum Belt Qty: ________ Belt Size: ________

Emergency Ventilation Fan Data: Quantity: ________
Manufacturer: ____________ Model: ____________ Serial Number(s): ____________
ID/Tag Number(s): ____________ Air Flow (cfm): ____________ Year Mfg.: ____________
Material: ☐ Galv. Steel, ☐ Stainless Steel, ☐ Aluminum Belt Qty: ________ Belt Size: ________

Ammonia Refrigeration Safety Inspection Checklist

GENERAL SYSTEM

Location: ______________________ ID/Tag No.: ____________
Facility Owner: ______________________
Address: ______________________
Contact: ______________________ Phone: ____________
Inspector: ______________________ Date: ____________

This checklist applies to the general system components.

Inspection Items	Conforms	Safety Status	Recommended Action, or Comments	Target Date
a) Equipment labeled and nameplate legible per ANSI/IIAR 2?	Yes ☐ No ☐ N/A ☐			
b) All components suitable for ammonia?	Yes ☐ No ☐ N/A ☐			
c) Operating within limits?	Yes ☐ No ☐ N/A ☐			
d) Fasteners tight, adequately anchored, and supported?	Yes ☐ No ☐ N/A ☐			
e) Safe access for Inspection, Testing and Maintenance (ITM)?	Yes ☐ No ☐ N/A ☐			
f) Free of excessive ice buildup?	Yes ☐ No ☐ N/A ☐			
g) Free of abnormal sounds/vibration?				
h) Free of ammonia leaks?	Yes ☐ No ☐ N/A ☐			
i) Adequate protection against traffic hazards?	Yes ☐ No ☐ N/A ☐			
j) Sufficient pressure/temperature gauges and/or transducers are present and functioning adequately?	Yes ☐ No ☐ N/A ☐			
k) Oil pots installed at all points where oil must be drained?	Yes ☐ No ☐ N/A ☐			
l) Oil drain valves are self-closing?	Yes ☐ No ☐ N/A ☐			
m) Sign in machinery room prominently displays: a. Name, address and telephone of installing/servicing contractor? b. Approximate quantity of ammonia? c. Lubricant identity and amount? d. Field test pressure?	Yes ☐ No ☐ N/A ☐			
n) Aisles in machinery room clearly marked and clear of obstructions?	Yes ☐ No ☐ N/A ☐			
o) There is more than one exit from the machinery room?	Yes ☐ No ☐ N/A ☐			
p) At least one exit is designated as a principal machinery room door and has required placarding per IIAR 2? Additional principal machinery room doors and auxiliary machinery room doors have required placarding per IIAR 2?	Yes ☐ No ☐ N/A ☐			

International Institute of Ammonia Refrigeration

Ammonia Refrigeration Safety Inspection Checklist

ID Number: _____

AIR-COOLING EVAPORATORS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Air Cooling Evaporators

Air Cooling Evaporator Location: _____

Air Cooling Identification Mark/No.: _____

Application

☐ Blast Freezer ☐ Storage Freezer

☐ Process Room ☐ Dock

☐ Storage Cooler

☐ Other *(Describe)*: _____

Type of Refrigerant Feed

☐ Liquid Recirculation ☐ Dry Expansion (DX)

☐ Flooded *(Surge Drum)*

☐ Other *(Describe)*: _____

Application Data

Tube and Fin Material: ☐ carbon steel ☐ stainless steel ☐ aluminum

Defrost Type: ☐ air ☐ water ☐ hot gas ☐ other _____

Design Room Air Temperature *(°F)*: _____ Normal Refrigerant Temperature *(°F)*: _____

Design Capacity *(TR)*: _____ Design Air Flow *(CFM)*: _____

Total Internal Vol. *(cubic ft)*: _____

Normal Ammonia Inventory *(Volume/Weight)*: ☐ cubic ft: _____ ☐ lb: _____

Air Cooling Evaporator Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Design Pressure *(psig)*: _____

Fan Motor Nameplate Data

Manufacturer, Name, Model, Serial No., Year Manufactured: _____

Frame Size: _____ Type: _____ Speed *(rpm)*: _____ Power *(hp)*: _____

Voltage: _____ FLA *(amps)*: _____ Phase: ☐ 1 ☐ 3

Frequency *(Hz)*: _____ Belt size and number: _____

IIAR Bulletin No. 109

Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Application: Type of Refrigerant Feed:

Blast Freezer	☐	Liquid Recirculation (Top Feed)	☐
Storage Freezer	☐	Liquid Recirculation (Bottom Feed)	☐
Storage Cooler	☐	Flooded (Surge Drum)	☐
Dock	☐	Direct Expansion (DX)	☐
Process Room	☐	Ammonia Absorption System	☐
Other (Describe)	☐	Other (Describe)	☐

_____ _____

Equipment Data and Limits:

Manufacturer: _____ Model: _____ Serial Number: _____

Year Manufactured: _____ Design Pressure (psig): _____

Room Air Temp (°F): _____ Suction (psig /°F): _____ /

Total Internal Vol: _____ Cu. Ft. Normal Ammonia Inventory (lbs.): _____

Tube and Fin Material: ☐ Galv. Steel, ☐ All Stainless Steel, ☐ Aluminum, ☐ Stainless tube/Aluminum Fin

Defrost Type: ☐ Air, ☐ Water, ☐ Hot Gas, ☐ Other: _____

Fan Motor Data:

Manufacturer: _____ hp: _____ rpm: _____ FLA: _____

Frequency (Hz): _____ Voltage: _____ Phase: _____ Service Factor: _____

Frame Size: _____ Belt Qty: _____ Belt Size: _____ Motor Qty: _____

IIAR Standard 6

International Institute of Ammonia Refrigeration

Ammonia Refrigeration Safety Inspection Checklist

ID Number: _____

AIR-COOLING EVAPORATORS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Air Cooling Evaporators

Air Cooling Evaporator Location: _____

Air Cooling Identification Mark/No.: _____

Application

☐ Blast Freezer ☐ Storage Freezer

☐ Process Room ☐ Dock

☐ Storage Cooler

☐ Other *(Describe)*: _____

Type of Refrigerant Feed

☐ Liquid Recirculation ☐ Dry Expansion (DX)

☐ Flooded *(Surge Drum)*

☐ Other *(Describe)*: _____

Application Data

Tube and Fin Material: ☐ carbon steel ☐ stainless steel ☐ aluminum

Defrost Type: ☐ air ☐ water ☐ hot gas ☐ other _____

Design Room Air Temperature *(°F)*: _____ Normal Refrigerant Temperature *(°F)*: _____

Design Capacity *(TR)*: _____ Design Air Flow *(CFM)*: _____

Total Internal Vol. *(cubic ft)*: _____

Normal Ammonia Inventory *(Volume/Weight)*: ☐ cubic ft: _____ ☐ lb: _____

Air Cooling Evaporator Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Design Pressure *(psig)*: _____

Fan Motor Nameplate Data

Manufacturer, Name, Model, Serial No., Year Manufactured: _____

Frame Size: _____ Type: _____ Speed *(rpm)*: _____ Power *(hp)*: _____

Voltage: _____ FLA *(amps)*: _____ Phase: ☐ 1 ☐ 3

Frequency *(Hz)*: _____ Belt size and number: _____

IIAR Bulletin No. 109

Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Application: Type of Refrigerant Feed:

Blast Freezer	☐	Liquid Recirculation (Top Feed)	☐
Storage Freezer	☐	Liquid Recirculation (Bottom Feed)	☐
Storage Cooler	☐	Flooded (Surge Drum)	☐
Dock	☐	Direct Expansion (DX)	☐
Process Room	☐	Ammonia Absorption System	☐
Other (Describe)	☐	Other (Describe)	☐

_____ _____

Equipment Data and Limits:

Manufacturer: _____ Model: _____ Serial Number: _____

Year Manufactured: _____ Design Pressure (psig): _____

Room Air Temp (°F): _____ Suction (psig /°F): _____ /

Total Internal Vol: _____ Cu. Ft. Normal Ammonia Inventory (lbs.): _____

Tube and Fin Material: ☐ Galv. Steel, ☐ All Stainless Steel, ☐ Aluminum, ☐ Stainless tube/Aluminum Fin

Defrost Type: ☐ Air, ☐ Water, ☐ Hot Gas, ☐ Other: _____

Fan Motor Data:

Manufacturer: _____ hp: _____ rpm: _____ FLA: _____

Frequency (Hz): _____ Voltage: _____ Phase: _____ Service Factor: _____

Frame Size: _____ Belt Qty: _____ Belt Size: _____ Motor Qty: _____

IIAR Standard 6

International Institute of Ammonia Refrigeration

Ammonia Refrigeration Safety Inspection Checklist

ID Number: _____

AIR-COOLING EVAPORATORS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Air Cooling Evaporators

Air Cooling Evaporator Location: _____

Air Cooling Identification Mark/No.: _____

Application

- ☐ Blast Freezer
- ☐ Storage Freezer
- ☐ Process Room
- ☐ Dock
- ☐ Storage Cooler
- ☐ Other *(Describe)*: _____

Type of Refrigerant Feed

- ☐ Liquid Recirculation
- ☐ Dry Expansion (DX)
- ☐ Flooded *(Surge Drum)*
- ☐ Other *(Describe)*: _____

Application Data

Tube and Fin Material: ☐ carbon steel ☐ stainless steel ☐ aluminum

Defrost Type: ☐ air ☐ water ☐ hot gas ☐ other _____

Design Room Air Temperature *(°F)*: _____ Normal Refrigerant Temperature *(°F)*: _____

Design Capacity *(TR)*: _____ Design Air Flow *(CFM)*: _____

Total Internal Vol. *(cubic ft)*: _____

Normal Ammonia Inventory *(Volume/Weight)*: ☐ cubic ft: _____ ☐ lb: _____

Air Cooling Evaporator Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Design Pressure *(psig)*: _____

Fan Motor Nameplate Data

Manufacturer, Name, Model, Serial No., Year Manufactured: _____

Frame Size: _____ Type: _____ Speed *(rpm)*: _____ Power *(hp)*: _____

Voltage: _____ FLA *(amps)*: _____ Phase: ☐ 1 ☐ 3

Frequency *(Hz)*: _____ Belt size and number: _____

IIAR Bulletin No. 109

Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Application: Type of Refrigerant Feed:

- Blast Freezer ☐
- Storage Freezer ☐
- Storage Cooler ☐
- Dock ☐
- Process Room ☐
- Other (Describe) ☐

_____

- Liquid Recirculation (Top Feed) ☐
- Liquid Recirculation (Bottom Feed) ☐
- Flooded (Surge Drum) ☐
- Direct Expansion (DX) ☐
- Ammonia Absorption System ☐
- Other (Describe) ☐

_____

Equipment Data and Limits:

Manufacturer: _____ Model: _____ Serial Number: _____

Year Manufactured: _____ Design Pressure (psig): _____

Room Air Temp (°F): _____ Suction (psig /°F): _____ /

Total Internal Vol: _____ Cu. Ft. Normal Ammonia Inventory (lbs.): _____

Tube and Fin Material: ☐ Galv. Steel, ☐ All Stainless Steel, ☐ Aluminum, ☐ Stainless tube/Aluminum Fin

Defrost Type: ☐ Air, ☐ Water, ☐ Hot Gas, ☐ Other: _____

Fan Motor Data:

Manufacturer: _____ hp: _____ rpm: _____ FLA: _____

Frequency (Hz): _____ Voltage: _____ Phase: _____ Service Factor: _____

Frame Size: _____ Belt Qty: _____ Belt Size: _____ Motor Qty: _____

IIAR Standard 6

International Institute of Ammonia Refrigeration

Ammonia Refrigeration Safety Inspection Checklist

ID Number: _____

AIR-COOLING EVAPORATORS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Air Cooling Evaporators

Air Cooling Evaporator Location: _____

Air Cooling Identification Mark/No.: _____

Application

☐ Blast Freezer ☐ Storage Freezer

☐ Process Room ☐ Dock

☐ Storage Cooler

☐ Other *(Describe)*: _____

Type of Refrigerant Feed

☐ Liquid Recirculation ☐ Dry Expansion (DX)

☐ Flooded *(Surge Drum)*

☐ Other *(Describe)*: _____

Application Data

Tube and Fin Material: ☐ carbon steel ☐ stainless steel ☐ aluminum

Defrost Type: ☐ air ☐ water ☐ hot gas ☐ other _____

Design Room Air Temperature *(°F)*: _____ Normal Refrigerant Temperature *(°F)*: _____

Design Capacity *(TR)*: _____ Design Air Flow *(CFM)*: _____

Total Internal Vol. *(cubic ft)*: _____

Normal Ammonia Inventory *(Volume/Weight)*: ☐ cubic ft: _____ ☐ lb: _____

Air Cooling Evaporator Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Design Pressure *(psig)*: _____

Fan Motor Nameplate Data

Manufacturer, Name, Model, Serial No., Year Manufactured: _____

Frame Size: _____ Type: _____ Speed *(rpm)*: _____ Power *(hp)*: _____

Voltage: _____ FLA *(amps)*: _____ Phase: ☐ 1 ☐ 3

Frequency *(Hz)*: _____ Belt size and number: _____

IIAR Bulletin No. 109

Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Application: Type of Refrigerant Feed:

Blast Freezer ☐ Liquid Recirculation (Top Feed) ☐

Storage Freezer ☐ Liquid Recirculation (Bottom Feed) ☐

Storage Cooler ☐ Flooded (Surge Drum) ☐

Dock ☐ Direct Expansion (DX) ☐

Process Room ☐ Ammonia Absorption System ☐

Other (Describe) ☐ Other (Describe) ☐

_____ _____

Equipment Data and Limits:

Manufacturer: _____ Model: _____ Serial Number: _____

Year Manufactured: _____ Design Pressure (psig): _____

Room Air Temp (°F): _____ Suction (psig /°F): _____ /

Total Internal Vol: _____ Cu. Ft. Normal Ammonia Inventory (lbs.): _____

Tube and Fin Material: ☐ Galv. Steel, ☐ All Stainless Steel, ☐ Aluminum, ☐ Stainless tube/Aluminum Fin

Defrost Type: ☐ Air, ☐ Water, ☐ Hot Gas, ☐ Other: _____

Fan Motor Data:

Manufacturer: _____ hp: _____ rpm: _____ FLA: _____

Frequency (Hz): _____ Voltage: _____ Phase: _____ Service Factor: _____

Frame Size: _____ Belt Qty: _____ Belt Size: _____ Motor Qty: _____

IIAR Standard 6

International Institute of Ammonia Refrigeration

Ammonia Refrigeration Safety Inspection Checklist

ID Number: _____

AIR-COOLING EVAPORATORS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Air Cooling Evaporators

Air Cooling Evaporator Location: _____

Air Cooling Identification Mark/No.: _____

Application

☐ Blast Freezer ☐ Storage Freezer

☐ Process Room ☐ Dock

☐ Storage Cooler

☐ Other *(Describe)*: _____

Type of Refrigerant Feed

☐ Liquid Recirculation ☐ Dry Expansion (DX)

☐ Flooded *(Surge Drum)*

☐ Other *(Describe)*: _____

Application Data

Tube and Fin Material: ☐ carbon steel ☐ stainless steel ☐ aluminum

Defrost Type: ☐ air ☐ water ☐ hot gas ☐ other _____

Design Room Air Temperature *(°F)*: _____ Normal Refrigerant Temperature *(°F)*: _____

Design Capacity *(TR)*: _____ Design Air Flow *(CFM)*: _____

Total Internal Vol. *(cubic ft)*: _____

Normal Ammonia Inventory *(Volume/Weight)*: ☐ cubic ft: _____ ☐ lb: _____

Air Cooling Evaporator Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Design Pressure *(psig)*: _____

Fan Motor Nameplate Data

Manufacturer, Name, Model, Serial No., Year Manufactured: _____

Frame Size: _____ Type: _____ Speed *(rpm)*: _____ Power *(hp)*: _____

Voltage: _____ FLA *(amps)*: _____ Phase: ☐ 1 ☐ 3

Frequency *(Hz)*: _____ Belt size and number: _____

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Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Application: Type of Refrigerant Feed:

Blast Freezer	☐	Liquid Recirculation (Top Feed)	☐
Storage Freezer	☐	Liquid Recirculation (Bottom Feed)	☐
Storage Cooler	☐	Flooded (Surge Drum)	☐
Dock	☐	Direct Expansion (DX)	☐
Process Room	☐	Ammonia Absorption System	☐
Other (Describe)	☐	Other (Describe)	☐

_____ _____

Equipment Data and Limits:

Manufacturer: _____ Model: _____ Serial Number: _____

Year Manufactured: _____ Design Pressure (psig): _____

Room Air Temp (°F): _____ Suction (psig /°F): _____ /

Total Internal Vol: _____ Cu. Ft. Normal Ammonia Inventory (lbs.): _____

Tube and Fin Material: ☐ Galv. Steel, ☐ All Stainless Steel, ☐ Aluminum, ☐ Stainless tube/Aluminum Fin

Defrost Type: ☐ Air, ☐ Water, ☐ Hot Gas, ☐ Other: _____

Fan Motor Data:

Manufacturer: _____ hp: _____ rpm: _____ FLA: _____

Frequency (Hz): _____ Voltage: _____ Phase: _____ Service Factor: _____

Frame Size: _____ Belt Qty: _____ Belt Size: _____ Motor Qty: _____

IIAR Standard 6

International Institute of Ammonia Refrigeration

Ammonia Refrigeration Safety Inspection Checklist

ID Number: _____

AIR-COOLING EVAPORATORS

Plant Owner: _____

Address: _____

Contact: _____ Telephone: _____

Inspector: _____ Date: _____

Air Cooling Evaporators

Air Cooling Evaporator Location: _____

Air Cooling Identification Mark/No.: _____

Application

☐ Blast Freezer ☐ Storage Freezer

☐ Process Room ☐ Dock

☐ Storage Cooler

☐ Other *(Describe)*: _____

Type of Refrigerant Feed

☐ Liquid Recirculation ☐ Dry Expansion (DX)

☐ Flooded *(Surge Drum)*

☐ Other *(Describe)*: _____

Application Data

Tube and Fin Material: ☐ carbon steel ☐ stainless steel ☐ aluminum

Defrost Type: ☐ air ☐ water ☐ hot gas ☐ other _____

Design Room Air Temperature *(°F)*: _____ Normal Refrigerant Temperature *(°F)*: _____

Design Capacity *(TR)*: _____ Design Air Flow *(CFM)*: _____

Total Internal Vol. *(cubic ft)*: _____

Normal Ammonia Inventory *(Volume/Weight)*: ☐ cubic ft: _____ ☐ lb: _____

Air Cooling Evaporator Nameplate Data

Manufacturer, Name, Model, Serial No.: _____

Year Manufactured: _____ Design Pressure *(psig)*: _____

Fan Motor Nameplate Data

Manufacturer, Name, Model, Serial No., Year Manufactured: _____

Frame Size: _____ Type: _____ Speed *(rpm)*: _____ Power *(hp)*: _____

Voltage: _____ FLA *(amps)*: _____ Phase: ☐ 1 ☐ 3

Frequency *(Hz)*: _____ Belt size and number: _____

IIAR Bulletin No. 109

Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: _____ ID/Tag No.: _____

Facility Owner: _____

Address: _____

Contact: _____ Phone: _____

Inspector: _____ Date: _____

Application: Type of Refrigerant Feed:

Blast Freezer	☐	Liquid Recirculation (Top Feed)	☐
Storage Freezer	☐	Liquid Recirculation (Bottom Feed)	☐
Storage Cooler	☐	Flooded (Surge Drum)	☐
Dock	☐	Direct Expansion (DX)	☐
Process Room	☐	Ammonia Absorption System	☐
Other (Describe)	☐	Other (Describe)	☐

_____ _____

Equipment Data and Limits:

Manufacturer: _____ Model: _____ Serial Number: _____

Year Manufactured: _____ Design Pressure (psig): _____

Room Air Temp (°F): _____ Suction (psig /°F): _____ /

Total Internal Vol: _____ Cu. Ft. Normal Ammonia Inventory (lbs.): _____

Tube and Fin Material: ☐ Galv. Steel, ☐ All Stainless Steel, ☐ Aluminum, ☐ Stainless tube/Aluminum Fin

Defrost Type: ☐ Air, ☐ Water, ☐ Hot Gas, ☐ Other: _____

Fan Motor Data:

Manufacturer: _____ hp: _____ rpm: _____ FLA: _____

Frequency (Hz): _____ Voltage: _____ Phase: _____ Service Factor: _____

Frame Size: _____ Belt Qty: _____ Belt Size: _____ Motor Qty: _____

IIAR Standard 6

ID Number: _____

AIR-COOLING EVAPORATORS

Requirement/Recommendation	Conforms	Recommended Action/Comments	Safety Status	Target Date
a) Nameplate legible & complete?	☐ Yes ☐ No			
b) Suitable for ammonia?	☐ Yes ☐ No			
c) Operation within limits?	☐ Yes ☐ No			
d) Adequately anchored and supported?	☐ Yes ☐ No			
e) Safe access for service & maintenance?	☐ Yes ☐ No			
f) Free from excessive vibration?	☐ Yes ☐ No			
g) Adequate protection against traffic hazards?	☐ Yes ☐ No			
h) Evaporator free from excessive ice buildup and clean of dirt?	☐ Yes ☐ No			
i) Drive properly guarded & protected?	☐ Yes ☐ No			
j) Evaporator condition (check one)	☐ clean, no visible corrosion ☐ slight visible corrosion ☐ extensive corrosion			

Are there any other conditions that might negatively affect safe evaporator operation? ☐ Yes ☐ No

If yes, describe. _____

IIAR Bulletin No. 109

Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: ID/Tag No.:

Inspection Items	Conforms	Safety Status	Recommended Action, or Comments	Target Date
a) Equipment labeled and nameplate legible per ANSI/IIAR 2?	Yes ☐ No ☐ N/A ☐			
b) Suitable for ammonia?	Yes ☐ No ☐ N/A ☐			
c) Operating within limits?	Yes ☐ No ☐ N/A ☐			
d) Fasteners tight, adequately anchored, and supported?	Yes ☐ No ☐ N/A ☐			
e) Safe access for Inspection, Testing and Maintenance (ITM)?	Yes ☐ No ☐ N/A ☐			
f) Free of excessive ice buildup?	Yes ☐ No ☐ N/A ☐			
g) Free of abnormal sounds/vibration?	Yes ☐ No ☐ N/A ☐			
h) Free of ammonia leaks?	Yes ☐ No ☐ N/A ☐			
i) All piping has markers per ANSI/IIAR 2?	Yes ☐ No ☐ N/A ☐			
j) Are valves in good condition?	Yes ☐ No ☐ N/A ☐			
k) Are critical manual and control valves tagged, exercised, and stems lubricated?	Yes ☐ No ☐ N/A ☐			
l) Sufficient pressure/temperature gauges and/or transducers are present and functioning adequately?	Yes ☐ No ☐ N/A ☐			
m) Belts, sheaves, coupling, etc., in good working order and adequately guarded?	Yes ☐ No ☐ N/A ☐			
n) Free of pitting and surface damage and coils free of dirt? a. If No, note damage level:	Yes ☐ No ☐ N/A ☐ Slight ☐ Extensive ☐			
o) Free of any other conditions that negatively affect safe operation?	Yes ☐ No ☐ N/A ☐			

If No, describe:

_____

IIAR Standard 6

ID Number: _____

AIR-COOLING EVAPORATORS

Requirement/Recommendation	Conforms	Recommended Action/Comments	Safety Status	Target Date
a) Nameplate legible & complete?	☐ Yes ☐ No			
b) Suitable for ammonia?	☐ Yes ☐ No			
c) Operation within limits?	☐ Yes ☐ No			
d) Adequately anchored and supported?	☐ Yes ☐ No			
e) Safe access for service & maintenance?	☐ Yes ☐ No			
f) Free from excessive vibration?	☐ Yes ☐ No			
g) Adequate protection against traffic hazards?	☐ Yes ☐ No			
h) Evaporator free from excessive ice buildup and clean of dirt?	☐ Yes ☐ No			
i) Drive properly guarded & protected?	☐ Yes ☐ No			

j) Evaporator condition (check one) ☐ clean, no visible corrosion ☐ slight visible corrosion ☐ extensive corrosion

Are there any other conditions that might negatively affect safe evaporator operation? ☐ Yes ☐ No

If yes, describe. _____

_____

_____

_____

_____

IIAR Bulletin No. 109

Ammonia Refrigeration Safety Inspection Checklist

AIR-COOLING EVAPORATOR

Location: ID/Tag No.:

Inspection Items	Conforms	Safety Status	Recommended Action, or Comments	Target Date
a) Equipment labeled and nameplate legible per ANSI/IIAR 2?	Yes ☐ No ☐ N/A ☐			
b) Suitable for ammonia?	Yes ☐ No ☐ N/A ☐			
c) Operating within limits?	Yes ☐ No ☐ N/A ☐			
d) Fasteners tight, adequately anchored, and supported?	Yes ☐ No ☐ N/A ☐			
e) Safe access for Inspection, Testing and Maintenance (ITM)?	Yes ☐ No ☐ N/A ☐			
f) Free of excessive ice buildup?	Yes ☐ No ☐ N/A ☐			
g) Free of abnormal sounds/vibration?	Yes ☐ No ☐ N/A ☐			
h) Free of ammonia leaks?	Yes ☐ No ☐ N/A ☐			
i) All piping has markers per ANSI/IIAR 2?	Yes ☐ No ☐ N/A ☐			
j) Are valves in good condition?	Yes ☐ No ☐ N/A ☐			
k) Are critical manual and control valves tagged, exercised, and stems lubricated?	Yes ☐ No ☐ N/A ☐			
l) Sufficient pressure/temperature gauges and/or transducers are present and functioning adequately?	Yes ☐ No ☐ N/A ☐			
m) Belts, sheaves, coupling, etc., in good working order and adequately guarded?	Yes ☐ No ☐ N/A ☐			
n) Free of pitting and surface damage and coils free of dirt? a. If No, note damage level:	Yes ☐ No ☐ N/A ☐ Slight ☐ Extensive ☐			
o) Free of any other conditions that negatively affect safe operation?	Yes ☐ No ☐ N/A ☐			

If No, describe:

_____

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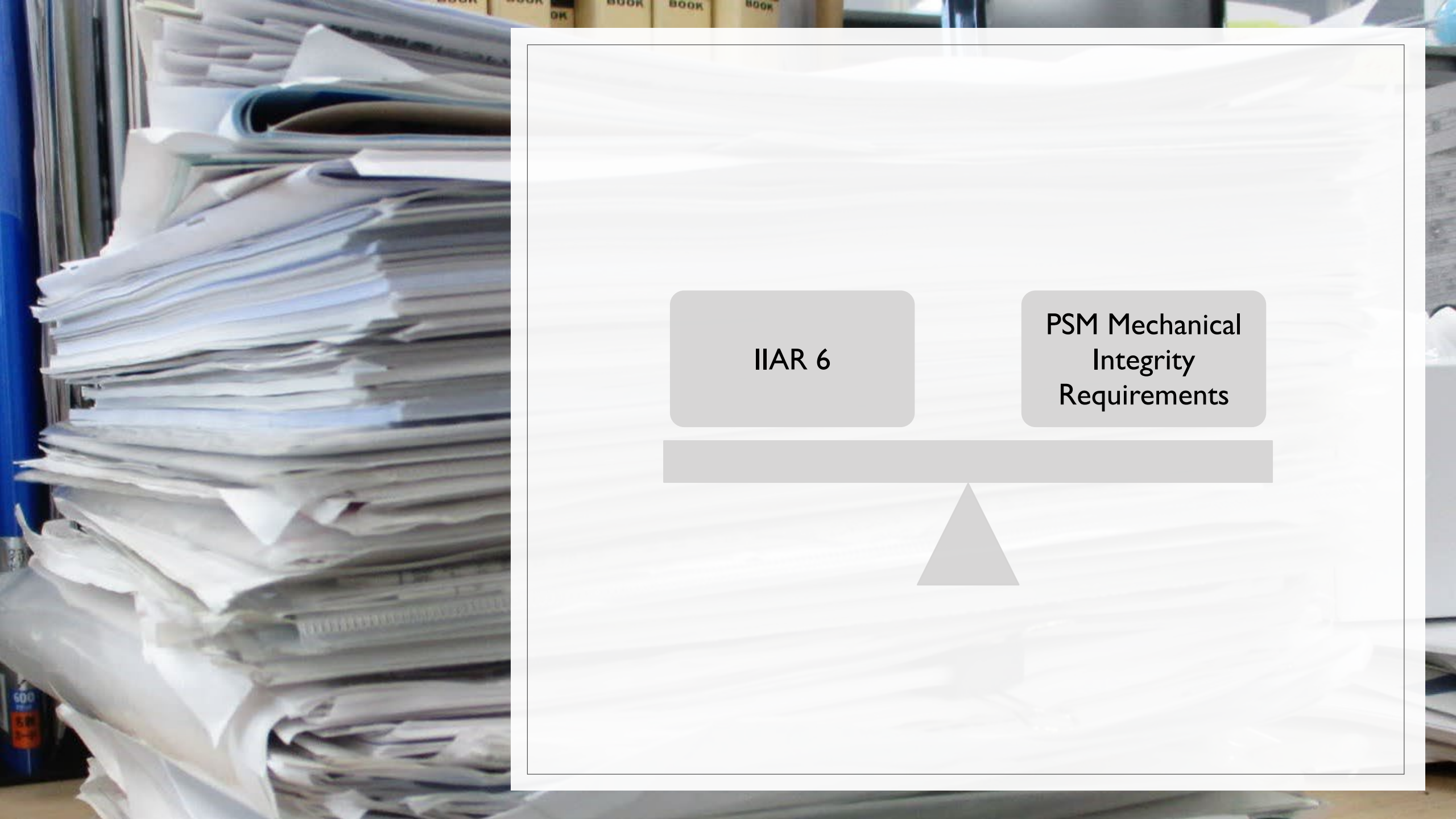
IIAR Standard 6

	and Maintenance (ITM)?					
	f) Free of excessive ice buildup?	Yes ☐ No ☐ N/A ☐				
	g) Free of abnormal sounds/vibration?	Yes ☐ No ☐ N/A ☐				
→	h) Free of ammonia leaks?	Yes ☐ No ☐ N/A ☐				
→	i) All piping has markers per ANSI/IIAR 2?	Yes ☐ No ☐ N/A ☐				
→	j) Are valves in good condition?	Yes ☐ No ☐ N/A ☐				
→	k) Are critical manual and control valves tagged, exercised, and stems lubricated?	Yes ☐ No ☐ N/A ☐				
→	l) Sufficient pressure/temperature gauges and/or transducers are present and functioning adequately?	Yes ☐ No ☐ N/A ☐				
	m) Belts, sheaves, coupling, etc., in good working order and adequately	Yes ☐ No ☐ N/A ☐				


IIAR 6
PSM Mechanical Integrity Requirements

ANSI/IIAR 6-2019 §5.1	*The owner or owner's designated representative shall ensure an inspection, testing, and maintenance program is developed to reduce the probability of an ammonia release.*
Title 8 §5189(j)(1)(A)	*The employer shall establish and implement written procedures to maintain the ongoing integrity of process equipment and appurtenances.*

IIAR 6	Title 8 §5189(j)(2)D)
Date of the inspection or test	Date of Inspection
Name of the individual or individuals who performed the inspection or test	Name of person who performed inspection or test
Serial number or other identifier of the equipment on which the inspection or test was performed	Serial number or other identifier
Description of the inspection or test performed	
Recommended corrective action(s) for each deficiency identified	
Description of corrective action(s) for each deficiency identified	
Identification of each designated responsible person assigned and authorized to remedy each deficiency identified	
Results based on the conditions at commencement of the inspection or test, including instrumentation readings	
Expected activation set points (+/-) including a functional description of the control logic	
Results based on the conditions after completion of the inspection or test, including instrumentation readings	
Expected completion date(s)	
Actual completion date(s)	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Period	Calendar Basis	Runtime Basis (hours)
Daily	Occurring once per 24 hours.	24
Weekly	Occurring once per calendar week.	168
Monthly	Occurring once per calendar month.	730
Quarterly	Occurring four times per year. The minimum period between ITM tasks is 2 months. The maximum is 4 months.	2,190
Semiannual	Occurring twice per 12 consecutive months. The minimum period between ITM tasks is 4 months. The maximum is 8 months.	4,380
Annual	Occurring once per year. The minimum period between ITM tasks is 9 months. The maximum is 15 months.	8,760
Biennial (Two Years)	Occurring once every other year. The minimum period between ITM tasks is 21 months. The maximum is 27 months.	17,520
Three Years	Occurring once every 36 months. The minimum period between ITM tasks is 30 months. The maximum is 42 months.	26,280
Five Years	Occurring once every 60 months. The minimum period between ITM tasks is 54 months. The maximum is 66 months.	43,800
Ten Years	Occurring once every 120 months. The minimum period between ITM tasks is 108 months. The maximum is 132 months.	87,600

Period	Calendar Basis	Runtime Basis (hours)
Daily	Occurring once per 24 hours.	24
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Ten Years	Occurring once every 120 months. The minimum period between ITM tasks is 108 months. The maximum is 132 months.	87,600

Period	Calendar Basis	Runtime Basis (hours)
Daily	Occurring once per 24 hours.	24
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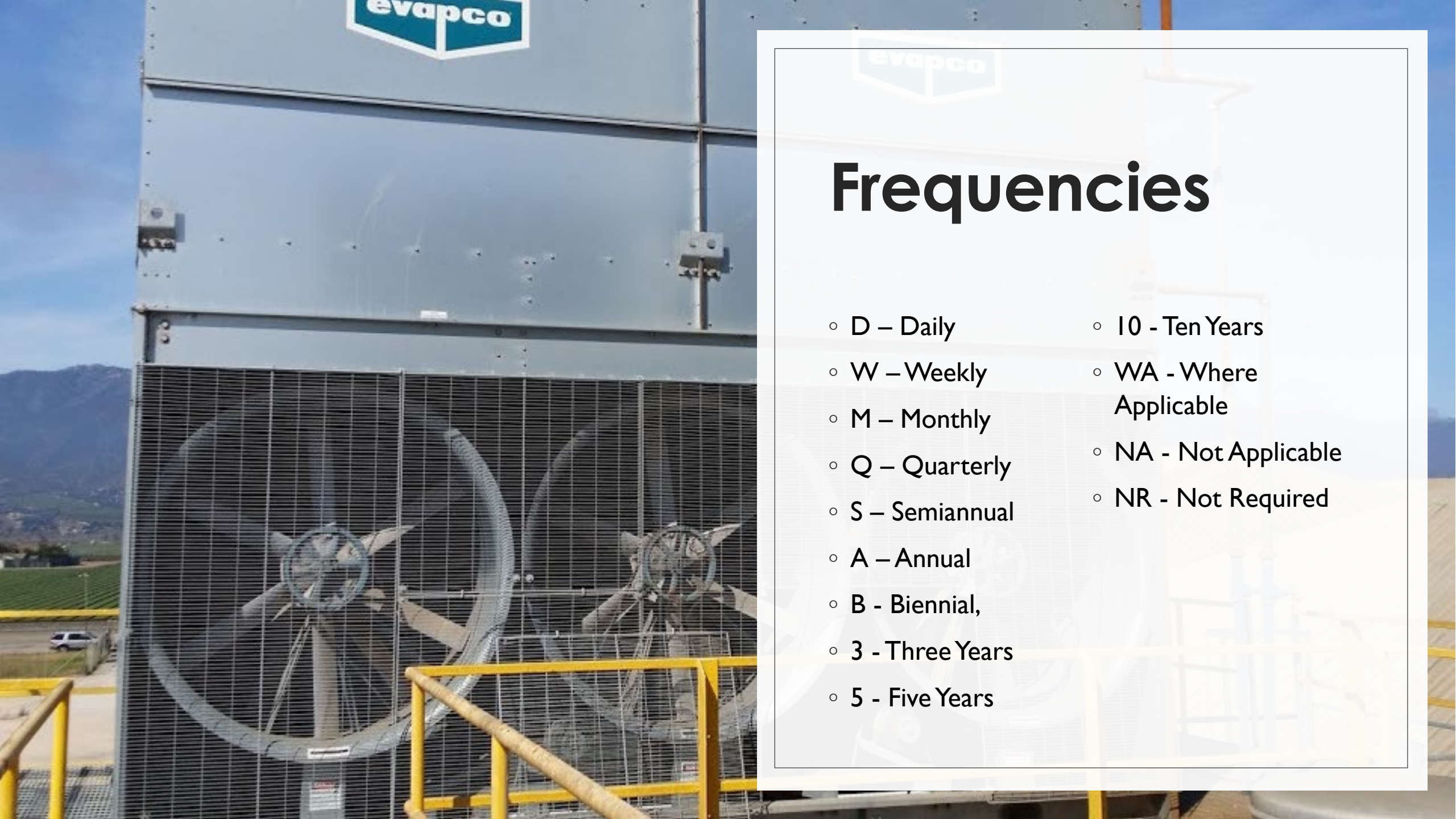
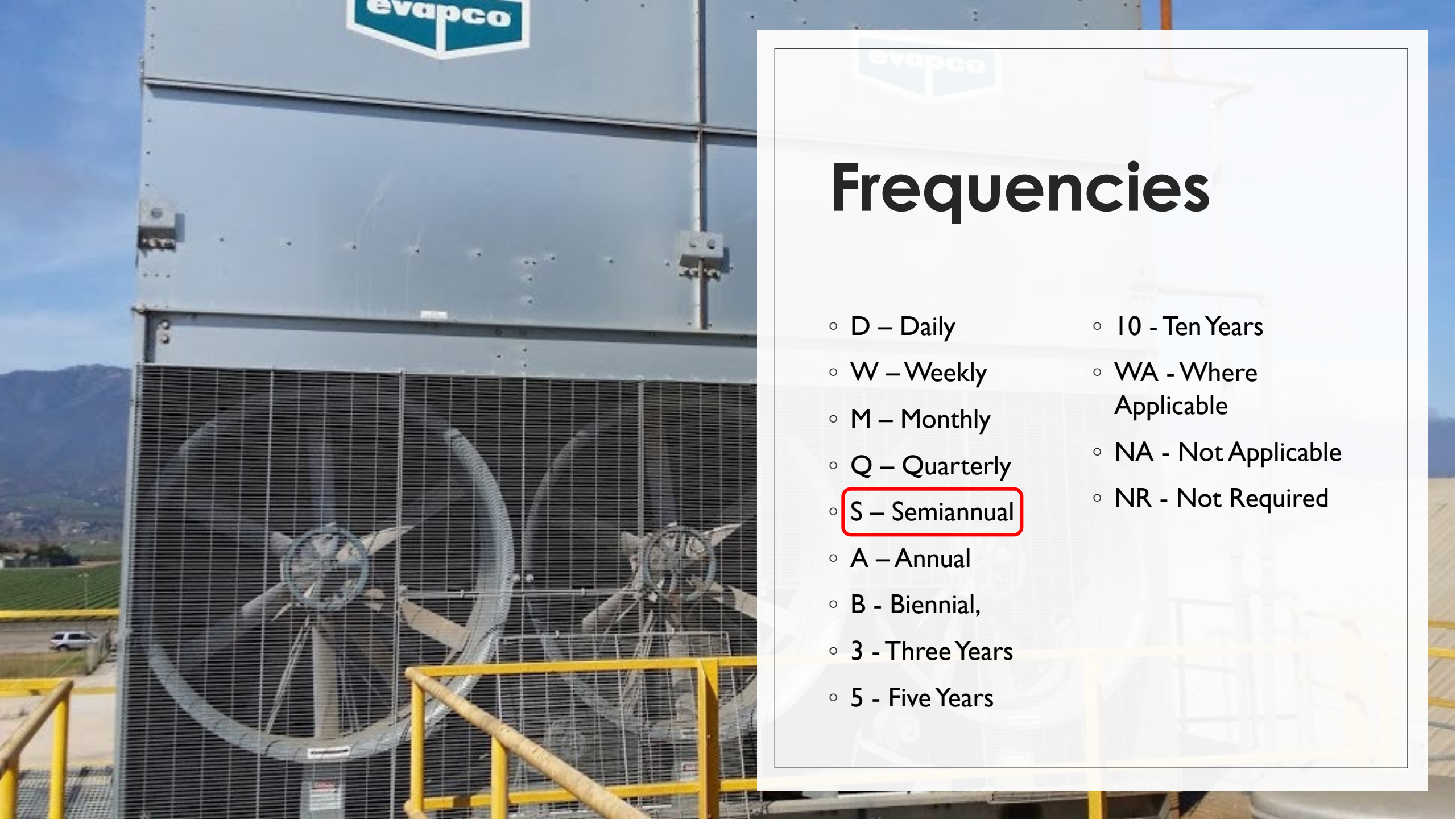
Quarterly	Occurring four times per year. The minimum period between ITM tasks is 2 months. The maximum is 4 months.	2,190
Semiannual	Occurring twice per 12 consecutive months. The minimum period between ITM tasks is 4 months. The maximum is 8 months.	4,380
Annual	Occurring once per year. The minimum period between ITM tasks is 9 months. The maximum is 15 months.	8,760
Biennial (Two Years)	Occurring once every other year. The minimum period between ITM tasks is 21 months. The maximum is 27 months.	17,520
Three Years	Occurring once every 36 months. The minimum period between ITM tasks is 30 months. The maximum is 42 months.	26,280
Five Years	Occurring once every 60 months. The minimum period between ITM tasks is 54 months. The maximum is 66 months.	43,800
Ten Years	Occurring once every 120 months. The minimum period between ITM tasks is 108 months. The maximum is 132 months.	87,600



Frequencies

- D – Daily
- W – Weekly
- M – Monthly
- Q – Quarterly
- S – Semiannual
- A – Annual
- B - Biennial,
- 3 - Three Years
- 5 - Five Years
- 10 - Ten Years
- WA - Where Applicable
- NA - Not Applicable
- NR - Not Required



Frequencies

- D – Daily
- W – Weekly
- M – Monthly
- Q – Quarterly
- S – Semiannual
- A – Annual
- B - Biennial,
- 3 - Three Years
- 5 - Five Years
- 10 - Ten Years
- WA - Where Applicable
- NA - Not Applicable
- NR - Not Required

ITM Task Description	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
a) Runtime hours	WA-D	WA-D	WA-D
b) Suction pressure	D	D	D
c) Discharge pressure	D	D	D
d) Oil pressure	D	D	D
e) Oil temperature	D	WA-D	D
f) Discharge temperature	D	WA-D	D
g) Verify oil levels are adequate	D	D	D
h) Oil filter differential pressure	D	WA-D	NA
i) Oil leaks	D	D	D
j) Lubricator oil level and drip rate	NA	NA	D
k) Jacket cooling oil level	NA	NA	D
l) Determine shaft seal leak rate	WA-W	WA-W	WA-W
m) Indicator of Compressor Capacity	D	WA-D	WA-D
n) Motor amperage (current)	D	WA-D	WA-D
o) Recorded Alarms and Shutdowns	D	WA-D	WA-D
p) Free from abnormal sounds and excessive vibration	D	D	D

ITM Task	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
q) Drive guard in place	D	D	D
r) Foundation solid, in place, and free from evidence of deterioration	A	A	A
s) Visually inspect mounting bolts are in place	A	A	A
t) Visually inspect metal surfaces for pitting or surface damage	A	A	A
u) Visually inspect coupling for wear	A	WA-A	WA-A
v) Visually inspect starter connections and associated timers and relays	A	A	A
w) Operation of oil heaters	A	A	A
x) Operation of unloader	M	M	M
y) Visually inspect alignment of compressor-motor drive shaft	A	A	A
Testing	**Screw**	**Recip**	**Rotary Vane**
Test safety shutdowns:			
a) Low suction pressure cutout	A	A	A
b) High discharge pressure cutout (HPCO) See Section 6.1.1	A	A	A

ITM Task Description	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
a) Runtime hours	WA-D	WA-D	WA-D
b) Suction pressure	D	D	D
c) Discharge pressure	D	D	D
d) Oil pressure	D	D	D
e) Oil temperature	D	WA-D	D
f) Discharge temperature	D	WA-D	D
g) Verify oil levels are adequate	D	D	D
h) Oil filter differential pressure	D	WA-D	NA
i) Oil leaks	D	D	D
j) Lubricator oil level and drip rate	NA	NA	D
k) Jacket cooling oil level	NA	NA	D
l) Determine shaft seal leak rate	WA-W	WA-W	WA-W
m) Indicator of Compressor Capacity	D	WA-D	WA-D
n) Motor amperage (current)	D	WA-D	WA-D
o) Recorded Alarms and Shutdowns	D	WA-D	WA-D
p) Free from abnormal sounds and excessive vibration	D	D	D

ITM Task	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
q) Drive guard in place	D	D	D
r) Foundation solid, in place, and free from evidence of deterioration	A	A	A
s) Visually inspect mounting bolts are in place	A	A	A
t) Visually inspect metal surfaces for pitting or surface damage	A	A	A
u) Visually inspect coupling for wear	A	WA-A	WA-A
v) Visually inspect starter connections and associated timers and relays	A	A	A
w) Operation of oil heaters	A	A	A
x) Operation of unloader	M	M	M
y) Visually inspect alignment of compressor-motor drive shaft	A	A	A
Testing	**Screw**	**Recip**	**Rotary Vane**
Test safety shutdowns:			
a) Low suction pressure cutout	A	A	A
b) High discharge pressure cutout (HPCO) See Section 6.1.1	A	A	A

ITM Task Description	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
a) Runtime hours	WA-D	WA-D	WA-D
b) Suction pressure	D	D	D
c) Discharge pressure	D	D	D
d) Oil pressure	D	D	D
e) Oil temperature	D	WA-D	D
f) Discharge temperature	D	WA-D	D
g) Verify oil levels are adequate	D	D	D
h) Oil filter differential pressure	D	WA-D	NA
i) Oil leaks	D	D	D
j) Lubricator oil level and drip rate	NA	NA	D
k) Jacket cooling oil level	NA	NA	D
l) Determine shaft seal leak rate	WA-W	WA-W	WA-W
m) Indicator of Compressor Capacity	D	WA-D	WA-D
n) Motor amperage (current)	D	WA-D	WA-D
o) Recorded Alarms and Shutdowns	D	WA-D	WA-D
p) Free from abnormal sounds and excessive vibration	D	D	D

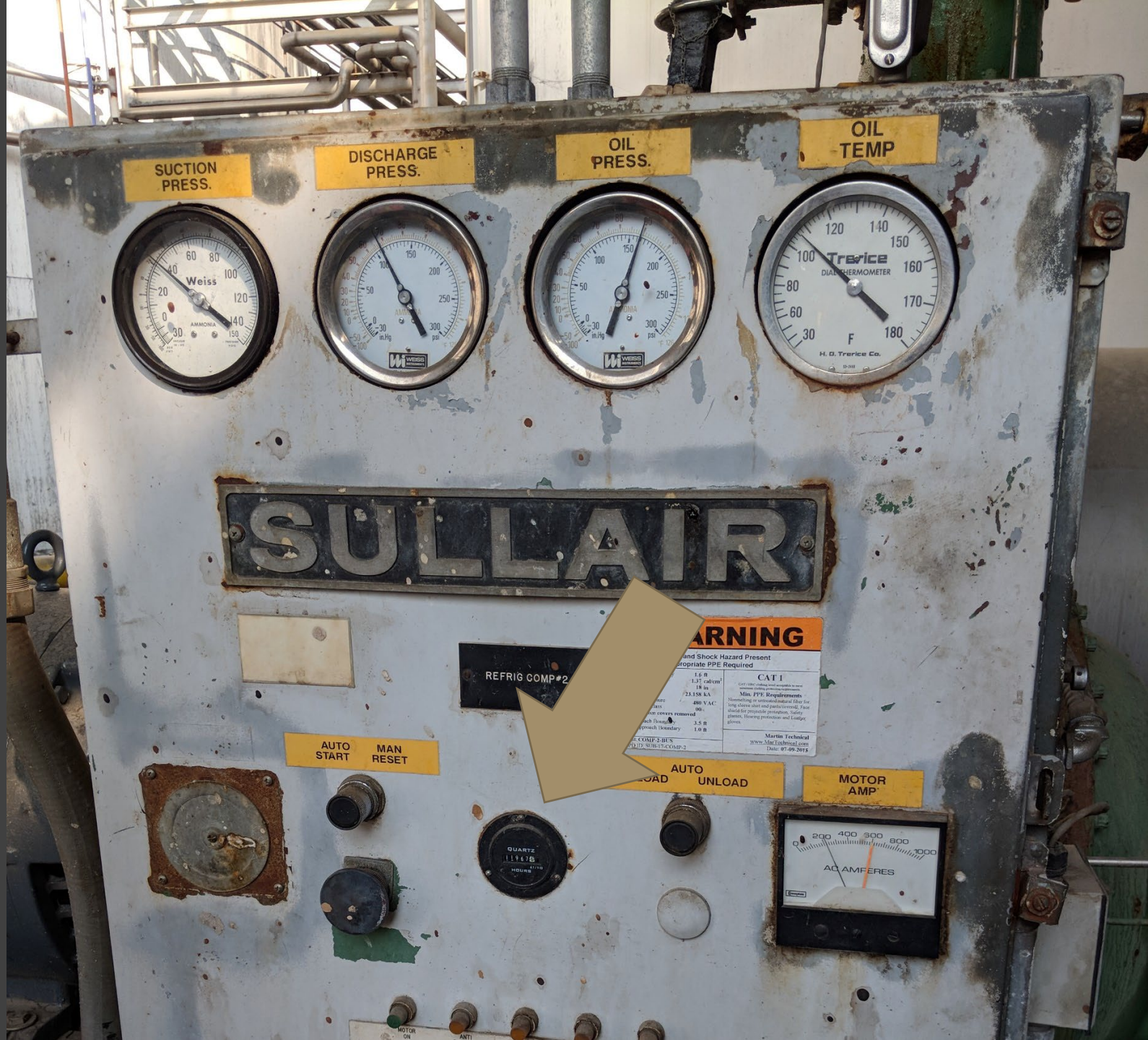
ITM Task	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
q) Drive guard in place	D	D	D
r) Foundation solid, in place, and free from evidence of deterioration	A	A	A
s) Visually inspect mounting bolts are in place	A	A	A
t) Visually inspect metal surfaces for pitting or surface damage	A	A	A
u) Visually inspect coupling for wear	A	WA-A	WA-A
v) Visually inspect starter connections and associated timers and relays	A	A	A
w) Operation of oil heaters	A	A	A
x) Operation of unloader	M	M	M
y) Visually inspect alignment of compressor-motor drive shaft	A	A	A
Testing	**Screw**	**Recip**	**Rotary Vane**
Test safety shutdowns:			
a) Low suction pressure cutout	A	A	A
b) High discharge pressure cutout (HPCO) See Section 6.1.1	A	A	A

ITM Task Description	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
a) Runtime hours	WA-D	WA-D	WA-D
b) Suction pressure	D	D	D
c) Discharge pressure	D	D	D
d) Oil pressure	D	D	D
e) Oil temperature	D	WA-D	D
f) Discharge temperature	D	WA-D	D
g) Verify oil levels are adequate	D	D	D
h) Oil filter differential pressure	D	WA-D	NA
i) Oil leaks	D	D	D
j) Lubricator oil level and drip rate	NA	NA	D
k) Jacket cooling oil level	NA	NA	D
l) Determine shaft seal leak rate	WA-W	WA-W	WA-W
m) Indicator of Compressor Capacity	D	WA-D	WA-D
n) Motor amperage (current)	D	WA-D	WA-D
o) Recorded Alarms and Shutdowns	D	WA-D	WA-D
p) Free from abnormal sounds and excessive vibration	D	D	D

ITM Task	Frequency		
Inspection	**Screw**	**Recip**	**Rotary Vane**
q) Drive guard in place	D	D	D
r) Foundation solid, in place, and free from evidence of deterioration	A	A	A
s) Visually inspect mounting bolts are in place	A	A	A
t) Visually inspect metal surfaces for pitting or surface damage	A	A	A
u) Visually inspect coupling for wear	A	WA-A	WA-A
v) Visually inspect starter connections and associated timers and relays	A	A	A
w) Operation of oil heaters	A	A	A
x) Operation of unloader	M	M	M
y) Visually inspect alignment of compressor-motor drive shaft	A	A	A
Testing	**Screw**	**Recip**	**Rotary Vane**
Test safety shutdowns:			
a) Low suction pressure cutout	A	A	A
b) High discharge pressure cutout (HPCO) See Section 6.1.1	A	A	A

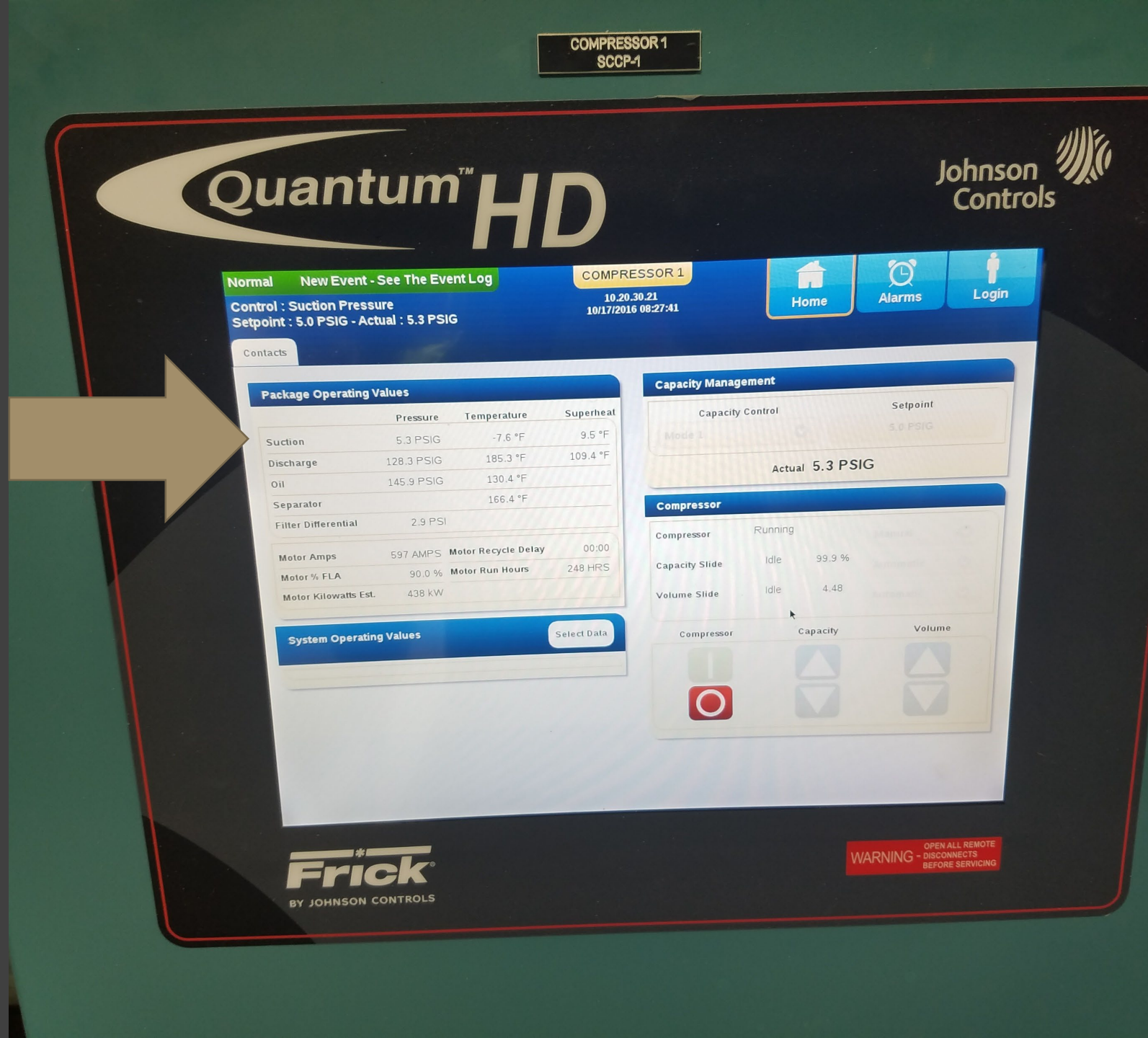
DAILY INSPECTIONS

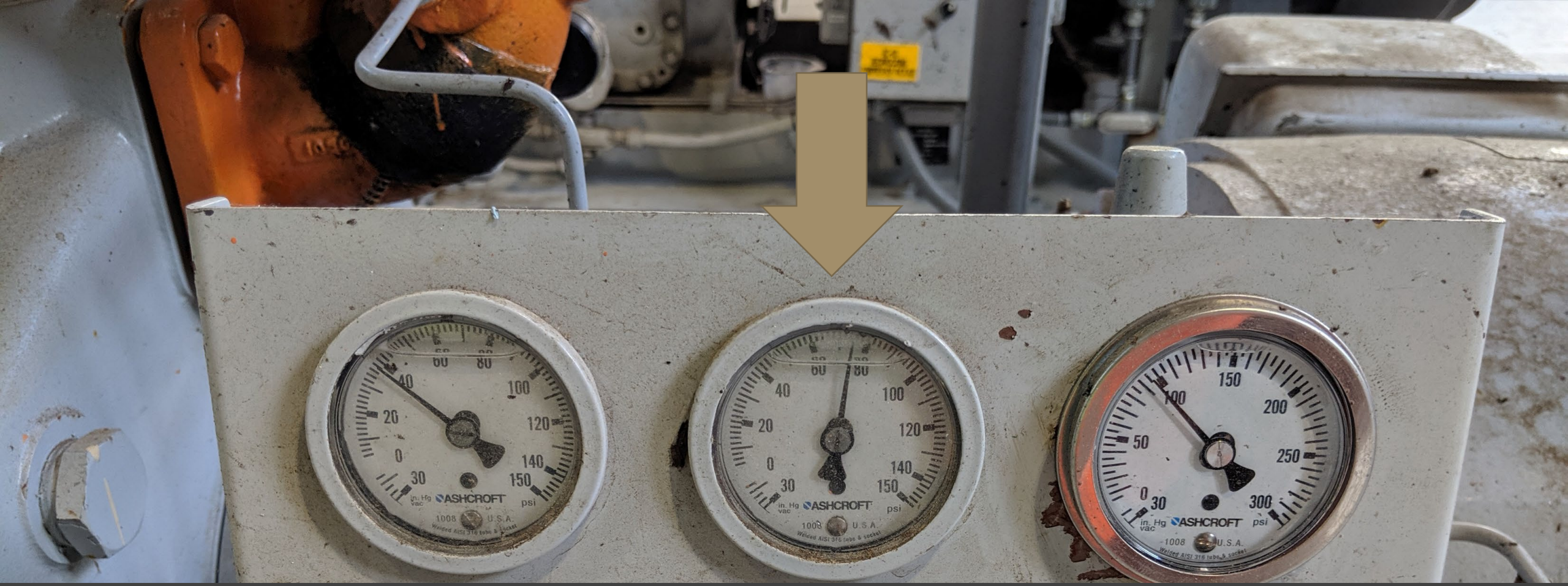
Record compressor runtime (hours)



DAILY INSPECTIONS

Record compressor suction pressure



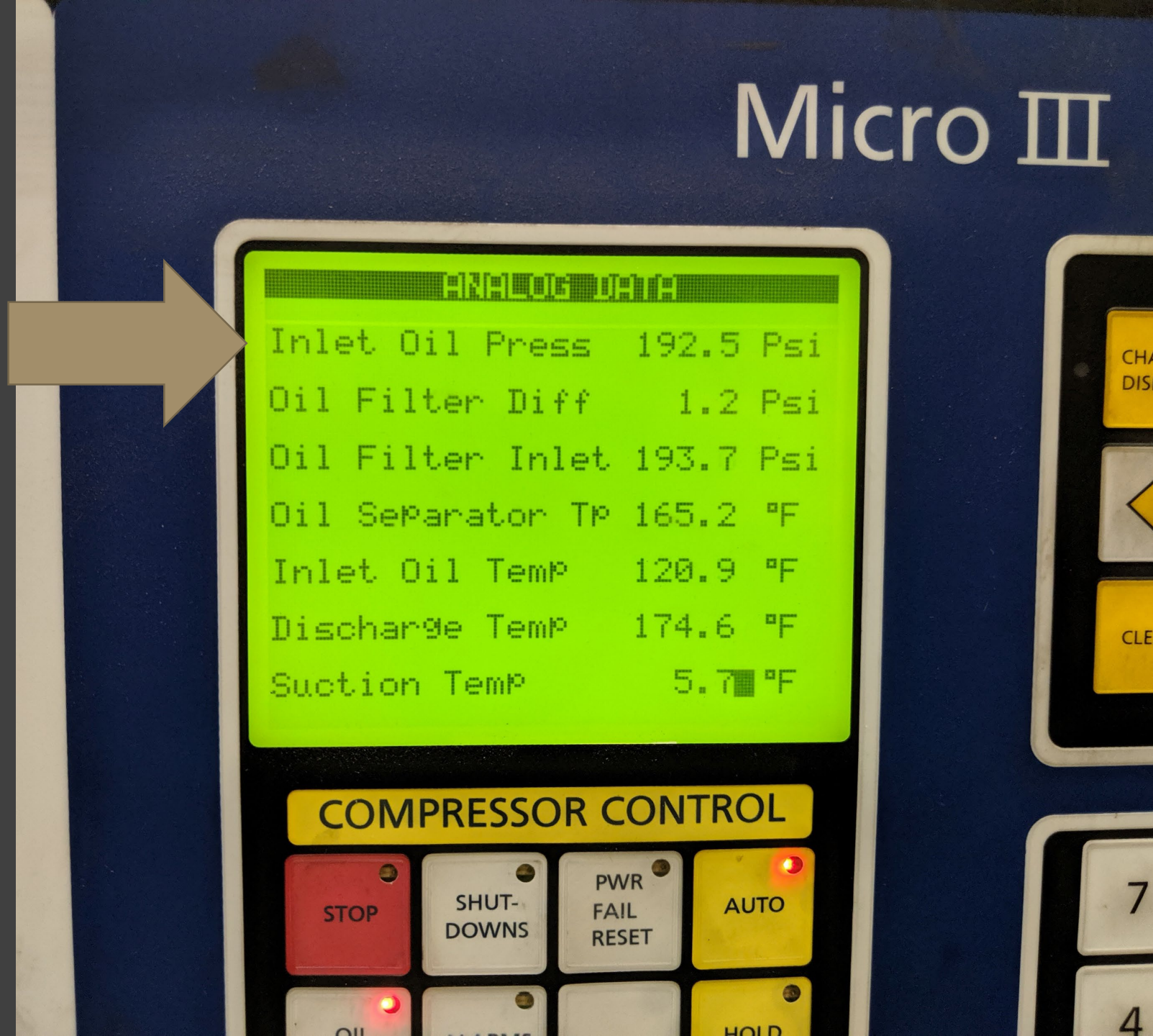


DAILY INSPECTIONS

Record compressor discharge pressure

DAILY INSPECTIONS

Record compressor oil pressure

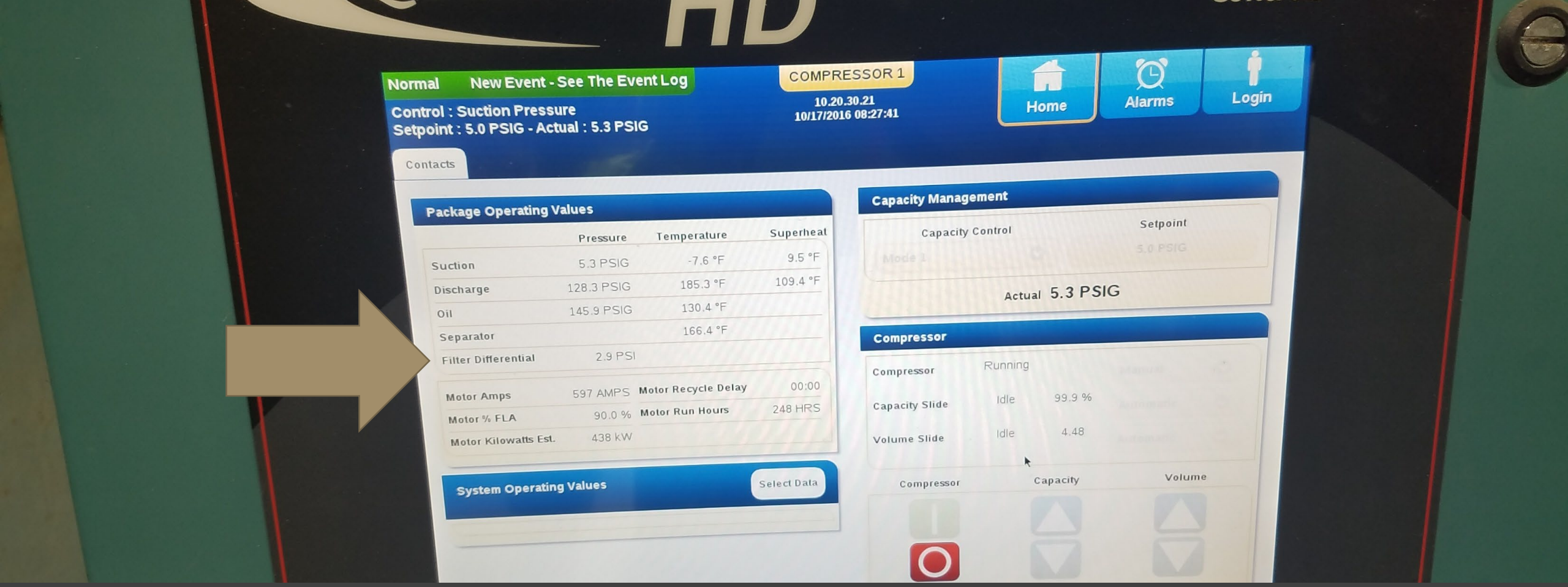


DAILY INSPECTIONS

Record compressor oil temperature

DAILY INSPECTIONS

Record compressor discharge temperature



DAILY INSPECTIONS

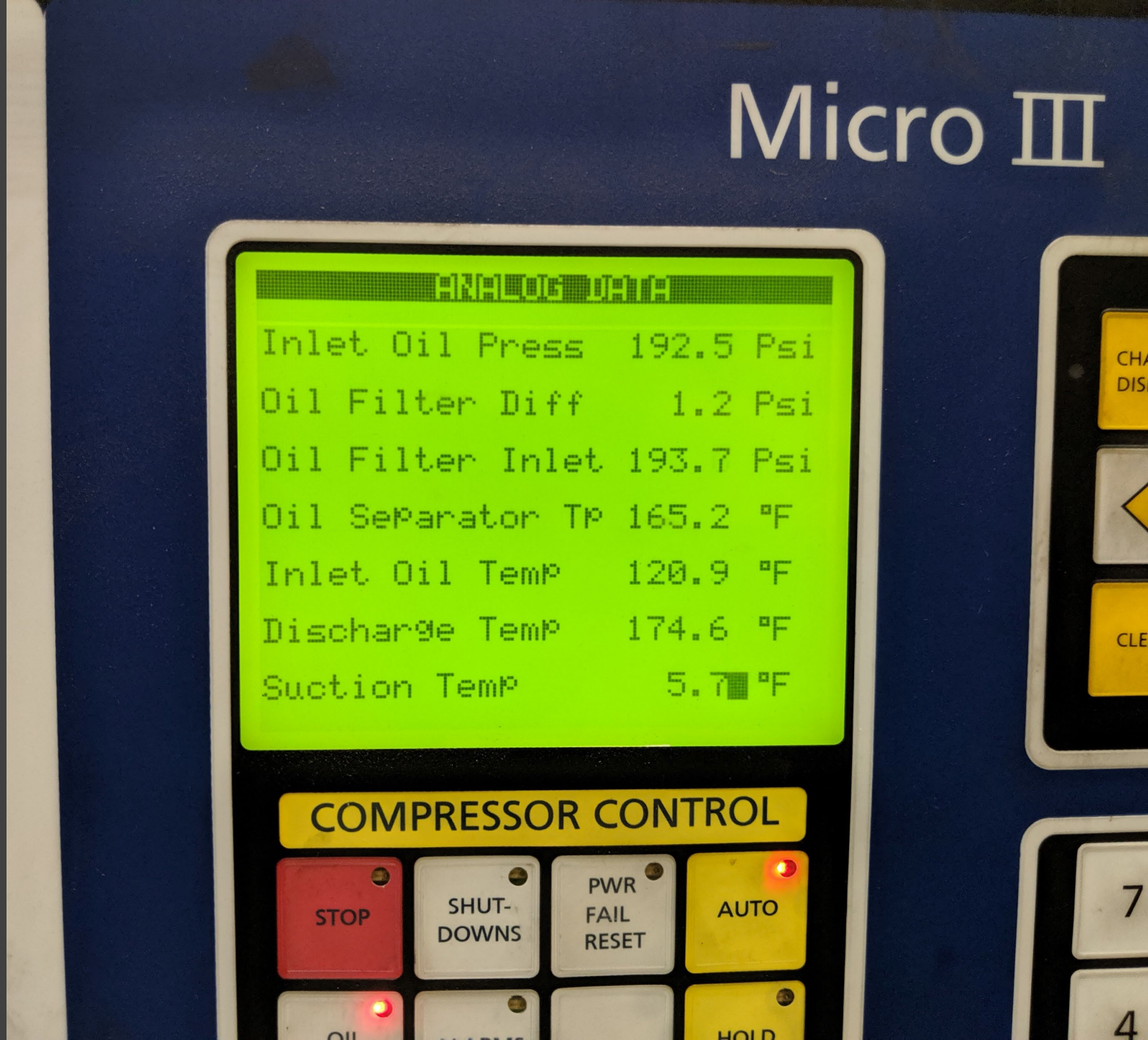
Record compressor oil filter differential pressure

DAILY INSPECTIONS

Record compressor motor amperage

DAILY INSPECTIONS

Record compressor alarms and shutdowns

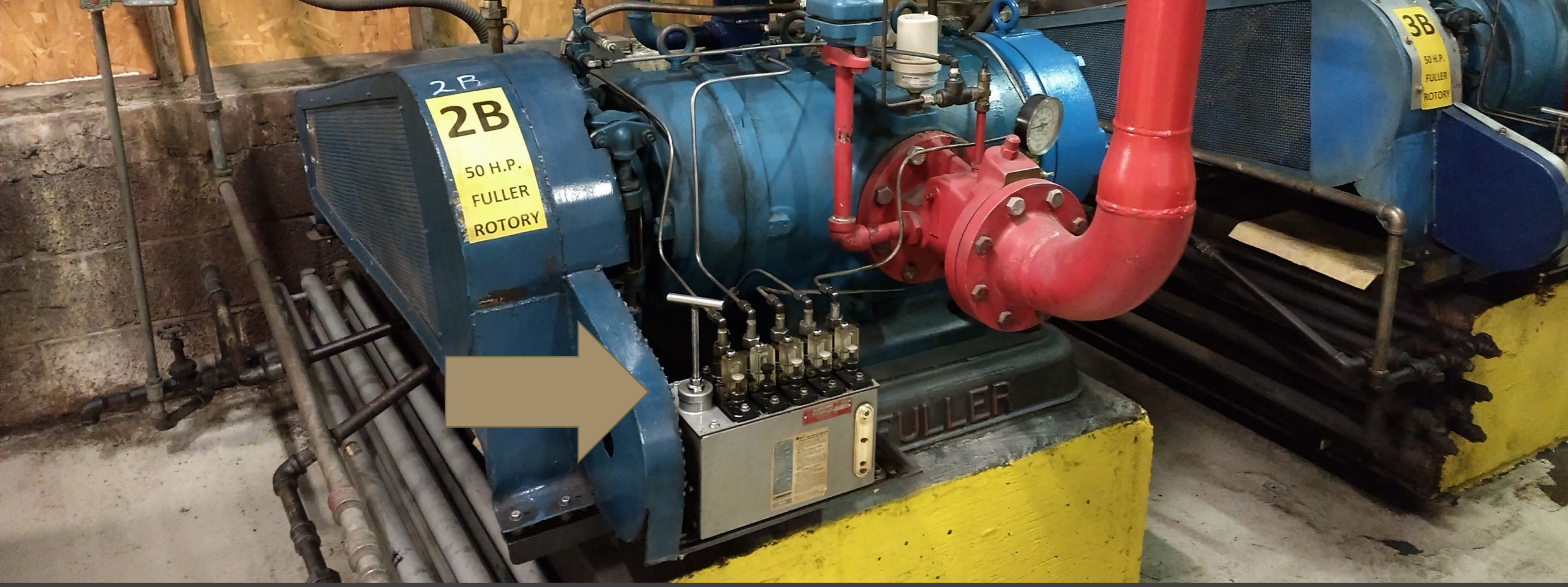


DAILY INSPECTIONS

Verify oil levels are adequate

DAILY INSPECTIONS

Check for oil leaks



DAILY INSPECTIONS

Check lubricator oil level and drip rate

DAILY INSPECTIONS

Check compressor for unusual vibration

WEEKLY INSPECTIONS

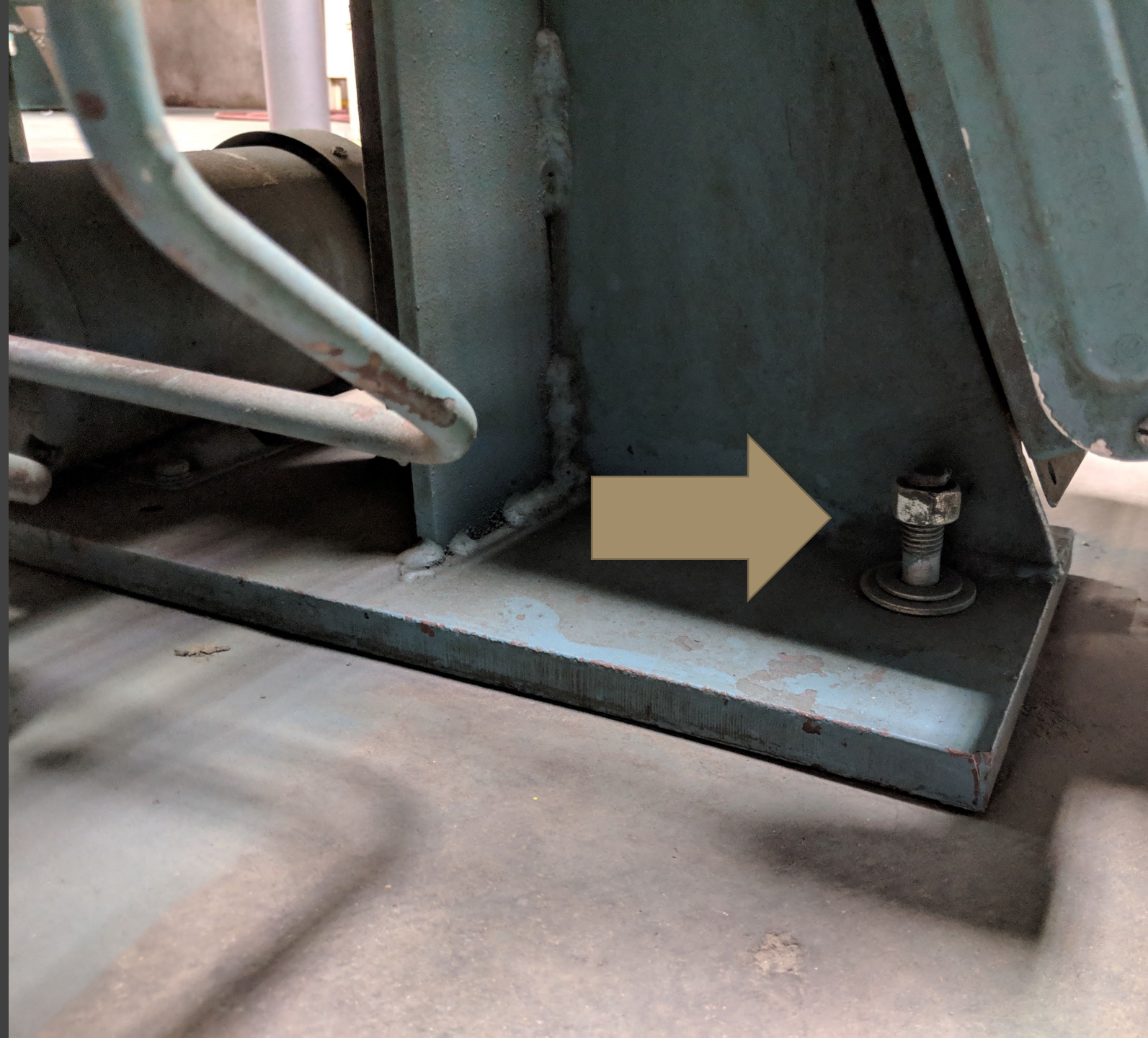
Check shaft seal drip rate

ANNUAL INSPECTIONS

Check that foundation is solid

ANNUAL INSPECTIONS

Check mounting bolts for tightness



ANNUAL INSPECTIONS

Visually inspect metal surfaces for pitting or surface damage

ANNUAL INSPECTIONS

Visually inspect coupling for wear

ANNUAL INSPECTIONS

Visually inspect starter connections and associated timers and relays

ANNUAL INSPECTIONS

Inspect operation of oil heaters

MONTHLY INSPECTIONS

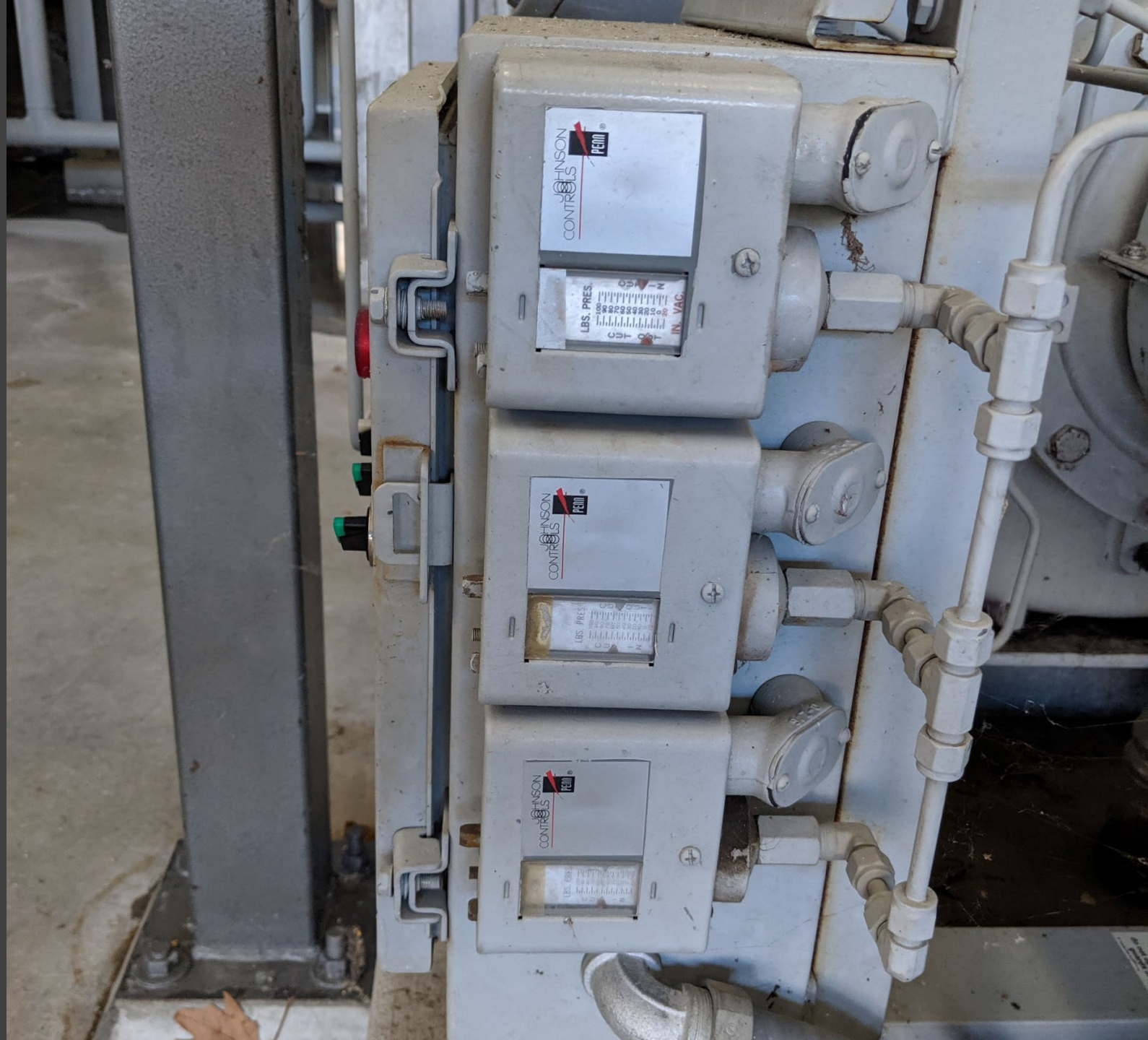
Inspect operation of unloader

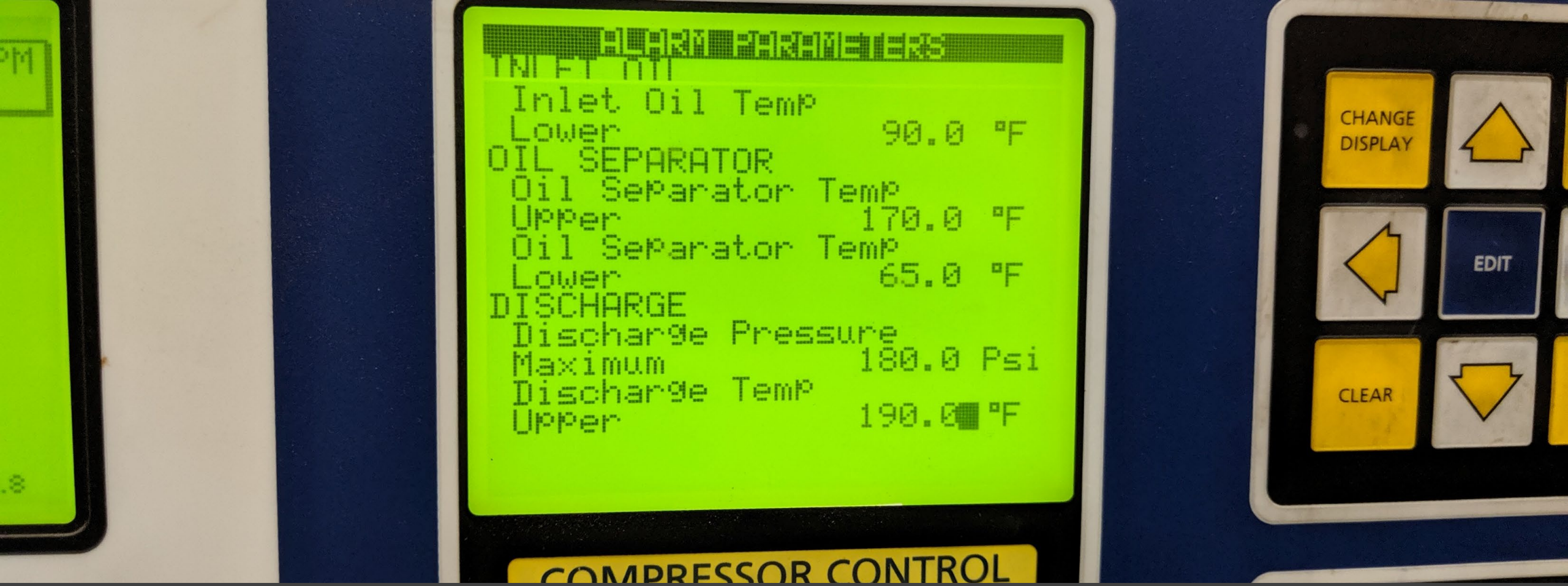
ANNUAL INSPECTIONS

Inspect alignment of motor drive shaft

ANNUAL TESTS

Test low suction pressure cutout





ANNUAL TESTS

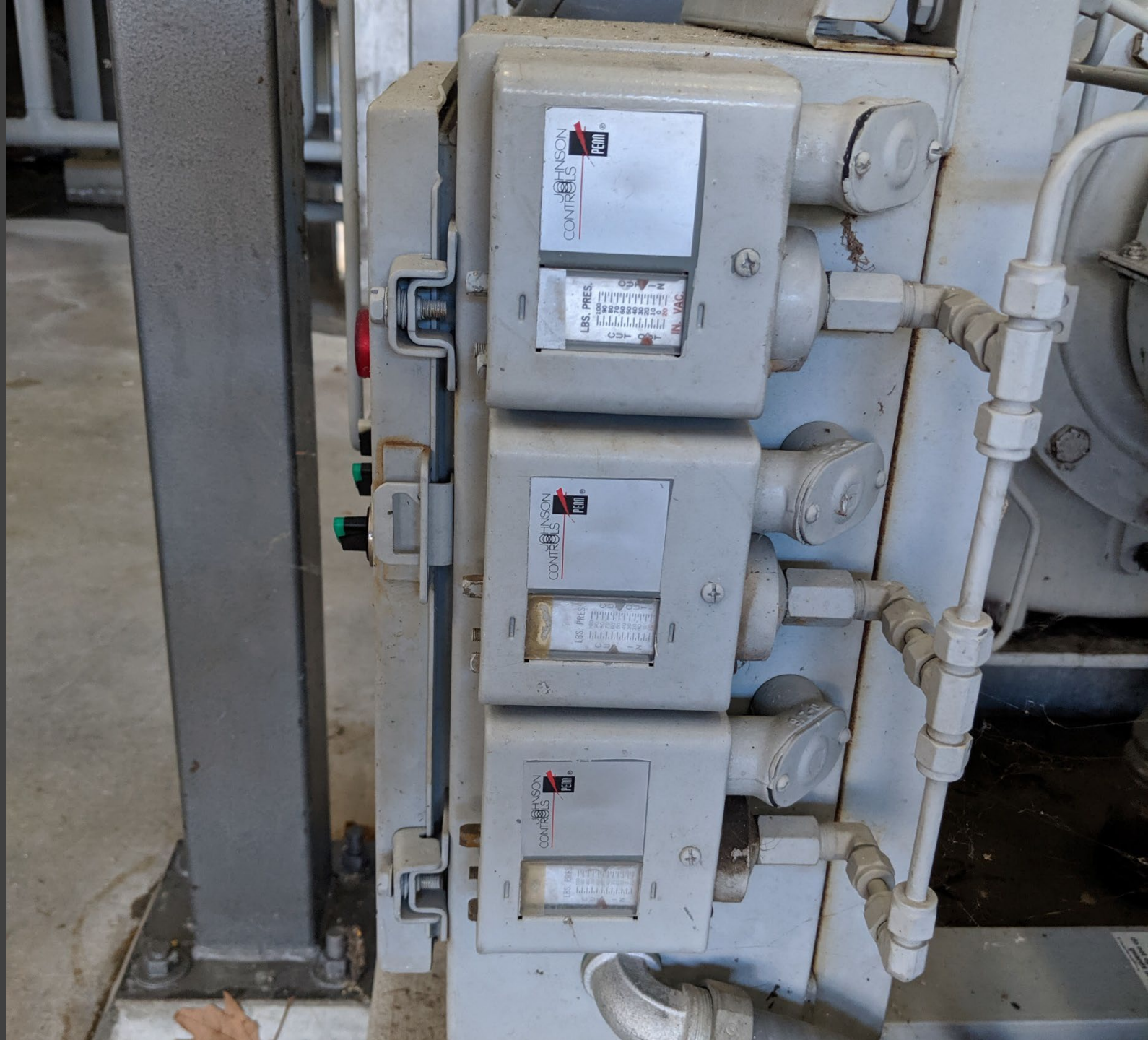
Test high discharge pressure cutout

ANNUAL TESTS

Test high discharge temperature cutout

ANNUAL TESTS

Test low oil pressure cutout

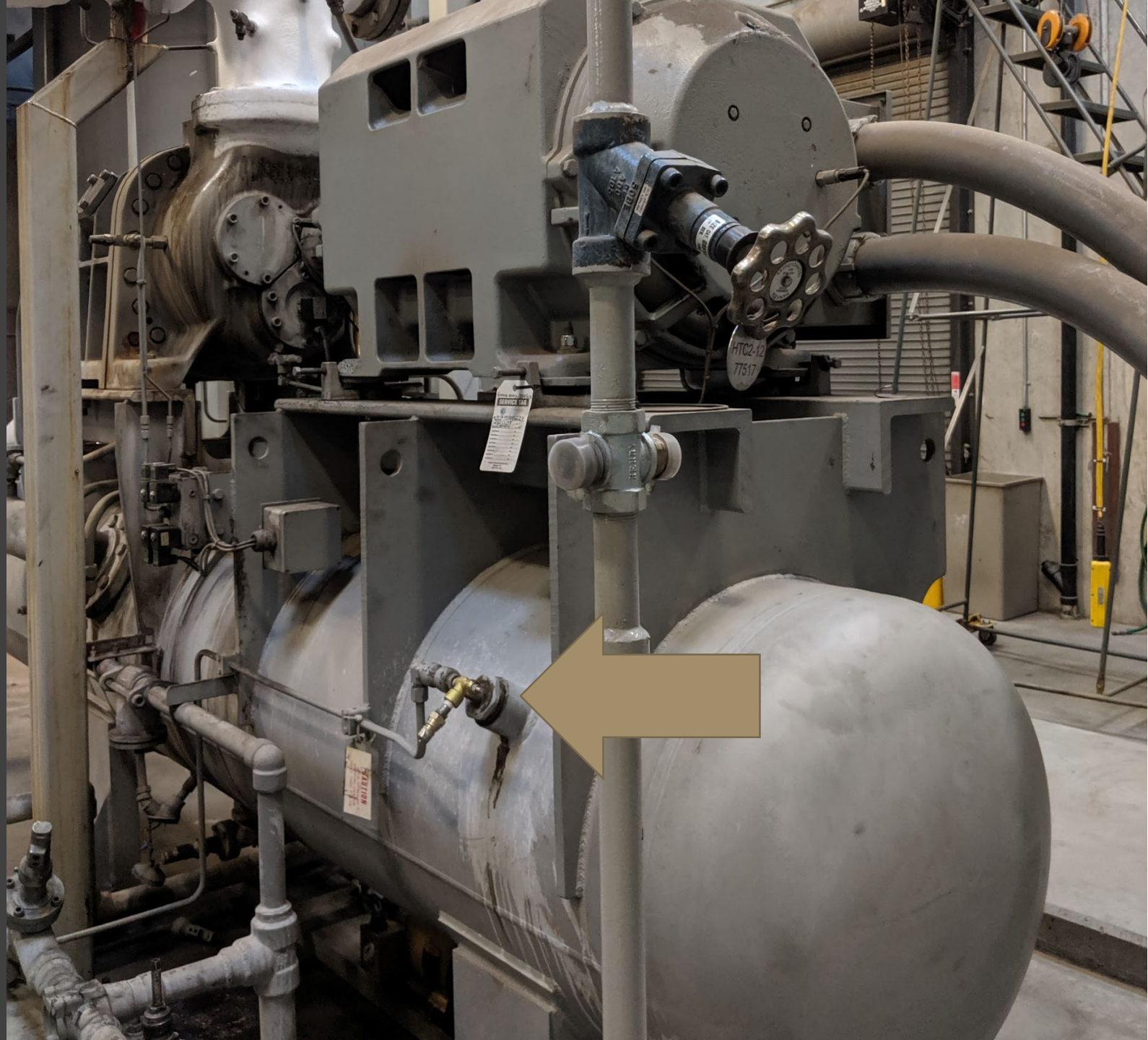


ANNUAL TESTS

Test high liquid level cutout

MAINTENANCE

Add oil (as needed)



MAINTENANCE

Change oil filter (as indicated by ΔP, runtime hours, oil analysis)

MAINTENANCE

Clean external oil pump
(5-Years)

MAINTENANCE

Oil Analysis (annual)

POLARIS Laboratories

Lubricant Analysis Report

North America: +1-877-808-3750

0	1	2	3	4
NORMAL		ABNORMAL		CRITICAL

Overall report severity based on comments.

Account Information		Component Information		Sample Information	
Account Number:	401110-8241-0645	Component ID:	SB-4	Tracking Number:	18178Y06677
Company Name:	FOSTER FARMS (PORTERVILLE, CA)	Secondary ID:		Lab Number:	I-115134
Contact:		Component Type:	AMMONIA SCREW COMPRESSOR	Lab Location:	Indianapolis
Address:		Manufacturer:	FES	Data Analyst:	JAS
		Model:	Information Requested	Sampled:	02-Oct-2018
Phone Number:		Application:	PLANT/INDUSTRIAL	Received:	09-Oct-2018
		Sump Capacity:		Completed:	10-Oct-2018

Filter Information		Miscellaneous Information		Product Information	
Filter Type:	Information Requested	Miscellaneous:	NONE	Product Manufacturer:	Information Requested
Micron Rating:	0			Product Name:	Information Requested
				Viscosity Grade:	Information Requested

Comments	Flagged data does not indicate an immediate need for maintenance action. Continue to observe the trend and monitor equipment and fluid conditions. Tin is at a MINOR LEVEL;

	Wear Metals (ppm)										Contaminant Metals (ppm)			Multi-Source Metals (ppm)						Additive Metals (ppm)				
Sample #	Iron	Chromium	Nickel	Aluminum	Copper	Lead	Tin	Cadmium	Silver	Vanadium	Silicon	Sodium	Potassium	Titanium	Molybdenum	Antimony	Manganese	Lithium	Boron	Magnesium	Calcium	Barium	Phosphorus	Zinc
1	3	0	0	0	0	0	2	0	0	0	1	0	0	0	0	2	0	0	0	0	0	0	1	1

	Sample Information							Contaminants			Fluid Properties					
Sample #	Date Sampled	Date Received	Lube Time h	Unit Time h	Lube Change	Lube Added gal	Filter Change	Fuel Dilution % Vol	Soot % Vol	Water % Vol	Viscosity 40°C cSt	Viscosity 100 °C cSt	Acid Number mg KOH/g	Base No. D4739 mg KOH/g	Oxidation abs/cm	Nitration abs/0.1 mm
1	02-Oct-2018	09-Oct-2018	0	11151	No	0	No			0 - mo. 6304C	64.9		0.01			

	Particle Count (particles/mL)										Additional Testing
Sample #	ISO Code Based On 4/6/14	> 4 µm	> 6 µm	> 10 µm	> 14 µm	> 21 µm	> 38 µm	> 70 µm	> 100 µm	Test Method	

MAINTENANCE

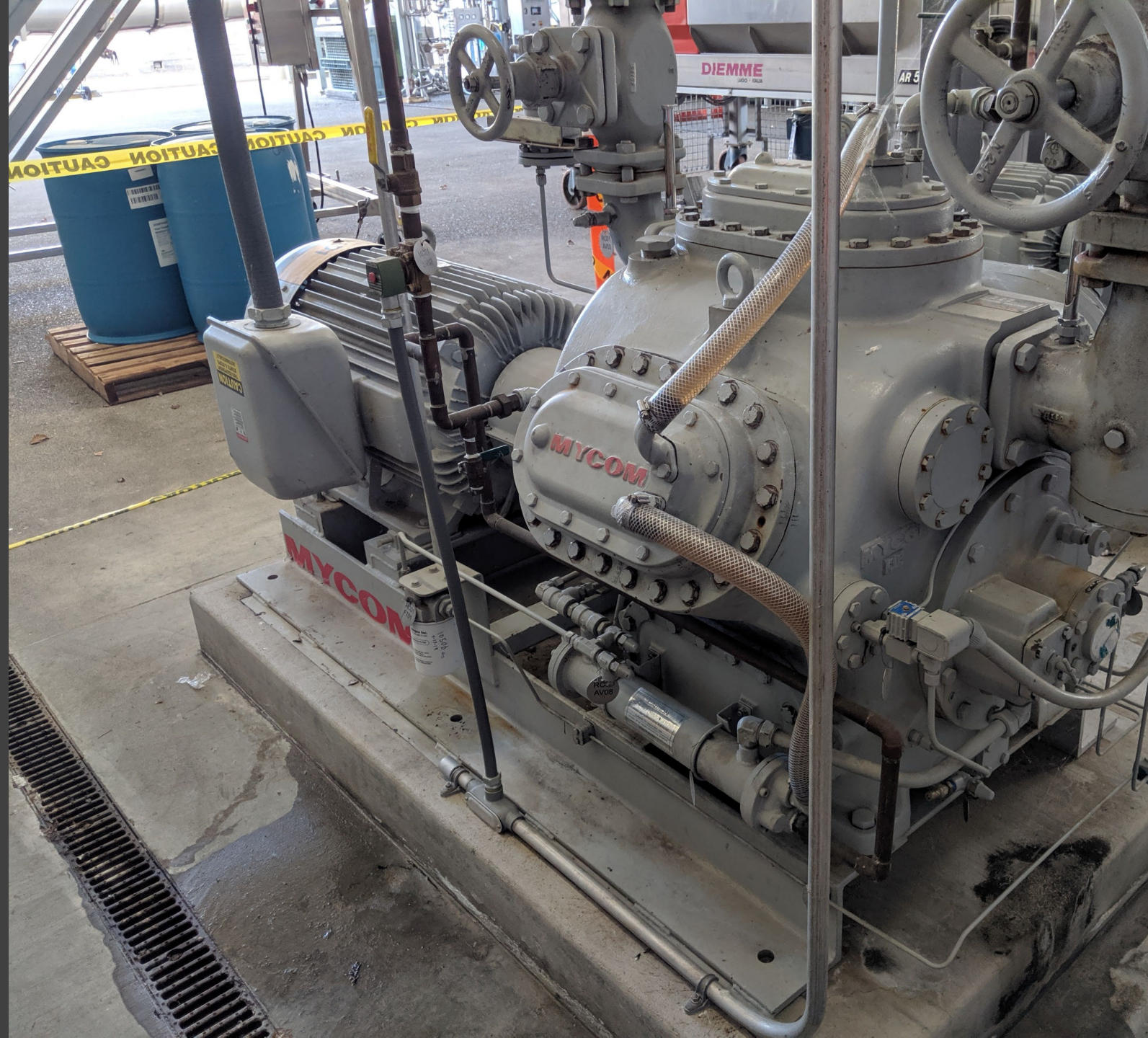
Align external oil pump shaft (5-years)

MAINTENANCE

Change oil (oil analysis, runtime, or annual)

MAINTENANCE

Verify coupling bolts are tight (annual)



MAINTENANCE

Replace shaft seal (as needed)

MAINTENANCE

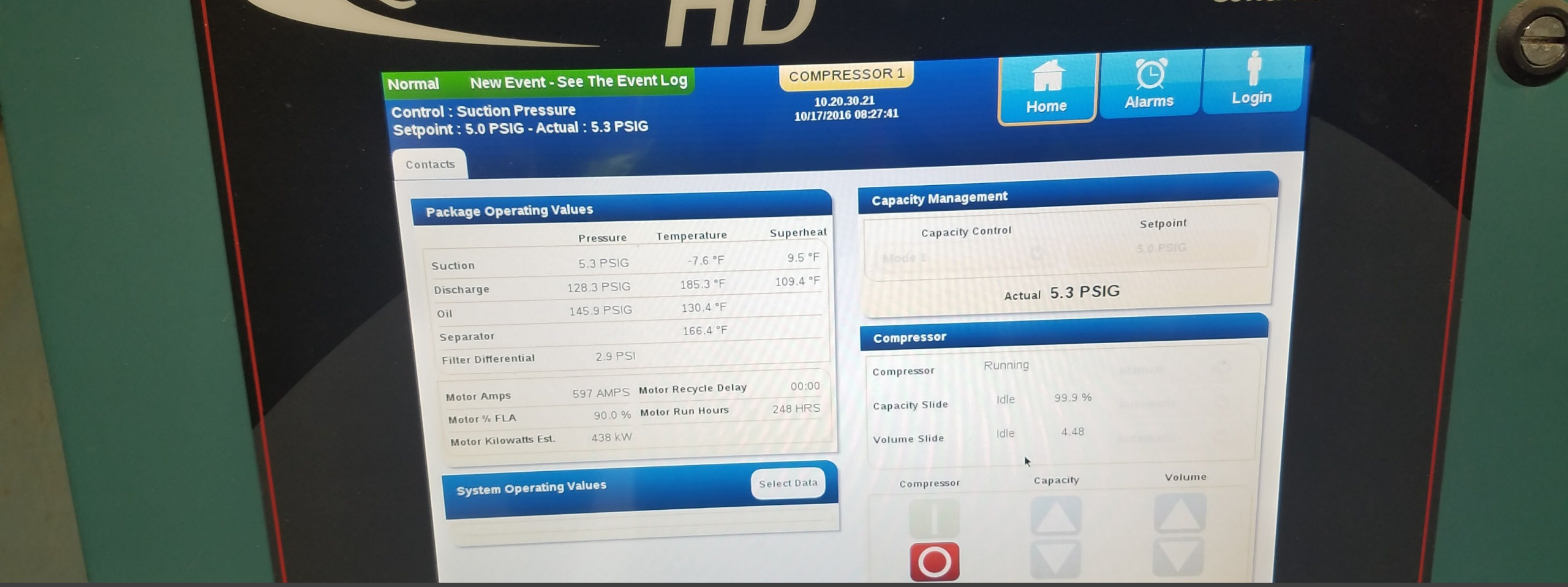
Measure (hot) compressor-motor drive shaft alignment (annual)

MAINTENANCE

Lubricate compressor and external oil pump electric motor bearings (semi-annual)

MAINTENANCE

Remove electrical connection box and check motor leads and insulation (annual)



MAINTENANCE

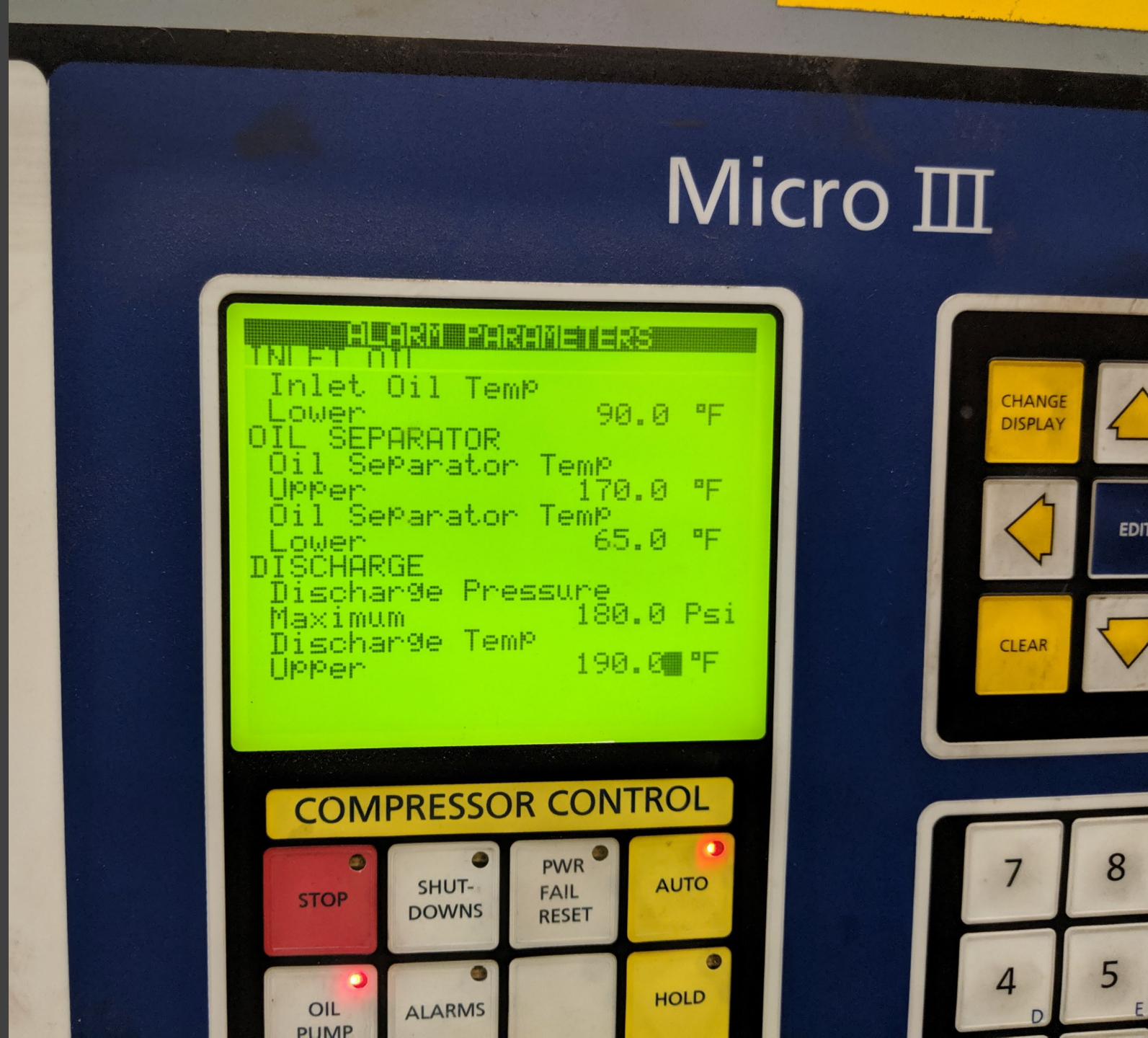
Verify integrity of control power (annual)

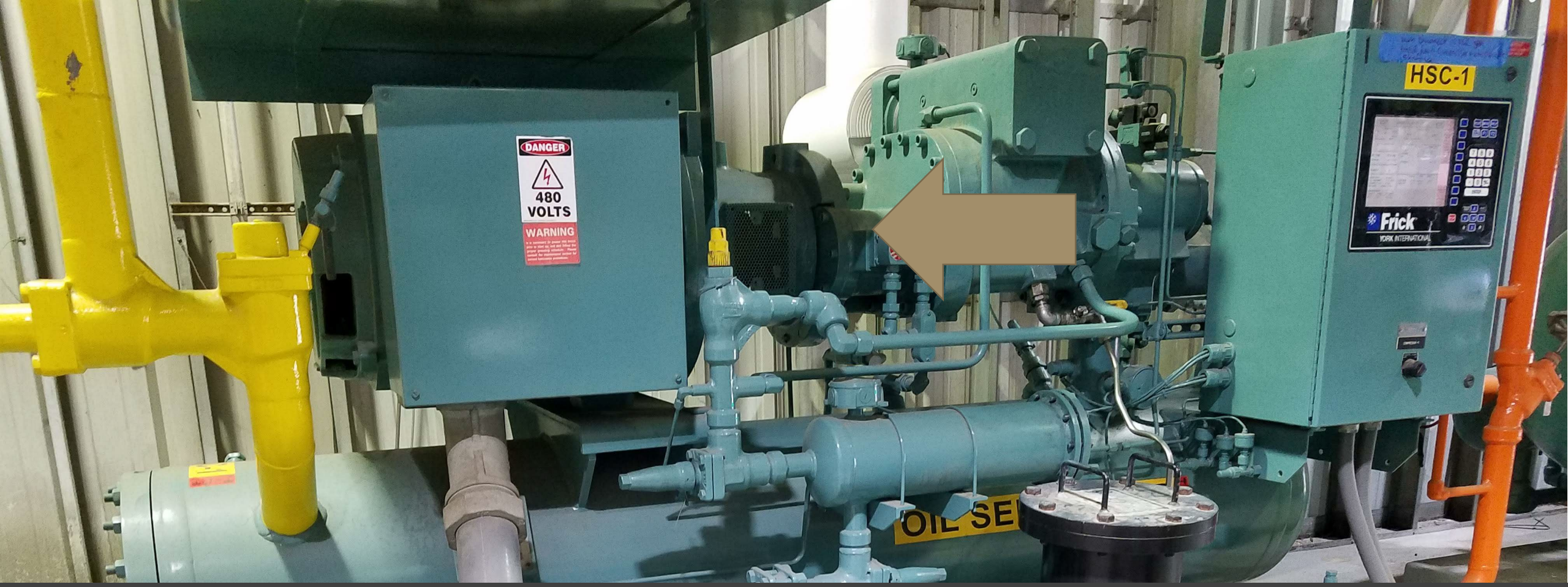
MAINTENANCE

Verify integrity of starter connections (annual)

MAINTENANCE

Calibrate pressure and temperature cutout switches (annual)



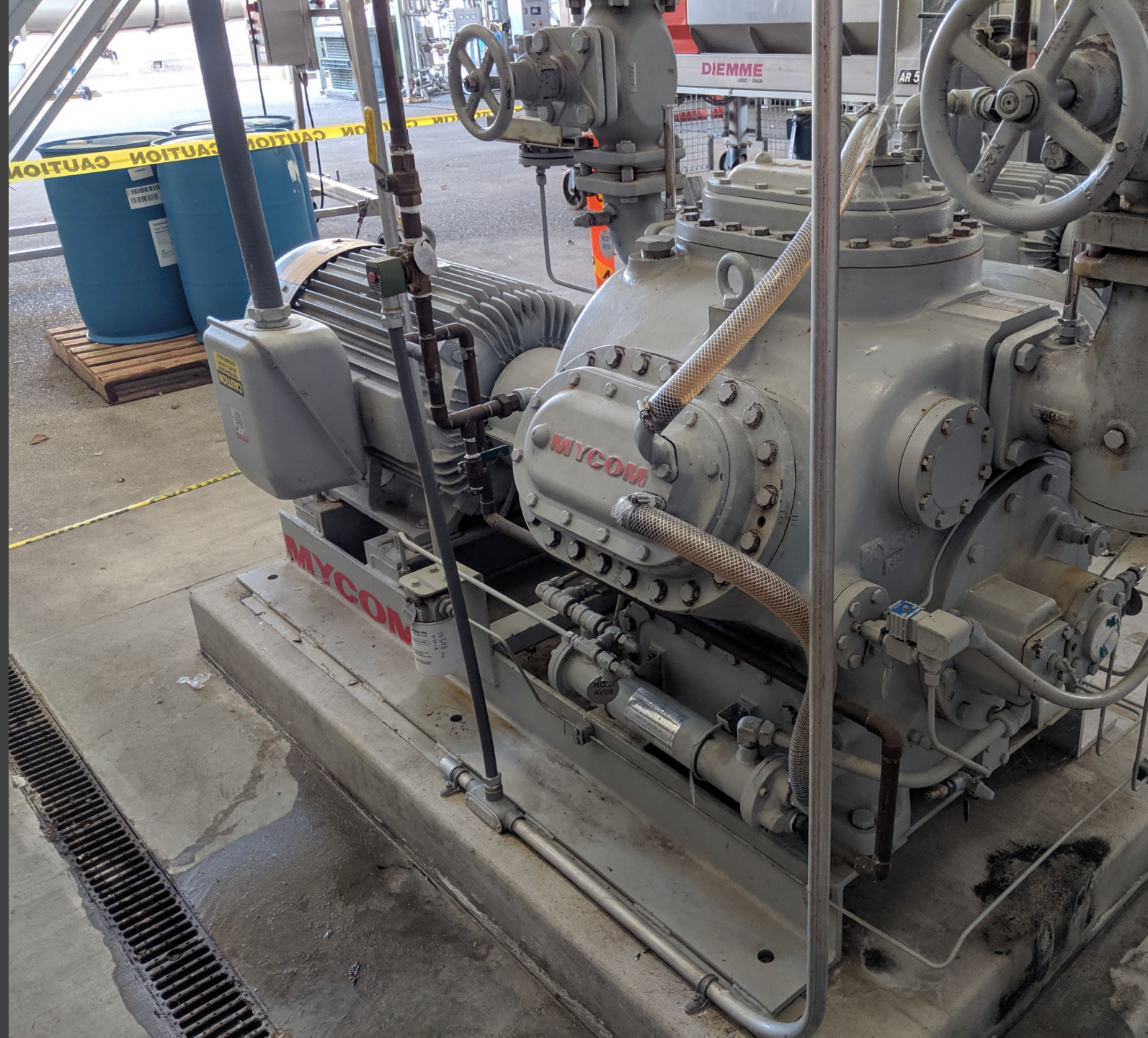


MAINTENANCE

Inspect for rotor axial play in motor driven rotor shaft (annual)

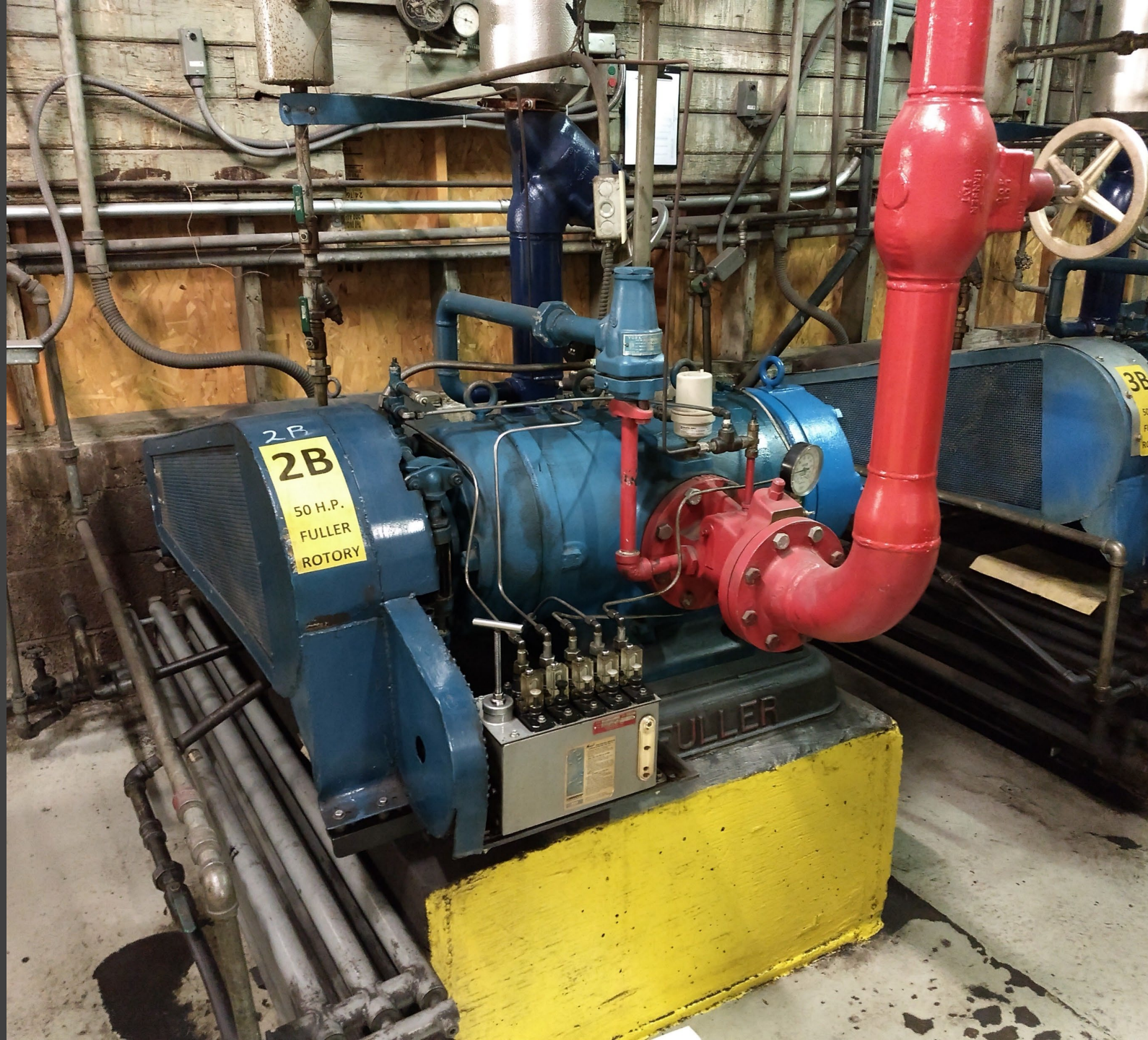
MAINTENANCE

Inspect pistons, rings, and plate valves (5-years)



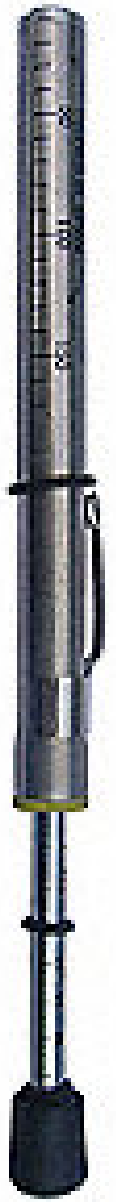
MAINTENANCE

Inspect vanes (5-years)



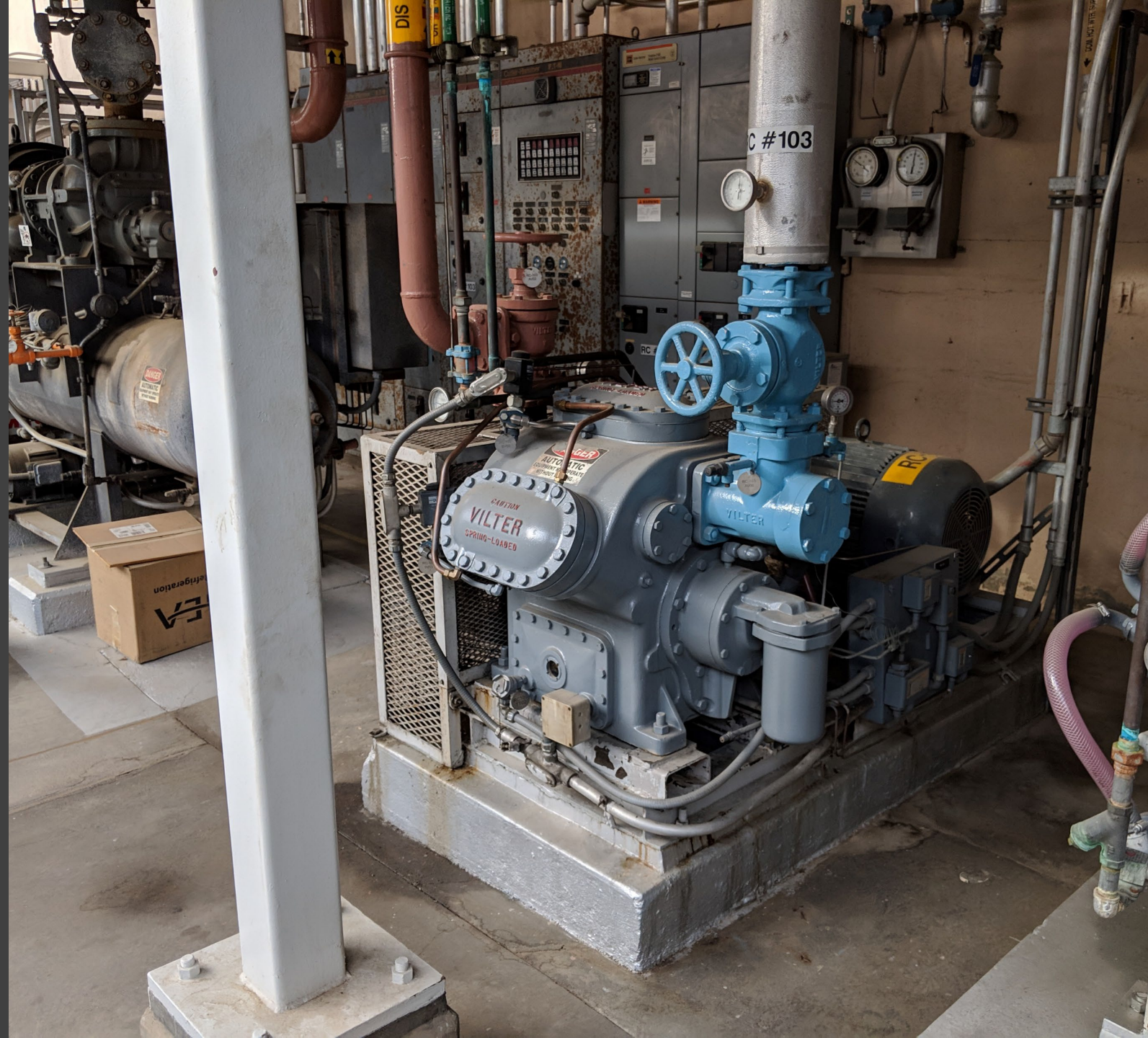
MAINTENANCE

Check belt tension
(annual)



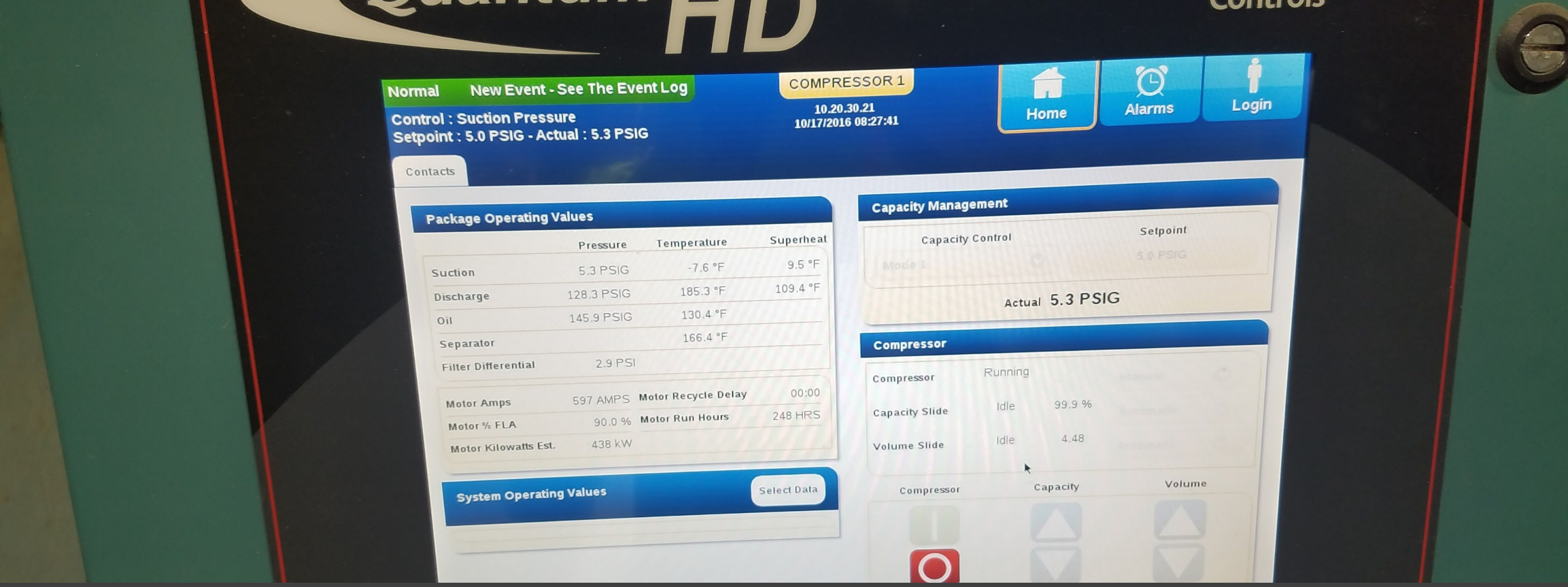
MAINTENANCE

Check pulley hub connections (annual)



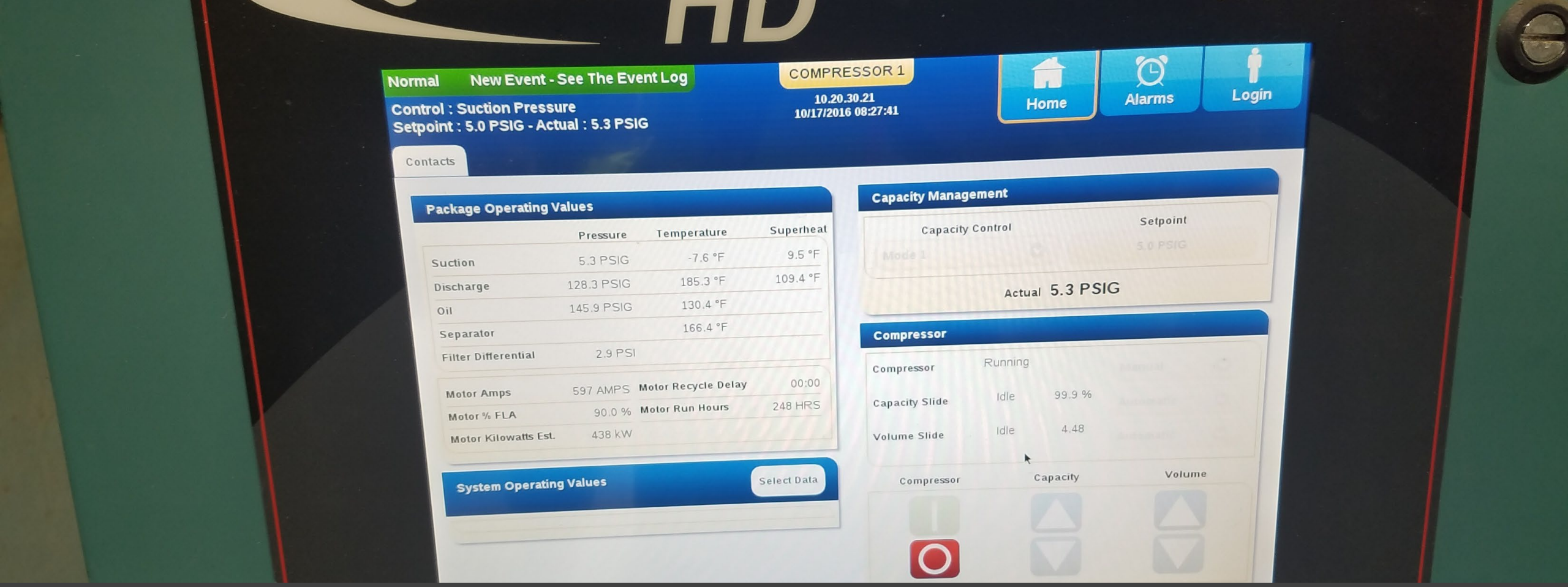
MAINTENANCE

Check electrical wiring for hot spots (annual)



MAINTENANCE

Calibrate motor current transducer (annual)

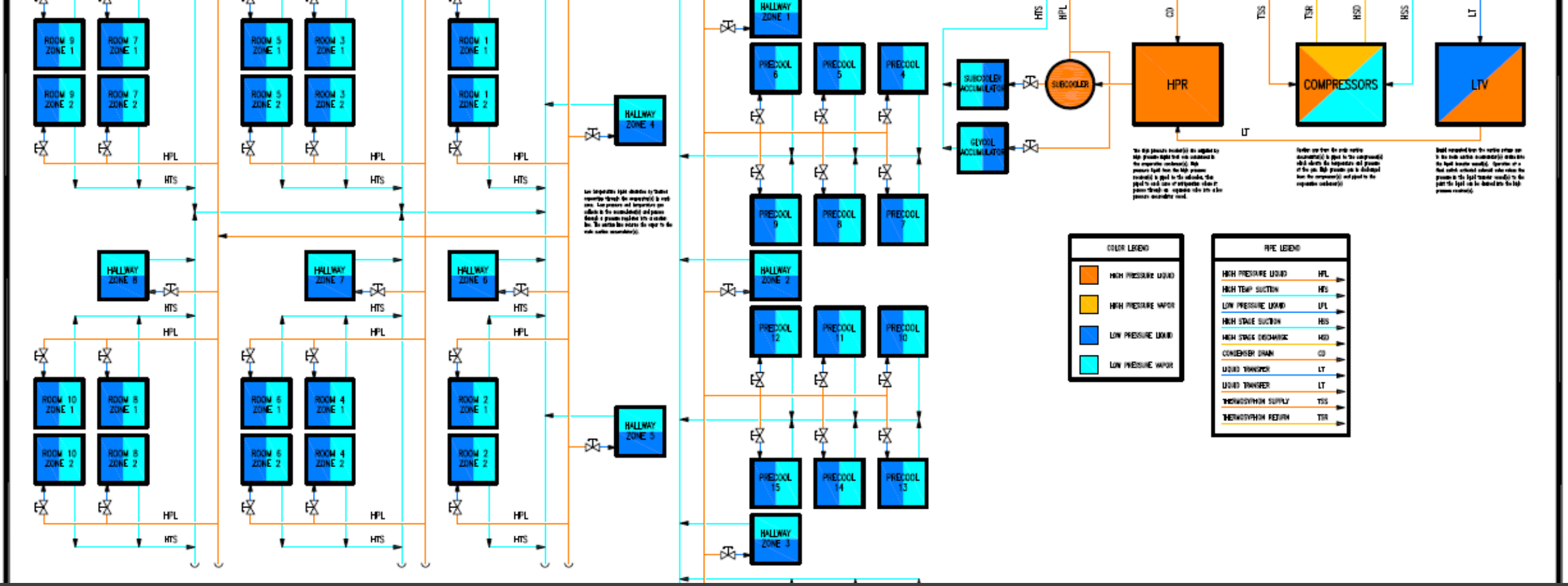


MAINTENANCE

Calibrate capacity/volume slide valve (annual)

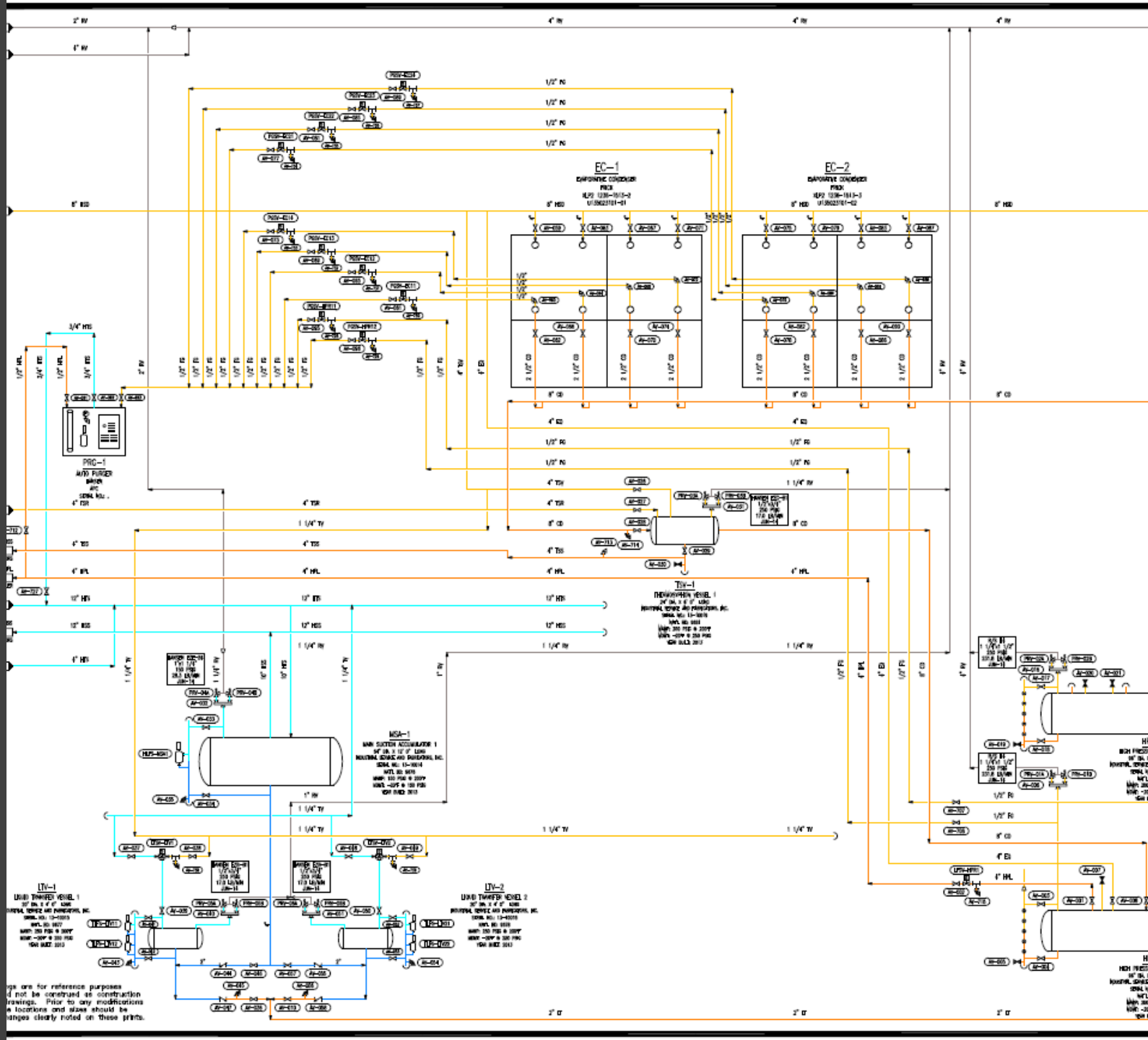
IIAR 6 Record Keeping Requirements ANSI/IIAR 6-2019 §5.3.3	PSI Documentation Requirements Title 8 CCR §5189(d)
Refrigeration flow drawings	Block flow diagram P&ID
Defined operating limits	Safe upper and lower limits for process variables such as temperatures, pressures, flows, levels and/or compositions
Safety system functional description	Safety systems (such as interlocks, detection and suppression systems, etc.)
Relief valve list with PRV manufacturer, PRV model number and set pressure, and where applicable, the three-way valve manufacturer and model number;	Relief system design and design basis
Ventilation system functional description	Ventilation system design
Installation, operation, and maintenance manuals;	Materials of construction
Manufacturer data reports for all pressure vessels;	Materials of construction
Equipment list	P&IDs

Record Keeping Requirements [§5.3]



FLOW DRAWINGS

FLOW DRAWINGS



OPERATING LIMITS

Design Pressure

The ammonia refrigeration system is divided into high and low sides. All components on the high-side of the system have a design pressure of 250, 300, or 400 psig. All components on the low-side of the system have a design pressure of 150 or 300 psig.

Consequence of Exceeding Design Pressure

- Compressors will shut down on high pressure cutout
- Emergency Pressure Control System (EPCS) will activate
- Pressure relief valves may lift
- Vessel may rupture if all safeties previously listed fail

Normal Discharge Pressure

The normal discharge pressure ranges from 120 psig - 200 psig based on ambient conditions and refrigeration system load patterns.

Consequence of Exceeding Normal Discharge Pressure

- Compressors will shut down on high pressure cutout
- Emergency Pressure Control System (EPCS) will activate
- Pressure relief valves may lift

Consequence of Deviating Below Normal Discharge Pressure

- Difficulty supplying liquid to evaporators and liquid injection cooled compressors

OPERATING LIMITS

FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
(Alternative Form for Single Chamber, Completely Shop or Field Fabricated Vessels Only
As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII,

Manufactured and certified by Industrial Service & Fabricators, Inc., 1425 South Burleson Boulevard, Burleson, Texas USA 7602
(Name and address of manufacturer)

Manufactured for California Controlled Atmosphere, 39138 Road 56, Dinuba, CA 93618
(Name and address of purchaser)

Location of installation Columbine Vineyards, 33777 Cecil Avenue, Delano, CA 93215
(Name and address)

Type:	Vertical tank	13-10137	---	10096-35 Rev. 1	97
	(Horiz. or Vert., tank)	(Mfg's serial No.)	(CRN)	(Drawing No.)	(Nat'l Bd

The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESS construction, and workmanship conform to ASME Rules, Section VIII, Division 1 2010
Year

to '11 --- S
Addenda (Date) Code Case Nos.

Shell	SA-240-304	0.250"	0	3' 0" OD	
	Matl (Spec. No. Grade)	Nom. Thk (in.)	Corr. Allow (in.)	Diam., I.D. (ft. & in.)	

Seams:	Wld., Dbl. Butt	None	70%	---	---	Wld., Sngl. Butt, Type 2	N
	Long (Welded, Dbl., Sngl., Lap, Butt)	R.T. (Spot or Full)	Eff. (%)	H.T. Temp. (oF)	Time (hr)	Girth (Welded, Dbl. Sngl. Lap, Butt)	R.T.

Heads: (a) Material SA-240-304 (b) Material (Spec. N
(Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Di
(a)	Top, Bottom	0.1875"	0	---	---	2:1	---	---	
(b)									

If removable, bolts used (describe other fastenings)
(Matl. Spec. No., Grade, Size, No.)

MAWP 150 (internal) 0 (external) psi. at max temp. 200 (internal)

SAFETY SYSTEMS

1. Ammonia Detection System

There are three ammonia sensors installed at

Detector Location	Manufacturer	Model	Serial Number
South Machinery Room Wall	Hansen	HEC4-N250	S12647D
West Machinery Room Wall	Hansen	HVSC4-N10K	1502400
Relief Vent Pipe	Hansen	HVSC4-N10K	R29232C

The detection system is interlocked with the refrigeration system controls as follows:

- Ammonia concentration monitors are installed inside and outside the machinery room to display the current concentration inside the room;
- If the ammonia concentration exceeds 25 ppm, a 38 lumen LED amber strobe and 97 dB audible alarm will be initiated inside and outside the room. In addition, the PLC will notify facility personnel;
- If the ammonia concentration exceeds 150 ppm, emergency ventilation will be activated and additional horn/strobe alarms outside the machinery room will be activated;
- If the ammonia concentration exceeds 1,000 ppm, the refrigeration machinery inside the machinery room will be de-energized and the fire departement will be notified through the facility alarm system.

SAFETY SYSTEMS

2. Emergency Control Box

The Emergency Control Box was installed in accordance with Fire Code at the time of construction. The control box contains three (3) valves.

- Valve #1: High Side Discharge Valve
- Valve #2: Low Side Discharge Valve
- Valve #3: High to Low Pressure Control Valve

Opening Valve #1 will evacuate the process through the high pressure side of the system. Opening Valve #2 will evacuate the process through the low pressure side of the system. Opening Valve #3 will equalize the high and low pressure portions of the system.

The Emergency Control Box is seldom used in a refrigeration system, but has been installed for rare emergency situations.

Compressor Name	Oil Seperator Name (See Vessel Tab)	Oil Seperator Size		Relieving Capacity for Vessel	PRV Setting	Minimum Required Discharge	Pressure Relief Valve Selected	Relief Size	Relief Valve Capacity	Type of Assembly	Number of Assemblies	Total Capacity	Date PRV Installed
		Dia	*Length*										
		in	*ft*	*lb/min*	*psig*	*lb/min*			*lb/min*	*S/D*		*lb/min*	
Compressor 1	Oil Separator 1	20	6.9167	5.8	300	14.5	Henry 5601	1/2" x 1"	68.5	D	1	68.5	Feb-18
Compressor 2	Oil Separator 2	20	6.9167	5.8	300	14.5	Henry 5601	1/2" x 1"	68.5	D	1	68.5	Feb-18
Compressor 3	Oil Separator 3	20	9	7.5	250	17.5	Shank 812	1/2" x 1"	29.1	D	1	29.1	Feb-18

RELIEF VALVE LIST

VENTILATION SYSTEM

VENTILATION SYSTEM DESIGN

The purpose of a machinery room mechanical ventilation system is to effectively remove potent contaminated air from the machinery room space and expel that air to a safe outdoor locat Additionally, the machinery room ventilation assists in maintaining the room temperature below 104ºF.

The mechanical ventilation system was retrofitted in The ventila system consists of the following components:

Emergency Ventilation Fan

Manufacturer: Airfoil Impellers

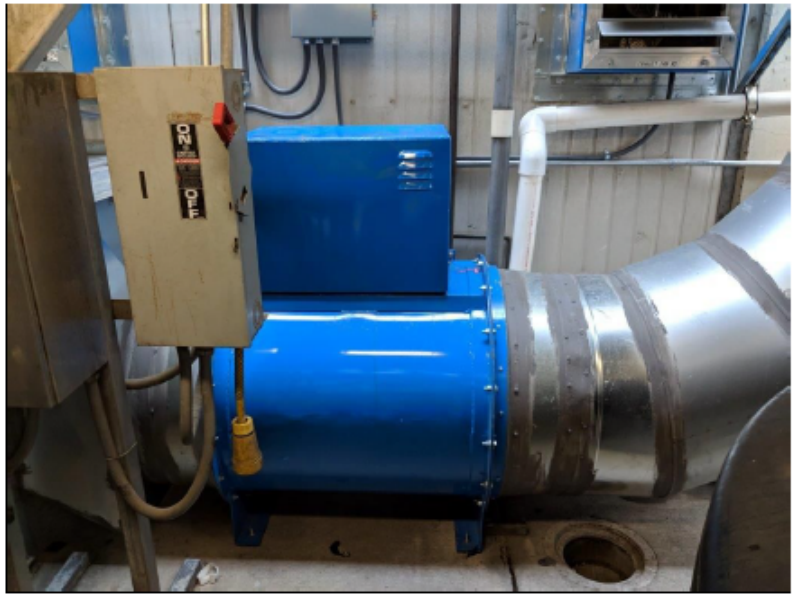
Model: TA3007503BD

S/N: S017116

Airflow: 16,916 CFM @ 1.0" SP

Motor: 7-½ HP, Explosion Proof

Fan Location: Mounted to the ground, outside the south machinery room wall. The fan dischar vertically through a circular duct and damper which terminates above the roof.



Bulletin 106B

evapco

PMC-E

EVAPORATIVE CONDENSERS

Easy to Install – Easy to Maintain

More Capacity

More Choices

*Forced Draft, Axial Fan Models Available in Capacities from **124** to **1,408** Ammonia Tons!*

Phillips REFRIGERATION

VALVES • VESSELS • SYSTEMS • CONTROLS

LOW SIDE VALVES
Series 701S
BULLETIN 701S-11E-01
Engineering Data

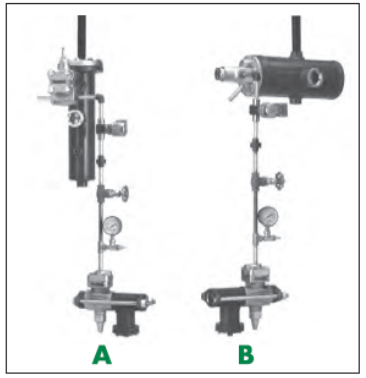
PILOT OPERATED FIXED OR ADJUSTABLE LEVEL

Size: 1/2"- 4"

For Ammonia (R-717) and Halocarbon Refrigerants

Features

- Pressure Rating: 300PSI (-20°F – +240°F)
- ASTM A536 Gr. 65-45-12 Ductile Iron Body and Bonnet
- Modulating Level through Metering Pilot
- Normally Closed
- Manual Lifting Stem
- Strainer Available
- Teflon Seat Disks are Replaceable



A 701S Valve with 101 Valve and Chamber Pilot Operated Level Control (Adjustable Level)

B 701S Valve with 301E Valve and Chamber Pilot Operated Level Control (Fixed Level)

Description

The Phillips® Series 701S Low Side valves are pilot-operated piston-type valves which meter the flow of liquid refrigerant to an evaporator or pressure vessel in response to liquid level requirements. The 701S is controlled by a float valve which responds to changing requirements, providing a modulating control arrangement.

The 701S valves are flanged and may be supplied with a mating strainer. A metering plug and spring are selected for specific operating conditions. A manual opening stem, for raising the metering plug off the internal port, and a replaceable PTFE seat disc are standard.

In fixed level applications, the 701S is typically controlled by a 301E float valve. The 301E is mounted in a welded steel chamber, external to the vessel where the level is being controlled. The chamber is equipped with a Phillips® Level Eye® for visual indication of the liquid level. See Bulletin 301E. (A Series 300 float valve, which mounts internal to the vessel being controlled, will also serve as a pilot float. See Bulletin 300H.)

In adjustable level applications, the 701S is controlled

Design Function

The 701S valve is actuated by controlling the pressure above the internal piston. A drop in liquid level, detected by the pilot float valve, reduces pressure in the pilot line as the pilot float orifice opens. This drop in pressure causes the 701S piston to rise and open slots in the metering plug. Conversely, a rise in liquid level closes the pilot float orifice and increases the pressure in the pilot line. This moves the 701S piston and metering plug toward the closed position.

Flow in the pilot line is from the top of the 701S to

Frick BY JOHNSON CONTROLS

Form 070.610-IOM (NOV 2014)

INSTALLATION - OPERATION - MAINTENANCE

File: SERVICE MANUAL - Section 70
Replaces: 070.610-IOM (AUG 2014)
Dist: 3, 3a, 3b, 3c

RWF II

ROTARY SCREW COMPRESSOR UNITS

ALL REFRIGERANTS

MODELS
100 through 1080

THIS MANUAL CONTAINS RIGGING, ASSEMBLY, START-UP, AND MAINTENANCE INSTRUCTIONS. READ THOROUGHLY BEFORE BEGINNING INSTALLATION. FAILURE TO FOLLOW THESE

IOMS

As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

1. Manufactured and certified by Industrial Service & Fabricators, Inc., 1425 South Burleson Boulevard, Burleson, Texas USA 76028
(Name and address of manufacturer)

2. Manufactured for California Controlled Atmosphere, 39138 Road 56, Dinuba, CA 93618
(Name and address of purchaser)

3. Location of installation Columbine Vineyards, 33777 Cecil Avenue, Delano, CA 93215
(Name and address)

4. Type: Vertical tank (Horiz. or Vert., tank) | 13-10137 (Mfg's serial No.) | --- (CRN) | 10096-35 Rev. 1 (Drawing No.) | 9799 (Nat'l Bd. No.) | 2013 (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE. The design, construction, and workmanship conform to ASME Rules, Section VIII, Division 1 2010 (Year)

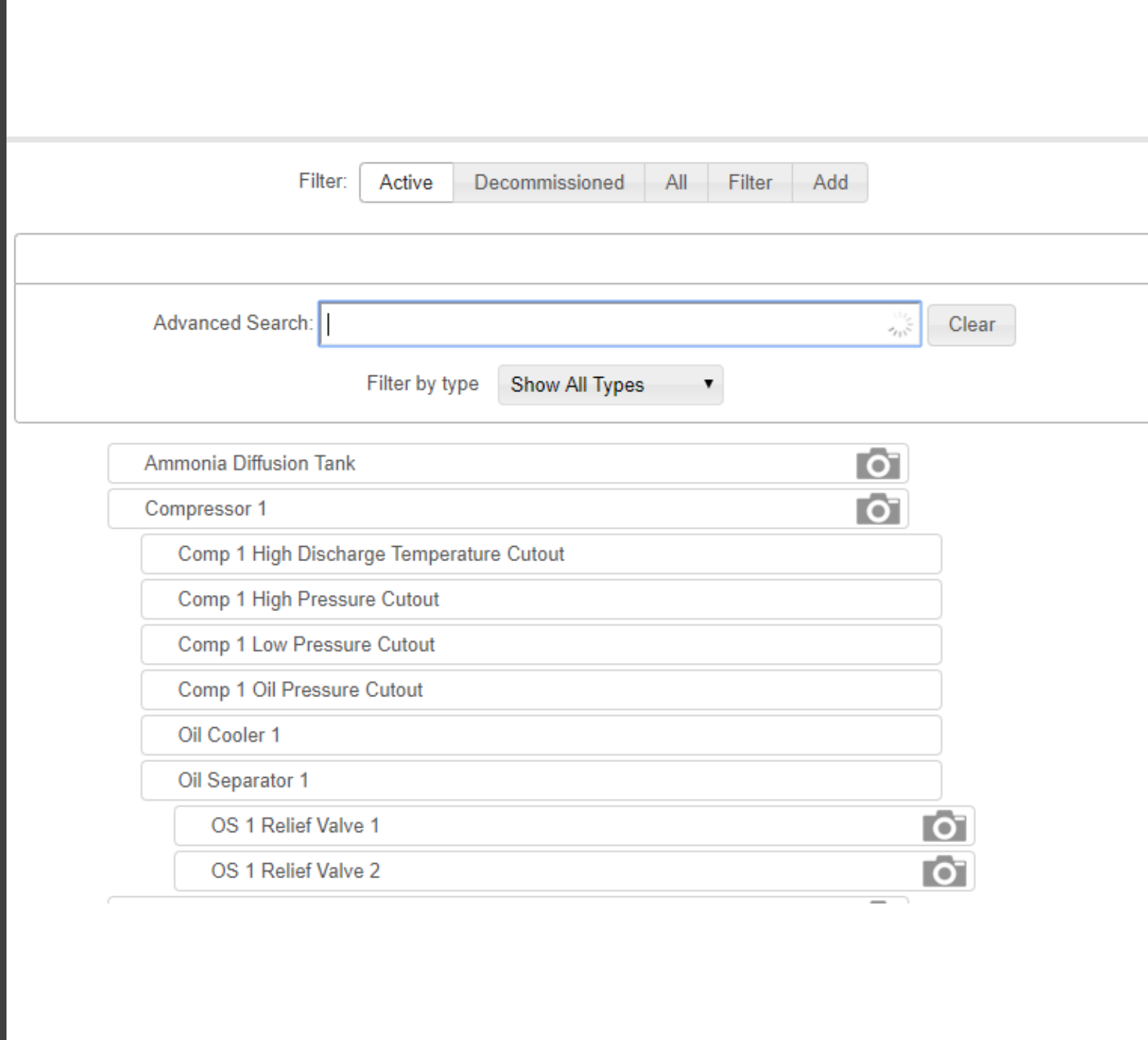
to '11 (Addenda (Date)) | --- (Code Case Nos.) | --- (Special Service per UG-120(d))

6. Shell: SA-240-304 (Matl (Spec. No. Grade)) | 0.250" (Nom. Thk (in.)) | 0 (Corr. Allow (in.)) | 3' 0" OD (Diam., I.D. (ft. & in.)) | 6' 0" (Length (overall) (ft. & in.))

7. Seams: Wld., Dbl. Butt (Long (Welded, Dbl., Sngl., Lap, Butt)) | None (R.T. (Spot or Full)) | 70% (Eff. (%)) | --- (H.T. Temp. (oF)) | --- (Time (hr)) | Wld., Sngl. Butt, Type 2 (Girth (Welded, Dbl. Sngl. Lap, Butt)) | None (R.T. (Spot or Full)) | 65% (Eff., (%)) | 1 (No. of Courses)

DATA REPORTS

EQUIPMENT LISTS



Gauge Board	+40°F Suction Pressure	50 - 70 psig							
	+25°F Suction Pressure	33 - 45 psig							
	Discharge Pressure	120 - 180 psig							
Compressor 1 (+40°F) GEA 195GMX	Running	Yes/No							
	Run Time	Hours							
	Oil Level	Top sight glass should be 1/2 full	O	O	O	O	O	O	O
	Alarms	Yes/No - check microprocessor							
	Suction Temperature	34°F - 47°F							
	Suction Pressure	50 - 70 psig							
	Discharge Temperature	155°F - 195°F							
	Discharge Pressure	120 - 180 psig							
	Oil Temperature	120°F - 170°F							
	Oil Filter Pressure	60 psig - 90 psig							

OPERATIONAL LOG

AMMONIA PURITY

Submit Form | Print

Apcco
Applied Process Cooling Corporation

Service Division
Phone (877) 231-6406
Fax (209) 545-1660

To be completed after testing each sample of ammonia from the system:		
(Sample 1) Vessel description: Recirc PP1		Ammonia level in vessel (%): 25
Vessel pressure: 25 pounds	Water quantity (ml): .02	Water Percentage: 0.171832
(Sample 2) Vessel description:		Ammonia level in vessel (%):
Vessel pressure:	Water quantity (ml):	Water Percentage:
(Sample 3) Vessel description:		Ammonia level in vessel (%):
Vessel pressure:	Water quantity (ml):	Water Percentage:
(Sample 4) Vessel description:		Ammonia level in vessel (%):
Vessel pressure:	Water quantity (ml):	Water Percentage:
(Sample 5) Vessel description:		Ammonia level in vessel (%):
Vessel pressure:	Water quantity (ml):	Water Percentage:
(Sample 6) Vessel description:		Ammonia level in vessel (%):
Vessel pressure:	Water quantity (ml):	Water Percentage:
(Sample 7) Vessel description:		Ammonia level in vessel (%):
Vessel pressure:	Water quantity (ml):	Water Percentage:
(Sample 8) Vessel description:		Ammonia level in vessel (%):
Vessel pressure:	Water quantity (ml):	Water Percentage:
(Sample 9) Vessel description:		Ammonia level in vessel (%):

OIL LOG

RESOURCE COMPLIANCE

Ammonia System Oil Draining Log

MECHANICAL INTEGRITY

Location: Machinery Room

Year: ____________

Drain Location	Date	Gal. Removed	Initials	Comments

Type of Record	Retention Duration
Daily Inspection Records	Most current 12 months
Daily Testing Records	Most current 12 months
Daily Maintenance Records	Most current 12 months
Annual Inspection Records	Most current 5 years
Annual Testing Records	Most current 5 years
Annual Maintenance Records	Most current 5 years
Five Year Inspection Records	Two (2) most current
Five Year Testing Records	Two (2) most current
Five Year Maintenance Records	Two (2) most current
Ten Year Maintenance Records	Two (2) most current

Type of Record	Retention Duration
Engineering Design Documentation	Life of the process
Pressure Vessel U-1, U-1A, U-3, UM Reports	Equipment life
Log (Operator Transfer of Information)	Most current 12 months
Secondary Coolant Records	Most current 12 months
Ammonia Refrigerant Records	Most current 5 years
Refrigeration Oil Records	Most current 5 years
Lubrication Records	Most current 5 years
Pressure Relief Valve (PRV) Records	PRV life
Current System Records listed in Section 5.3.3	Life of the process
Instrument and Device Testing and Calibration	Most current 5 years

Type of Record	Retention Duration
Engineering Design Documentation	Life of the process
Pressure Vessel U-1, U-1A, U-3, UM Reports	Equipment life
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Lubrication Records	Most current 5 years
Pressure Relief Valve (PRV) Records	PRV life
Current System Records listed in Section 5.3.3	Life of the process
Instrument and Device Testing and Calibration	Most current 5 years

PIPE CORROSION

ANSI/IIAR 6-2019 TABLE A.11.1.1.3.1

Table A.11.1.1.3.1
Piping Sizes, Schedules, and Thicknesses (Carbon Steel Only)

Pipe Size (in.) (OD)	Pipe Schedule	Nominal Thickness (in.)	*Mill Tolerance Thickness (in.)	Alert Thickness (in.)	Remaining Percentage from Nominal	Replacement Thickness (in.)	Remaining Percentage from Nominal	**Pressure T_{min} (in.)
0.5 (0.840)	80	0.147	0.129	0.080	54%	0.044	30%	0.011
0.75 (1.050)	80	0.154	0.135	0.080	52%	0.046	30%	0.013
1 (1.315)	80	0.179	0.157	0.080	45%	0.054	30%	0.017
1.25 (1.660)	80	0.191	0.167	0.080	42%	0.057	30%	0.021
1.5 (1.900)	80	0.200	0.175	0.090	45%	0.060	30%	0.024
2 (2.375)	80	0.218	0.191	0.100	46%	0.065	30%	0.030
2 (2.375)	40	0.154	0.135	0.100	65%	0.046	30%	0.030
2.5 (2.875)	40	0.203	0.178	0.100	49%	0.061	30%	0.036
3 (3.500)	40	0.216	0.189	0.110	51%	0.065	30%	0.044
3.5 (4.000)	40	0.226	0.198	0.120	53%	0.068	30%	0.051
4 (4.500)	40	0.237	0.207	0.120	51%	0.071	30%	0.057
5 (5.563)	40	0.258	0.226	0.120	47%	0.081	31%	0.071
6 (6.625)	40	0.280	0.245	0.130	46%	0.094	34%	0.084
8 (8.625)	40	0.322	0.282	0.131	41%	0.119	37%	0.109
10 (10.750)	40	0.365	0.319	0.164	45%	0.146	40%	0.136
12 (12.750)	ST	0.375	0.328	0.194	52%	0.172	46%	0.162
14 (14.000)	ST	0.375	0.328	0.213	57%	0.188	50%	0.178
16 (16.000)	ST	0.375	0.328	0.244	65%	0.213	57%	0.203
18 (18.000)	ST	0.375	0.328	0.274	73%	0.238	64%	0.228
20 (20.000)	ST	0.375	0.328	0.305	81%	0.264	70%	0.254
24 (24.000)	ST	0.375	0.328	0.326	87%	0.315	84%	0.305

Adapted from *Principles and Practices of Mechanical Integrity Guidebook for Industrial Refrigeration Systems*.
*Mill Tolerance Thickness is 12.5% less than Nominal Thickness in accordance with ASME B31.5 and ASTM specifications.
**Pressure T_{min} is in accordance with ASME B31.5 (300 psi, A53 Gr A ERW, temperatures at or above -20 °F).


CONTROL
PRESSURE
RECIEVER
AMMONIA
REFRIGERANT (R717)
KING
VALVE
ingersoll Rand
Oil-Free Air


DUPLICATE TAG
American Bridge
Division of
United States Steel Corporation
Trademark
U
RT 4
W
MAX. ALLOW. WORKING PRESS.
250 PSI AT 650
SERIAL NO. 134158 BUILT 19 79
SHELL THICKNESS 1/2"
HEAD THICKNESS .547" MIN.
SURFACE AREA 237 CAPACITY 1961
SERVICE: DUPLICATE TAG
NEVINS CO
P.O. 7611


KING
VALVE
Oil-Free Air

Nominal Thickness of a 3” Sch 80 Pipe is 0.300

60% Material Loss

Table A.11.1.1.3.1
Piping Sizes, Schedules, and Thicknesses (Carbon Steel Only)

Pipe Size (in.) (OD)	Pipe Schedule	Nominal Thickness (in.)	*Mill Tolerance Thickness (in.)	Alert Thickness (in.)	Remaining Percentage from Nominal	Replacement Thickness (in.)	Remaining Percentage from Nominal	**Pressure T_{min} (in.)
0.5 (0.840)	80	0.147	0.129	0.080	54%	0.044	30%	0.011
0.75 (1.050)	80	0.154	0.135	0.080	52%	0.046	30%	0.013
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*Mill Tolerance Thickness is 12.5% less than Nominal Thickness in accordance with ASME B31.5 and ASTM specifications.
**Pressure T_{min} is in accordance with ASME B31.5 (300 psi, A53 Gr A ERW, temperatures at or above -20 °F).

Resource Compliance

126 W. Ventura Ct.,
Kingsburg, CA 93631

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