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THE GREENCHILL PARTNERSHIP

Refrigerant Leak Prevention through Regular Maintenance

July 19, 2012

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Q & A

- Q&A session after presentation
- Submit your questions using CHAT at anytime; we'll go through them during Q&A
  - If you'd like to remain anonymous, send your question by CHAT to Keilly Witman instead of to all participants
- Raise your hand during Q&A (hand button is on upper left of screen)

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Today's speaker…….

Dustan Atkinson – Kysor/Warren

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Dustan Atkinson is a Product Manager at Kysor/Warren where he is responsible for delivering new products and refrigeration technology to the supermarket industry, as well as day-to-day product line management. Dustan has a B.S. in Marketing from Berry College in Rome, GA.

Preventative Maintenance

July 2012

Dustan Atkinson

Kysor Warren

Preventative Maintenance

AGENDA

- Introduction
  - Importance of Preventative Maintenance
  - Keeping Records
- Preventative Maintenance Guidelines
  - Cases
  - Compressorized Systems/Racks
  - Air-Cooled Condensers
  - Air-Cooled Condensing Units
  - Unit Coolers (Evaporators)

Preventative Maintenance

IMPORTANCE OF PREVENTATIVE MAINTENANCE

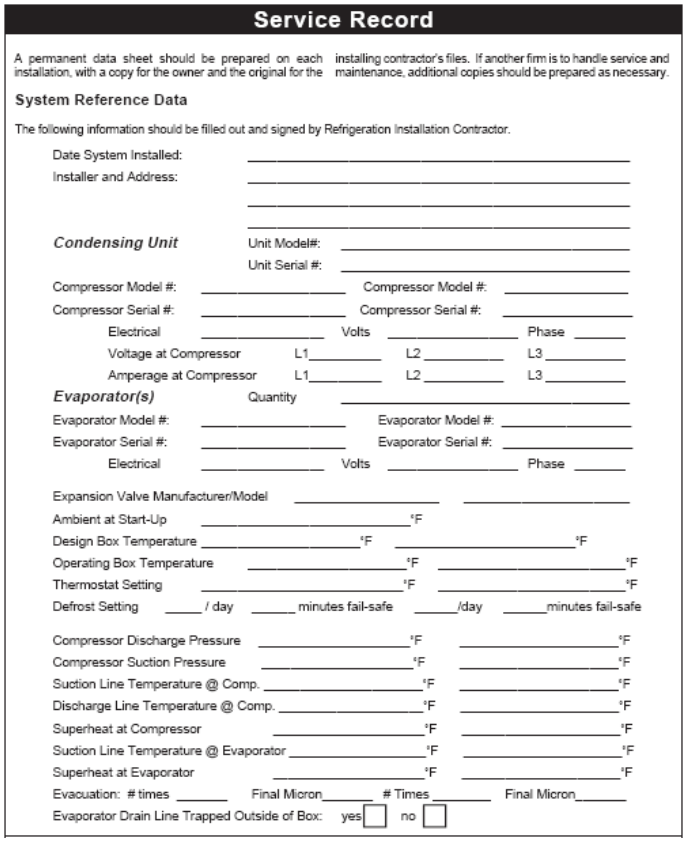
- Regularly scheduled maintenance of your refrigeration equipment is required in order to keep it operating to its maximum efficiency while avoiding potentially costly repairs of a premature failure due to equipment neglect

- Failure to properly maintain equipment can lead to failures including (but not limited to):
  - Refrigerant leaks
  - Loss of refrigeration capacity
  - Poor energy efficiency
  - Excessive corrosion

Preventative Maintenance

KEEPING RECORDS

- Keep a service record any time the equipment is serviced or adjusted
  - Helps identify recurring problems
    - Especially leaks
    - May be required by law
  - Expedites troubleshooting
- Keep the service record/log on the premises at all times
- Ensure all service/operation/ troubleshooting guides are present for your equipment



Service Record

A permanent data sheet should be prepared on each installation, with a copy for the owner and the original for the installing contractor's files. If another firm is to handle service and maintenance, additional copies should be prepared as necessary.

System Reference Data

The following information should be filled out and signed by Refrigeration Installation Contractor.

Date System Installed: _____

Installer and Address: _____

_____

_____

Condensing Unit Unit Model#: _____

Unit Serial #: _____

Compressor Model #: _____ Compressor Model #: _____

Compressor Serial #: _____ Compressor Serial #: _____

Electrical _____ Volts _____ Phase _____

Voltage at Compressor L1_____ L2 _____ L3 _____

Amperage at Compressor L1_____ L2 _____ L3 _____

Evaporator(s) Quantity _____

Evaporator Model #: _____ Evaporator Model #: _____

Evaporator Serial #: _____ Evaporator Serial #: _____

Electrical _____ Volts _____ Phase _____

Expansion Valve Manufacturer/Model _____ _____

Ambient at Start-Up _____ °F

Design Box Temperature _____ °F _____ °F

Operating Box Temperature _____ °F _____ °F

Thermostat Setting _____ °F _____ °F

Defrost Setting ____ / day ____ minutes fail-safe ____/day ____minutes fail-safe

Compressor Discharge Pressure _____ °F _____ °F

Compressor Suction Pressure _____ °F _____ °F

Suction Line Temperature @ Comp. _____ °F _____ °F

Discharge Line Temperature @ Comp. _____ °F _____ °F

Superheat at Compressor _____ °F _____ °F

Suction Line Temperature @ Evaporator _____ °F _____ °F

Superheat at Evaporator _____ °F _____ °F

Evacuation: # times _____ Final Micron_____ # Times _____ Final Micron_____

Evaporator Drain Line Trapped Outside of Box: yes ☐ no ☐

Preventative Maintenance

IMPORTANCE OF PREVENTATIVE MAINTENANCE

- All guidelines in this presentation are for general educational purposes only. Due to variables in equipment application, operation conditions and environmental conditions, recommended service intervals may vary.
- Recommendations may vary by manufacturer or specific equipment model, please consult your equipment operational manual for guidelines specific to your equipment
- All preventative maintenance should be conducted by qualified personnel only
- Contact service technician at the first sign of trouble

Preventative Maintenance

REFRIGERATED DISPLAY CASES

Preventative Maintenance

REFRIGERATED CASE GUIDELINES

- Cleaning
  - Always shut off power before cleaning cases
  - Generally, soap and water can be used to wipe down
    - Water temp. should not exceed 120°F
    - Special precautions must be taken when cleaning some components
      - Cleaning agents must not be corrosive to metal
      - Do NOT use household glass cleaners such as Windex® --these may damage anti-fog coatings
      - Do NOT use hot water on cold glass surfaces

Cleaning Frequency Recommendations

Cleaning Frequency	Refrigerated Products
Daily	Seafood – Service, unpackaged Deli (unwrapped items)
Weekly	Seafood – Self-serve, packaged Dairy – Milk Meat – Red meat, packaged Meat-Chicken, packaged Produce
Monthly	Frozen Food Drinks (juice, beer, soda) Condenser coils on self contained

Note: It is very important to consult your local health code for specific requirements. Each individual customer and store condition may need special requirements and it is up to individual store management to make those decisions to ensure food safety.

Preventative Maintenance

REFRIGERATED CASE GUIDELINES

- Cleaning Interior Surfaces
  - Should be cleaned AT LEAST every 3 months
    - The case should be thoroughly emptied and cleaned
      - Can use most mild soap formulas, ammonia based cleaners and sanitizing solutions
  - Can be cleaned as needed for code compliance or merchandising effect
- Cleaning Exterior Surfaces
  - Exterior surfaces should be cleaned at least on a weekly basis.
    - Use warm water and mild soap to protect and maintain the finish
    - Do not use cleaners containing abrasive materials or ammonia which will scratch or dull the finish.
    - The waste outlet should be flushed with water following each cleaning
      - **EXCEPTION:** Self-contained cases are not connected to a drain system and have their own evaporating pan with limited capacity.

Preventative Maintenance

REFRIGERATED CASE GUIDELINES

- Monthly
  - Ensure the case is free of obstructions or debris in/near coil
    - Should be included in routine cleaning procedure
  - Check for excessive corrosion
    - Excessive corrosion may lead to leaks and significantly reduced capacity
- Yearly
  - Inspect wiring for signs of wear or discoloration

Preventative Maintenance

REFRIGERATED CASE GUIDELINES

- Merchandising Guidelines
  - Do NOT place merchandise beyond the load limit line or over the front of the adjustable shelves
  - Do NOT allow shelving, merchandise or signage to extend into the air curtain
  - Check that air discharge and return flues are open and free of debris or other obstructions
  - Do NOT place merchandise in case unless case is operating properly

Preventative Maintenance

COMPRESSORIZED SYSTEMS / PARALLEL RACK GUIDELINES

Preventative Maintenance

COMPRESSORIZED SYSTEMS / PARALLEL RACK GUIDELINES

- Ongoing/Continuous
  - Monitor system pressures

- Weekly
  - Check refrigerant charge using the liquid line sight glass
    - Any signs of leaks should be investigated immediately
  - Check compressor oil level
    - Ensure adequate oil level is maintained in the compressor
  - Check compressor crankcase heater operation.
  - Check main power and control voltage.
  - Check appearance of area around the unit.
    - Any new stains or oil residue may indicate presence of a leak

Preventative Maintenance

COMPRESSORIZED SYSTEMS / PARALLEL RACK GUIDELINES

- Monthly
  - Check the refrigerant system for leaks.
    - Any signs of oil leakage or known leaks should be addressed immediately
  - Check suction filters and liquid line filter driers.
  - Confirm all flanged connections, fittings and line clamps are tight
    - Loose connections can lead to significant leaks
  - Tighten all electrical connections.
  - Check operation/condition of compressor contactors.
  - Check appearance of control panel interior.
  - Check appearance of exterior conduit / junction boxes.

Preventative Maintenance

COMPRESSORIZED SYSTEMS / PARALLEL RACK GUIDELINES

- Monthly
  - Check appearance of insulation.
  - Check operation of auxiliary equipment.
  - Confirm system pressures are within specified limits
    - A system pressure out side of standard may indicate a leak or other operational issue

Preventative Maintenance

COMPRESSORIZED SYSTEMS / PARALLEL RACK GUIDELINES

- Quarterly
  - With unit in stable operation, record all operating conditions:
    - Suction / discharge / liquid refrigerant pressure(s) and temperature(s)
    - System superheat, liquid sub-cooling, ambient temperature
    - Compressor amperage
  - Test all operating and safety controls.
- Annually
  - Obtain oil sample for analysis; change oil if required.
  - Change liquid line filter drier and suction filter cores.

Preventative Maintenance

UNIT COOLERS

Preventative Maintenance

UNIT COOLER GUIDELINES

- Unit coolers should be serviced every six months.
  - Visual Inspection
    - Check for signs of excessive corrosion
    - Check for signs of oil/refrigerant leakage
    - Check for obstructions or debris in/near coil
      - It is very important to maintain at least stated minimum clearances to ensure adequate air distribution and maintain cooling capacity
    - Check for EXCESS ice build-up

Product stacked too close to unit cooler

Preventative Maintenance

UNIT COOLER GUIDELINES

- Check Unit Cooler Fan Operation
- Clean Unit Cooler Coil and Blades
- Inspect Electrical Wiring & Components
- Observe Cooling Cycle
  - Superheat at Unit Cooler
  - Check Coil Feeding

Preventative Maintenance

CONDENSING UNITS

Preventative Maintenance

CONDENSING UNIT GUIDELINES

- Quarterly
  - Visual inspection
    - Check for excessive corrosion
      - Can lead to tube degradation and leaks as well as capacity loss
    - Check for signs of oil/refrigerant leakage
      - Any signs of leaks (i.e. discoloration around unit, or oil residue) should be investigated immediately
    - Check for obstructions or debris in/near coil
      - It is very important to maintain at least stated minimum clearances to ensure adequate air distribution and maintain cooling capacity

Preventative Maintenance

CONDENSING UNIT GUIDELINES

- Quarterly
  - Visual inspection
    - Check moisture indicator/sight glass
      - Confirm no gas is present (should be liquid)
        - » Less than full column of liquid may indicate the presence of a leak
      - Confirm that there is no indicator of excessive moisture
    - Check for unusual noise or vibration
    - Inspect wiring for signs of wear or discoloration
    - Confirm all flanged connections, fittings and line clamps are tight

Preventative Maintenance

CONDENSING UNIT GUIDELINES

- Check Condenser Fan Operation
  - Check that each fan rotates freely and quietly.
  - Check all fan set screws and tighten if needed.
  - Check all fan blades for sighs of stress or wear
  - Verify that all fan motors are mounted securely
  - Lubricate motors if applicable
    - most motors are permanently sealed ball bearing type and do not require lubrication
- Clean Condenser Coil and Blades
  - Periodic cleaning can be accomplished by using a brush, low pressure water (not a power washer) or a commercially available coil cleaning foam.
    - If a foam cleaner is used, it should not be an acid based cleaner. Follow label directions for appropriate use.

Preventative Maintenance

CONDENSING UNIT GUIDELINES

- Inspect Electrical Wiring & Components
  - Verify that all electrical and ground connections are secure
  - Check condition of compressor and heater contactors. Look for discoloration and pitting.
  - Clean electrical cabinet. Look for signs of moisture, dirt, debris, insects and wildlife.
- Check Refrigeration Cycle
  - Check suction, discharge and net oil pressure readings.
  - Check pressure drop across all filters and driers.
  - Verify that superheat at the compressor conforms to specification.
  - Check pressure and safety control settings and verify proper operation.

Preventative Maintenance

CONDENSING UNIT GUIDELINES

- Annually
  - All Quarterly Items
  - Submit Oil Samples for Evaluation
    - Confirm there is no discoloration, contaminants or acids
      - Discoloration and acids may indicate overheating of the compressor
  - Inspect Suction Accumulator (if Applies)

Preventative Maintenance

AIR-COOLED CONDENSERS

Preventative Maintenance

CONDENSER/FLUID COOLER GUIDELINES

- Every six months.
  - Visual Inspection
    - Check for excessive corrosion on fins, cabinet, copper tubing or solder joints
    - Check for signs of oil/refrigerant leakage
      - Look for oil stains on headers, return bends and fins
      - Check any suspect areas with a leak detector
    - Check for obstructions or debris in/near coil
      - It is very important to maintain at least stated minimum clearances to ensure adequate air distribution and maintain cooling capacity
    - Inspect condenser fan blades and motor mounts
      - Look for cracks, loose set screws or mounting bolts
      - Look for any excessive or unusual vibration

Preventative Maintenance

CONDENSER/FLUID COOLER GUIDELINES

- Every six months
  - Check fan operation
    - Check that each fan rotates freely and quietly.
    - Check all fan set screws and tighten if needed.
    - Check all fan blades for sighs of stress or wear
    - Verify that all fan motors are securely fastened to the motor rail.
    - Lubricate motors if applicable
      - most motors are permanently sealed ball bearing type and do not require lubrication
  - Clean coil and fan blades
    - Periodic cleaning can be accomplished by using a brush, low pressure water or a commercially available coil cleaning foam.
      - If a foam cleaner is used, it should not be an acid based cleaner. Follow label directions for appropriate use.

Preventative Maintenance

CONDENSER/FLUID COOLER GUIDELINES

- Every six months
  - Inspect electrical wiring and components
    - Visually inspect all wiring for wear, kinks, bare areas and discoloration.
    - Verify that all electrical and ground connections are secure, tighten if necessary.
    - Check operation/calibration of all fan cycle controls when used.

Questions?