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Thermal Insulation Association of Canada — The Voice of The Mechanical Insulation Industry

Association Canadienne de l'Isolation Thermique — La voix de l'industrie de l'isolation mécanique

Operations & Maintenance
Mechanical Insulation
Preventive Maintenance Protocol

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Overview

Mechanical insulation is very often ignored when it comes to preventive maintenance considerations on mechanical systems. Established protocols are in place to effectively undertake preventive maintenance on major equipment such as boilers, chillers, valves, etc. However, when it comes to the insulation originally designed to allow this equipment and the attendant piping and ducting to perform efficiently, the absence of any established review process is often the norm.

Properly installed and maintained mechanical insulation is effective in these areas:

- Saving energy.
- Reducing GHG emissions.
- Condensation control.
- Preventing corrosion.
- Eliminating mould growth.
- Personnel (burn) protection [1], [2].
- Help maintain the life and operational efficiency of mechanical systems.

A recommended brief checklist of steps O&M personnel should undertake when walking though a facility follows. Issues relating to diminished efficiency on mechanical insulation often occur when repairing or replacing any piece of equipment or fitting. Damage often occurs on mechanical insulation when it is used to stand on or as a support for ladders.

Equipment Required

- Clipboard.
- Self-adhesive labels to mark and indicate areas subject to review (wired on if the system is too hot, wet or dirty).
- Tape measure, measuring wheel or electronic distance calculator for long pipe and duct runs.
- Camera.
- Infrared thermometer.
- Infrared thermography camera (optional).

Inspection Frequency

Exposed Systems: Once a month or as part of a regularly scheduled walk-through inspection routine or immediately following any repair or replacement of fittings or equipment. Infrared thermography or a heat gun should be used on hot systems to determine surface temperature [1].

Concealed Systems: Whenever staining, dripping or accumulated fluid on adjacent surfaces occurs. Infrared thermography should be used on hot systems to determine high temperature areas.

Inspection Process

- Identify and label the system or area.
- Record visually (camera) and by description (clipboard).
- Record:
    - Dimensions.
    - Surface temperature.
    - Access.

1) Are the DHW, SHW, steam, cold or chilled piping, fittings and equipment insulated? [2]
    a. **YES**: Determine if insulation thickness and covering are appropriate for the application.
    b. **NO**: Determine appropriate type of insulation and covering, and optimum insulation thickness.

2) Is the insulation on DHW, SHW, steam, cold or chilled piping, fittings and equipment damaged? [2]
    a. **YES**: Remove and safely discard the damaged insulation and covering. Install new insulation. Determine optimum thickness appropriate for the application. Install new covering appropriate for the application.
    b. **NO**: Determine if insulation thickness and covering are appropriate for the application.
3) Is there staining, dampness, dripping or pooled fluid anywhere? [2]
    a. **YES**: Remove and safely discard all wet insulation and covering. Determine the cause of the wet insulation and effect repairs. Install new insulation. Determine optimum thickness appropriate for the application. Install new covering appropriate for the application.
    b. **NO**: No further action required.

Execution

- Install mechanical insulation, covering and accessories per manufacturers' recommendations [3]. Complex installations may require the involvement of an experienced mechanical insulation contractor.
- Install or reuse removable fitting covers on valves, strainers, steam traps, etc.
- When deemed appropriate, mechanical insulation and covering that has been removed may be reused. NOTE: Damaged or wet insulation should not be reused.

Resources

[1] **National Building Code of Canada-2010 (NBC-2010)** references the maximum surface temperature permitted for personnel protection:

6.2.9.2.2. "Exposed piping or equipment subject to human contact shall be insulated so that the temperature of the exposed surface does not exceed 70C (158F)".

American Society of Testing Materials: ASTM C1055-03 (Reapproved 2014), "A more reasonable and safer maximum temperature is 40C (104F)".

[2] Mechanical Insulation Calculators are used to determine optimum insulation thickness for a given application, surface temperature, payback and GHG reduction:

3E Plus: www.pipeinsulation.org

Mechanical Insulation Design Guide (MIDG): www.wbdg.org (Simple Calculators)

[3] Execution:
Thermal Insulation Association of Canada (TIAC) - Best Practices Guide: www.tiac.ca

National Energy Code for Buildings-2015 (NECB-2015):
Table 5.2.2.5 Insulation of Ducts.
Table 5.2.5.3 Minimum Thickness of Pipe Insulation.
Table 6.2.3.1 Minimum Thickness for Service Water Heating Systems.
Division B – Notes:
A-5.2.2.5.(2), 5.2.5.3.(8) and 6.2.3.1.(6) Insulation Thickness.
A-5.2.2.5.(7) and 5.2.5.3.(7) Installation Standards.

Mechanical Insulation Design Guide (MIDG): www.wbdg.org

ASHRAE 90.1-2010: Tables 6.8.2A and 6.8.2B Minimum Duct Insulation R-value.
Tables 6.8.3A and 6.8.3B Minimum Pipe Insulation Thickness.

Conclusion

- The Mechanical Insulation Calculators serve to quantify and provide the economic rationale to proceed with the required repairs or upgrades.
- The determination of whether or not to proceed can be decided in-house.
- The initial inspection process and necessary following steps can be undertaken at no cost to the facility.
- TIAC can help (www.tiac.ca).