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The following pages will outline a case study, which shows the benefits in energy and cost savings of properly installed mechanical insulation.

Insulation is a proven means for conserving energy, reducing greenhouse gas emissions, increasing process productivity, providing a safer and more productive work environment, controlling condensation (which can lead to mold growth), supporting sustainable design technology and a host of other benefits.

Mechanical insulation does all of this, while providing a return on investment (ROI) rate, which is seldom rivaled. Despite the proven ROI, insulation is often overlooked and its benefits undervalued. Insulation is truly the lost or forgotten technology. Can you think of a more important time than now to think about how insulation can help you?

An insulation system is a technology, which needs to be engineered and maintained throughout the entire process. Several studies have estimated roughly 10 to 30 percent of all installed insulation is now missing or damaged.

The practice of not replacing or maintaining an insulation system in a timely and correct manner reduces the full benefits of insulation, and in return, decreases the ROI. In many cases, significant other issues - such as excessive energy loss, corrosion under insulation (CUI), mold development, increased cost of operations and reduced process productivity or efficiency - develop.

You can learn more on www.MechanicalInsulatorsLMCT.com, where additional case studies can be viewed.

Please do not hesitate to contact me should you have any additional questions.
Thank you,

Peter Ielimi

Executive Director
Mechanical Insulators Labor Management Cooperative Trust

SALAMANDER INSPECTIONS LTD

Mechanical Insulation Energy Audits

Energy Audit

For Reynolds Museum
6246 – 40 Avenue
Wetaskiwin, Alberta

April 12, 2016

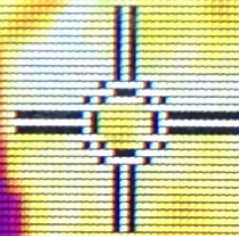


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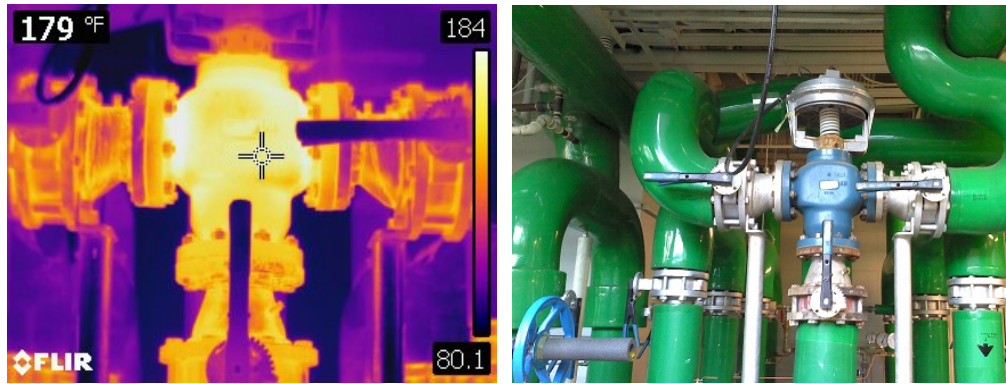
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Bare heating valves in the boiler room of the Reynolds Museum

About Salamander Inspections and the FLIR Thermographic Camera

Salamander Inspections Ltd. is a third party inspection service providing energy audits for mechanical insulation systems in the Commercial/Institutional sector. We are utilizing a state of the art FLIR thermographic camera to provide us with accurate measurements and photographs of heat loss and gain on mechanical systems within the scope of work determined by our clients.

This three way control valve, as photographed by the FLIR camera uses sensors built within the camera to show the heat radiating from the valve. The brighter the color the hotter the temperature of the object. The camera must be set up to filter out the ambient heat from surrounding objects to ensure that the temperatures are accurate. The camera then takes a thermal image as well as a digital picture for reference.

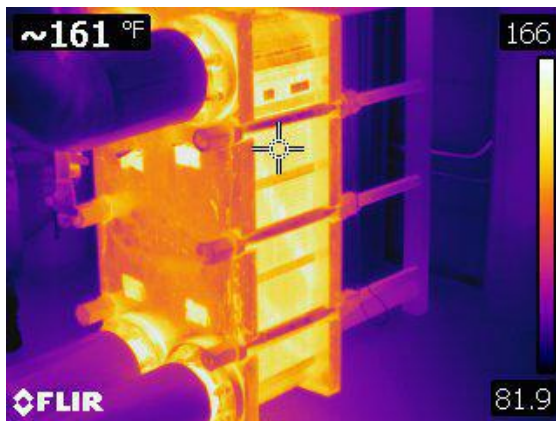
Methodology

The audit was performed by systematically inspecting the condition of all mechanical systems within the scope of work. The type of system, condition, temperature and footage was recorded and used to determine outcomes that will be beneficial to the operation of the building. The areas targeted within the scope of work have been checked using a FLIR digital thermal imaging camera which shows clearly problem areas that may not be seen with the naked eye. The photographs clearly show the areas of concern which can be addressed by applying mechanical insulation products.

Executive Summary

The Reynolds Museum is located at 6246 – 40 Avenue, Wetaskiwin Alberta and is a premier museum exhibiting all things from the transportation industry. This includes aircraft, automobiles, specialty farm and mining equipment from the 1930's to present day.

Salamander Inspections has performed an energy audit of the heating system within the Boiler Room which comprises three levels and one separate Mechanical Fan Room. The purpose of the audit was to determine the current state of mechanical insulation applied to the systems. These are the two areas within our scope of work.



There are some areas where pumps, valves, heat exchanger and piping remain without insulation applied.

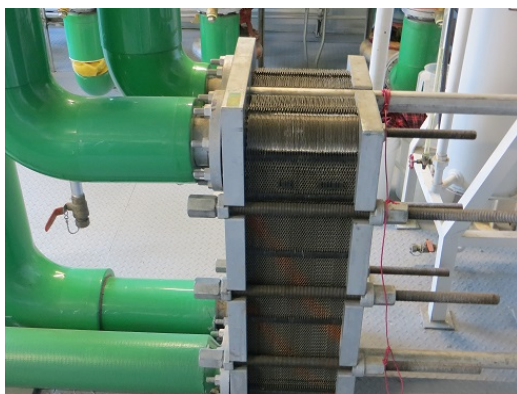
The aggregate annual energy savings Reynolds Museum resulting from the insulation upgrades will be 1,325 GJ. The annual fuel cost saving will be \$5,300. The cost of insulation upgrades is \$7,381. The ROI is approximately 1.3 years for this effort (Note: The insulation costs do not include the finishes such as PVC elbows or PVC finish).

The 1,325 GJ energy saving produces a 65.8 Mt reduction of CO₂ emissions. The annual NO_x emissions reduction will be .021 Mt.

Boiler Room and Fan Room

We have assessed the boiler room and found that the insulation applied to the mechanical systems is in good condition. However, there are some instances where pumps, valves and piping have no insulation applied and therefore, an opportunity to receive some savings is available. During the course of this inspection we counted at least (37) valves, (7) strainers, (10) pumps with numerous other areas which need to be insulated. We also note that the current thickness of applied insulation is 1 ½ wall which meets current best practices and ASHRAE 90.1 (2010). **The boiler room comprises 99% of the items listed on the 3e spreadsheet.**

The workmanship of the existing insulation is very good but there are some bad practices that were followed when these materials were installed. There isn't a reason to not insulate valves, pumps, flanges and or fittings but to achieve cost savings at the time of construction or a specification which allowed these practices to take place. We can now show that not insulating pipes hot or cold will cost money for the operation of the building and or repairs to equipment and piping. The report contains visual inspection of these systems utilizing thermographic analysis and conventional digital photographs for reference.





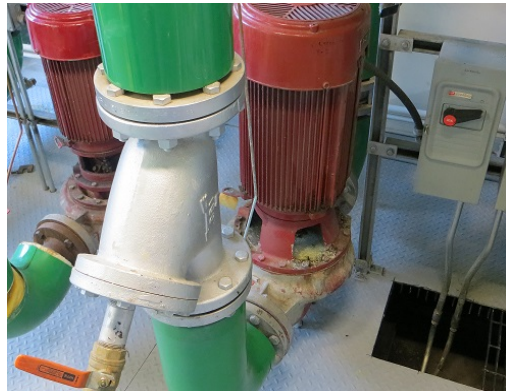
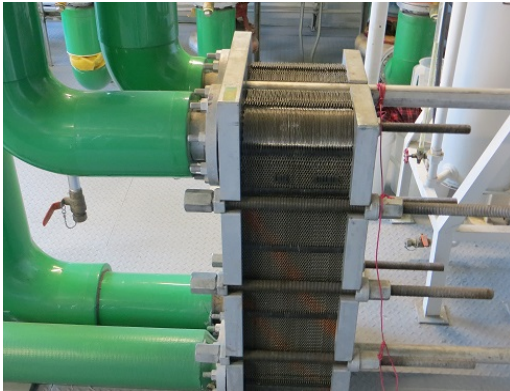
Fan Room

We have inspected the mechanical fan room and found the same experience of missing insulation on the valves, pumps and poorly insulated piping that was not insulated with respect to the original specification. The picture below shows clearly that there is no insulation under the PVC elbow and the elbow is melting from the heat. The copper from the hot water tanks also requires insulation and in its current state poses a possible burning hazard.



Personnel Protection

We also would like to address the hazards that the hot exposed items present to personnel. The boiler rooms and fan rooms generally are tightly packed with equipment and piping systems operating up to 121 C, the systems and equipment which are not insulated leave many opportunities for employees and maintenance personnel to come in contact with these surfaces which can burn skin. Properly insulated systems and equipment eliminate the possibility of individuals coming into contact with these hot surfaces and will prevent accidental burns which will add value by individuals not having claims and or lost time incidents.



Energy Calculations

Reynolds Museum	Heating system cycle @ 6600 hours operation	Boiler Room and Fan Room
Heat Loss per hour	190,347 btu	
@24 hrs	4,568,328 btu	
@31 days	141,618,168 btu	
total	149.41 GJ @ 1 month	5 months = 747.05GJ
Heat Loss per hour	190,347 btu	
@24hrs	4,568,328 btu	
@30 days	137,049,840 btu	
total	144.59 GJ@ 1 month	4 months = 578.36 GJ
	total	1,325.41 GJ
	Cost of fuel	& \$ 4.00/GJ
	Savings per year	\$5,301.64

Insulation Materials

This is a list of materials needed to insulate areas noted during our inspection, these are used as input for the 3EPlus spreadsheet for heat loss calculations. The insulation costs are estimates only and should not be used as actual costs.

pipng		1" iron @ 12 ft	\$49.80
pipng		2" @ 45 ft	\$230.40
Piping		6" @ 2 ft	\$17.62
Piping		8" @ 9 ft	\$97.11
Piping		10" @ 27 ft	\$356.40
Valves	16	6" @ 5.58 ft per valve	\$786.55
Valves	19	8" @ 5.97 ft per valve	\$1223.90
Valves	10	10" @ 6.38 ft per valve	\$842.16
Tees	3	10" @ 6.38 ft per tee	\$211.20
Strainers	7	8" @ 6.38 ft per strainer	\$481.88
Strainers	3	10" @ 3 ft per strainer	\$118.80
Pumps	2	6" @ 3 ft	\$26.43
Pumps	3	8" @ 9 ft	\$97.11
Heat Exchanger		21.27 sq ft	\$41.68
Total materials cost		1 ½ wall material	\$4,581.31
Work days		7@ \$400 per day	\$2,800.00
Total materials & labor			\$7,381.31

Recommendations and Conclusions

Upon consideration of all observed conditions and the information gathered from the 3EPlus program, we recommend that all areas identified within this report be insulated or repaired. We also recommend that **Best Practices** be followed when applying insulation to these items as any deviation from applying insulation will reduce any potential savings. For example, we know that the elimination of canvas can shorten the lifespan of fiberglass with an ASJ finish because of the lack of a protective cladding system. We also recommend using removable insulating pads where necessary or feasible. This will allow maintenance to take place by removing the insulation pad whenever maintenance needs to take place.

If all areas are addressed, you will receive:

- 1) Annual reduction of heat loss - **1,325 GJ**
- 2) Annual cost savings derived through properly insulated piping, valve, strainers and equipment - **\$5,300**
- 3) Potential savings on maintenance costs for equipment
- 4) Elimination of personal protection hazards

Disclosure

We have no relevant financial or non-financial relationships to disclose.

Limitations

We have used information provided to us from various sources but information such as operational heating cycles and cooling cycles are based on conversations with maintenance personnel.

Disclaimer

Results stated in this report are estimated and based upon the data supplied or determined during the audit process. Only the previously agreed to areas have been included in this report. These results are not covered by warranty nor are they guaranteed. The results are intended to portray a reasonable estimate of potential energy savings and emissions reduction with the use of an upgraded and maintained insulation system.

Please contact the undersigned should you have questions about this report.

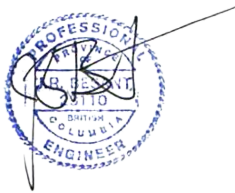
Best regards,

Report prepared by:
Salamander Inspections



Bob Barter (Project Coordinator)

Reviewed by:
Besant and Associates Engineers Ltd.



Jeff Besant, MBA, P.Eng.

PHOTOGRAPHS