



**Thermal
Science
Technologies**

Insulation Assessment Report



**ACME Steam Facility
U.S.**

Introduction

On June XX, 2013, TST performed an insulation assessment at the ACME Steam facility located in the US. The purpose of the insulation assessment was to identify all bare piping and pipe fittings that are contributing to substantial energy losses throughout the steam distribution system at the facility.

Bare pipe and pipe fittings such as valves, strainers, unions, tees, elbows, flanges, tanks and heat exchangers can lead to substantial heat losses on a distribution system. These un-insulated fittings are most often found in mechanical rooms, boiler houses, power plants, manholes, vaults, pits and underground tunnels. Re-insulating steam and condensate pipe and fittings is one of the quickest and most economical ways to recover heat losses.

Insulating bare piping and/or fittings with TST's custom-made Removable Insulation Covers (RIC) can reduce energy losses by 75%-90%. RICs are preferred over regular conventional insulation due to the fact that they are easily removed and replaced without damage if maintenance work is frequently performed on the pipe or fitting. Conventional insulations are usually damaged or completely destroyed when removed from a pipe fitting in the field. The presence of RICs on frequently maintenance fittings means that it will always remain insulated regardless of how much maintenance work is performed on that fitting.

Assessment Findings

While performing an insulation assessment of the steam distribution system, TST technicians identified and measured 773 pipe fittings that were found to be un-insulated in various buildings and manholes at the site (see Attachment No. 1).

Buildings

TST surveyed piping systems within ten (10) different buildings at the facility. Our recommendation is to manufacture and install 600 RICs on various bare pipe fittings within these buildings in an effort to reduce heat losses on the distribution system.

Manholes

TST surveyed the piping systems within fifteen (15) manholes at the facility. Our recommendation is to manufacture and install 189 RICs on various bare pipe

fittings within these manholes in an effort to reduce heat losses on the distribution system.

Projected Energy Savings

To assure non-biased and realistic energy savings in this assessment, all estimates are compiled by an independent, third-party engineering firm. Thermal conductivity (K-Factor) of TST's fabrication materials for RICs (i.e. jacketing, insulation) were utilized in all formulations in order to provide the most realistic scenario for energy savings. The following assumptions were also made:

- 8760 operational hours per year
- Ambient temperature of 80°F
- Emissivity of 0.9
- Steam production cost of \$21.09 mmBtu/year
- ASTM C1129, ASTM C585, C68
- NAIMA & 3E Plus Version 4.0

Estimated RICs	789
Annual Savings Buildings (BTU/HR)	329,118.0
Annual Savings Manholes (BTU/HR)	187,086.0
Projected Annual Savings (\$)	\$119,209.83
Estimated Project Cost (\$)	\$134,460.07
ROI (years)	1.8
10-Year Savings Projection	\$1,192,098.30

Conclusion

As indicated earlier in this report, TST identified approximately 789 different bare pipe fittings that appear to be a significant source of heat loss at the facility. TST recommends that RICs be installed on all of the identified fittings. TST is capable of handling the identification, measurement, design, fabrication and installation of its RICs in a turnkey manner.

TST will provide its own vehicles and equipment to access all work areas within the facility (including confined spaces). Please see Attachment No. 2 for a priced proposal and detailed specification options.

DISCLAIMER

All energy savings estimates provided in the attached report were derived from data that was provided to Thermal Science Technologies, LLC (TST) by an independent, third-party insulation expert. All thermal calculations are based on the installation of 1-inch thick Removable Insulation Cover except where a 1.5 inch thickness is necessary.

All energy savings estimates were developed with the following data assumptions: Bare pipe, ambient temperature 80°F, wind speed of 0, emissivity of .9, and Type "E" 9-11 lb. density needled fiberglass mat insulation and pipe insulation terminating at a minimum of 3" from flanges for maintenance as recommended in ASTM C1129. The following references were also used to develop the energy savings estimates provided in this report: ASTM Standards C585, C1129 & C680, NAIMA and 3E Plus v.4.0.

In this report Thermal Science Technologies, LLC. (TST) provides energy savings estimates that were derived from thermal calculations related to the use of its own Removable Insulation Covers (RICs). Each estimate relies upon credible factors and assumptions that are furnished by the client or that may be mutually agreed upon by TST and the client. These factors and assumptions are unique to the particular application for which the estimate was generated and therefore should not be relied upon generally or applied to any other applications, or to energy savings evaluations beyond the scope of work designated by TST. This estimate is provided for the convenience of the client and does not create a warranty or guarantee of any kind by TST. Any reliance by the client or any other third-party upon TST's energy savings estimates for energy savings beyond the designated TST scope of work is at the relying party's own risk.

Steam distribution system heat losses can be a result of numerous factors and/or failures, including but not limited to degraded thermal insulations, insulation removal, water intrusion, flooding, steam leaks, steam trap failures, condensate leaks, and other destructive forces within above-ground and underground piping networks. The sale or use of TST's products does not create a warranty or guarantee of any kind related to steam system performance, fuel or water consumption, electric output, O & M occurrences of underground steam piping networks, or any result related to energy consumption. Any warranty or guarantee created by the sale or use of TST's products is specifically limited to the thermal performance as originally and properly installed by our own personnel and is specifically limited in amount to the actual amounts paid to TST for its products.

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