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Energy Assessment for Steam Systems

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The American Society of Mechanical Engineers

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FOREWORD

This document provides a standardized framework for conducting an energy assessment for steam systems, hereafter referenced as an "assessment." A steam system is defined as a system containing steam generator(s) or other steam source(s), a steam distribution network, and end-use equipment. Cogeneration and power generation components may also be elements of the system. If steam condensate is collected and returned, the condensate return subsystem is a part of the steam system. Assessments involve collecting and analyzing system design, operation, energy use, and performance data and identifying energy performance improvement opportunities for system optimization. An assessment may also include additional information, such as recommendations for improving resource utilization, reducing per unit production cost, reducing life cycle costs, and improving environmental performance related to the assessed system(s).

This Standard provides a common definition for what constitutes an assessment, for both users and providers of assessment services. The objective is to provide clarity for these types of services which have been variously described as energy assessments, energy audits, energy surveys, and energy studies. In all cases, systems (energy-using logical groups of industrial equipment organized to perform a specific function) are analyzed through techniques, such as measurements, resulting in the identification, documentation, and prioritization of performance improvement opportunities.

This Standard sets the requirements for conducting and reporting the results of an assessment that evaluates the entire system, from energy inputs to the end use utilization of these inputs. An assessment that complies with this Standard need not address each individual system component or subsystem within an industrial facility with equal weight; however, it must be sufficiently comprehensive to identify the major energy efficiency opportunities for improving the overall energy performance of the system. This Standard is designed to be applied primarily at industrial facilities, but many of the concepts can be used in other facilities such as those in the institutional and commercial sectors.

The Standard is part of a portfolio of documents designed to assist in improving the efficiency of industrial facilities. Initially, four assessment standards are being developed for compressed air, process heating, pumping, and steam systems. Other related existing and planned efforts to improve the efficiency of industrial facilities include:

(a) ASME guidance documents for the assessment standards, which provide rationale for the technical requirements of the assessment standards and give technical guidance, application notes, alternate approaches, tips, techniques, and rules-of-thumb.

(b) A certification program for each assessment standard that recognizes certified practitioners as individuals who have demonstrated, via a professional qualifying exam, that they have the necessary knowledge and skills to properly apply the assessment standard.

(c) An energy management standard, "A Management System for Energy, ANSI/MSE 2000:2008," which is a standardized approach to managing energy supply, demand, reliability, purchase, storage, use, and disposal, and is used to control and reduce an organization's energy costs and energy-related environmental impact. Note: This ANSI standard will eventually be superseded by ISO 50001, now under development.

(d) An ANSI-accredited measurement and verification protocol that includes methodologies for verifying the results of energy efficiency projects.

(e) A program, Superior Energy Performance, that will offer ANSI-accredited certification for energy efficiency through application of ANSI/MSE 2000:2008 and documentation of a specified improvement in energy performance using the ANSI measurement and verification protocol.

The complementary documents described above, when used together, will assist organizations seeking to establish and implement company-wide or site-wide energy plans.

ASME EA-3–2009 was approved by the EA Industrial System Energy Assessment Standards Committee on October 1, 2009 and approved by the American National Standards Institute (ANSI) on December 2, 2009.

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The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

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The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his request in the following format:

Subject: Cite the applicable paragraph number(s) and a concise description.

Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.

Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

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ENERGY ASSESSMENT FOR STEAM SYSTEMS

1 SCOPE AND INTRODUCTION

1.1 Scope

This Standard covers steam systems that are defined as a system containing steam generator(s) or other steam source(s), a steam distribution network and end-use equipment. Cogeneration and power generation components may also be elements of the system (gas turbines, backpressure steam turbines, condensing steam turbines). If steam condensate is collected and returned, the condensate return subsystem is a part of the steam system.

This Standard sets the requirements for preparing for, conducting, and reporting the results of a steam system energy assessment (hereafter referenced as an "assessment") that considers the entire system, from energy inputs to the work performed as the result of these inputs. An assessment complying with this Standard need not address each individual system component or specific system within an industrial facility with equal weight; however, it shall be sufficiently comprehensive to identify the major opportunities for improving the overall energy performance of the steam system. This Standard is designed to be applied primarily at industrial facilities, but most of the specified procedures can be used in other facilities such as those in the institutional and commercial sectors.

The scope of work shall be to complete a comprehensive assessment on a steam system. In the case of an exceptionally large facility, it may be desirable to focus on only one of several steam systems. As a result, the assessment plan should be developed for this specific system only. If an energy stream derives from or is directed to an adjacent system (possibly in an adjacent energy-supplying or receiving facility), then the details of the energy streams (e.g., electricity, steam, natural gas) shall be considered as part of the assessment of the target system.

Assessments involve collecting and analyzing data on system design, operation, energy use, and performance, and identifying energy performance improvement opportunities for system optimization. An assessment may also include recommendations for improving resource utilization, reducing per unit production cost, reducing life cycle costs, and improving environmental performance related to the assessed system(s). Assessment activities shall include but are not limited to engaging facility personnel and providing information about the assessment process; collecting and analyzing data on system design, operation, energy use, and performance; identifying energy performance improvement opportunities and making recommendations for system improvement and energy-saving project implementation in a written report. This report shall document system design; quantify energy operation and performance data; document the assessment process; show results, recommendations and savings projections; and improve the plant or facility personnel's understanding of steam system energy use and operation.

This Standard sets requirements for:

(a) organizing and conducting a steam system assessment

(b) analyzing the data from the assessment

(c) reporting and documentation of assessment findings

When contracting for assessment services, plant personnel may use the Standard to define and communicate their desired scope of assessment activity to third party contractors or consultants.

1.2 Limitations

This Standard does not provide guidance on how to perform a steam system assessment, but sets the requirements that need to be performed during the assessment. For additional assistance, see the companion *ASME Guide for ASME EA-3-2009 Energy Assessment for Steam* Systems on how to apply this Standard.

(a) This Standard does not specify how to design a steam system.

(b) This Standard does not specify the qualifications and expertise required of the person using the Standard.

(c) This Standard does not specify how to implement the recommendations developed during the assessment, but does include recommendations for implementation activities.

(d) This Standard does not specify how to measure and validate the energy savings that result from implementing assessment recommendations.

(e) This Standard does not specify how to calibrate test equipment used during the assessment.

(f) This Standard does not specify how to estimate the implementation cost or conduct financial analysis for recommendations developed during the assessment.

(g) This Standard does not specify specific steps required for safe operation of equipment during the assessment. The plant personnel in charge of normal operation of the equipment are responsible for ensuring that it is operated safely during the data collection phase of the assessment.