



U.S. Department of Energy
Energy Efficiency and Renewable Energy

industrial technologies program

US DOE Industrial Steam BestPractices Software Tools

Riyaz Papar, PE, CEM
Hudson Technologies Company
Phone: (281) 298 0975
Email: rpapar@hudsontech.com

Agenda

- Introduction
- Steam System BP Tools Suite
 - SSST
 - SSAT
 - 3EPlus
- Q & A

Steam System Management Objective:

**Minimize Steam Use,
Energy Losses And
Most Importantly
STEAM COST!!**

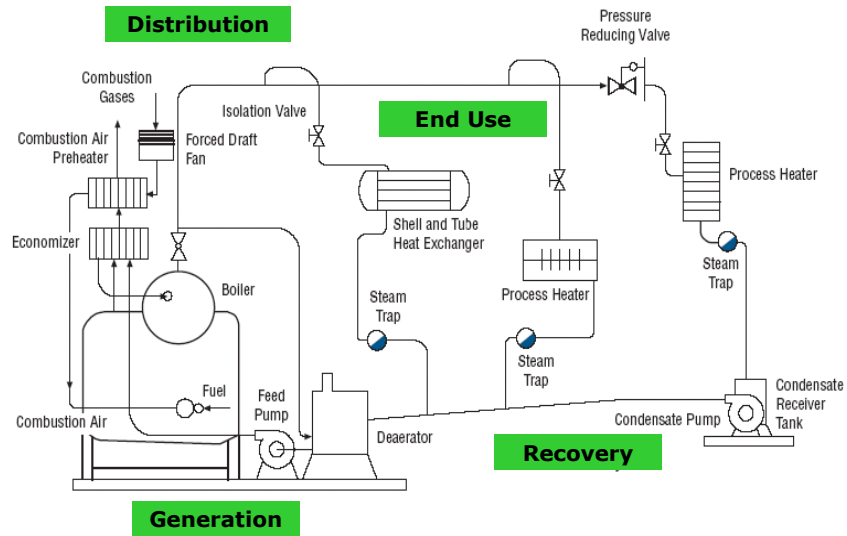
Steam Market Assessment Takeaways

- Fuel savings estimates – individual projects –
ranged from 0.6 percent to 5.2 percent
- Estimated payback periods generally very attractive
 - Ranged from 2 to 34 months
 - Most less than 2 years
- Potential steam savings in target industries –
over 12 percent of fuel use

Promising Areas To Achieve Steam Energy and Cost Savings?

Use Steam System Scoping Tool (SSST) For Initial Assessment

Generation, Distribution, End Use, Recovery



Steam System Scoping Tool (SSST)

- Software designed to develop awareness of potential steam opportunities
- Major tool worksheets
 - General data
 - Profiling data
 - Total system operating practices
 - Boiler plant operating practices
 - Distribution, End Use, Recovery system operating practices
 - Summary evaluation

Two SSST Formats Available

- Excel Spreadsheet (Version 1.0d)
 - Linking capability across plants
 - Spreadsheet – Look and Feel
 - Manual entry of scores
- Visual Basic (Version 2.0.0)
 - Radio buttons – software package look and feel
 - Automatic entry of scores

Demonstration



Steam System Assessment Tool (SSAT)

- A Steam System Opportunity Assessment Tool
- Produces mass, energy, and economic balances for a steam system
- Completes evaluations of energy utilization improvement projects
- Version 3.0.0 now available
 - Metric (SI units) capability

Key SSAT Features

- Choice of 1, 2, or 3 Header Pressure Models
- Schematics of Model Steam Systems
- Estimates of Site & Global Environmental Emissions
- Major Equipment Simulated:
 - Boiler
 - Back-pressure turbines
 - Condensing turbine
 - Deaerator
 - Steam traps, leaks, insulation losses
 - Letdowns
 - Flash vessels
 - Feedwater preheat exchangers

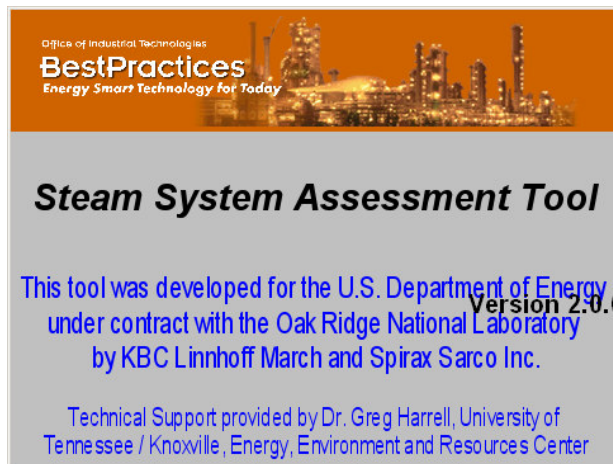
SSAT Can Evaluate Key Steam Improvement Projects

- Steam Demand Changes
- Boiler Efficiency
- Alternative Fuels
- Steam Turbines vs PRVs
- Boiler Blowdown
- Condensate Recovery
- Heat Recovery
- Flash Steam Recovery

SSAT Worksheets

- **Input**
 - Builds the model
- **Model**
 - Graphical representation of the system
 - Base case
- **Projects Input**
 - Allows projects to be activated
 - Allows custom project operation
- **Projects Model**
 - Graphical representation of the system
 - The modified system
- **Results**
 - Side-by-side comparison of the major system operating factors
- **Stack Loss Calculator**
 - Calculate boiler stack losses for SSAT fuels
- **User Calculations**
 - Open worksheet to allow individual calculations

Demonstration



Office of Industrial Technologies
BestPractices
Energy Smart Technology for Today

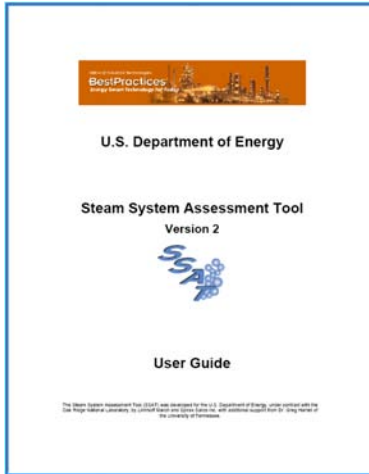
Steam System Assessment Tool

This tool was developed for the U.S. Department of Energy
under contract with the Oak Ridge National Laboratory
by KBC Linnhoff March and Spirax Sarco Inc.

Version 2.0.0

Technical Support provided by Dr. Greg Harrell, University of
Tennessee / Knoxville, Energy, Environment and Resources Center

SSAT “Help” Available



Insulation

- Safety
 - Comes first and mustn't be compromised at all
 - OSHA requires surface temperatures to be less than 120-140 °F
- Energy Cost Reduction
 - Reduce fuel cost
- Process & Product Quality Control
 - Temperature requirement
 - Quality of product
- NIA has a certified insulation appraisal training program

Insulation Loss

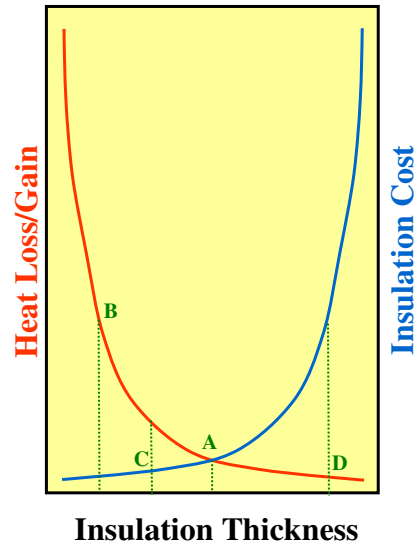
- Often maintenance repairs result in sections of missing insulation
- As an example, in a 200 psig (400 °F) steam system, 10 feet of un-insulated 8 inch pipe will result in:
 - A heat transfer loss of 300 MMBtu/yr
 - \$3,600/yr in fuel expenditures
 - \$10.00/10⁶Btu
 - 80% boiler efficiency

Insulation Tool – 3EPlus

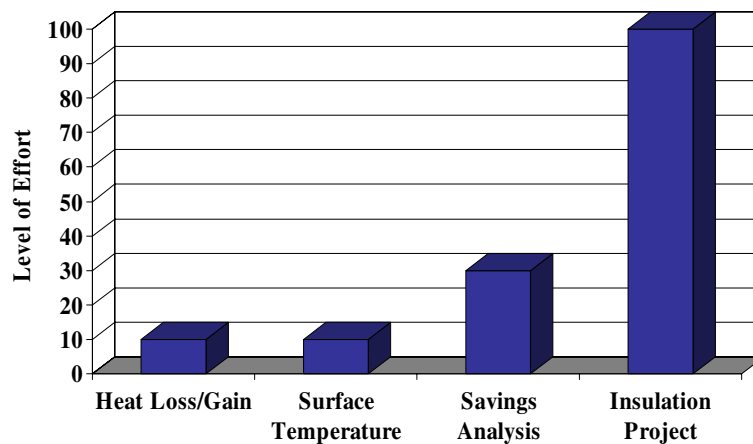
- North American Insulation Manufacturers Association (NAIMA) developed 3EPlus - determines optimum insulation thickness for a wide variety of insulating materials
- Software outputs include:
 - Surface heat transfer loss
 - Insulation surface temperature
 - Simple payback of an insulating project

Economic Insulation Thickness

- Pareto Curves
 - 2-objective problem
 - Maximum of one objective is Minimum of other
 - And vice versa
- Optimize for lowest Life Cycle Cost



3EPlus Insulation Software

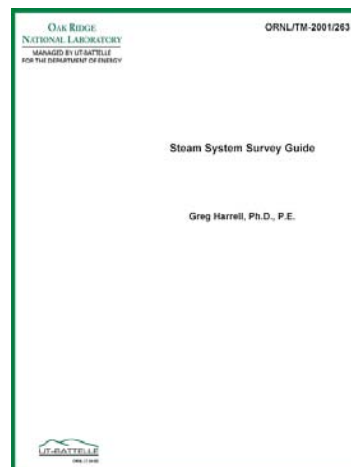


Demonstrating The 3E-Plus Insulation Appraisal Software...



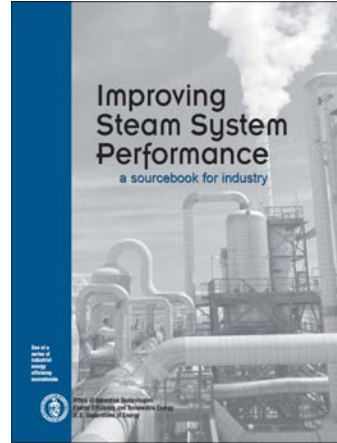
Steam System Survey Guide

- Technical Guide
- Covers 5 Areas:
 - Steam system profiling
 - Identifying steam properties
 - Improving boiler operations
 - Improving resource utilization
 - Improving steam distribution



Steam System Sourcebook

- Includes Three Main Sections:
 - Steam System Basics
 - Performance Improvement Opportunities
 - Programs, Contacts, and Resources



Steam Energy Tips

- 1- Page Tips For Improving Steam System Areas
- Available On BestPractices Web Site, And In Steam Sourcebook



Where to Download the Tools

- US DOE website - <http://www.eere.energy.gov/industry/bestpractices/software.html>
- Search the internet by Keyword – “DOE BestPractices Software Tools”



Additional Training

- US DOE website - <http://www.eere.energy.gov/industry/bestpractices/>
- Training Calendar
- Qualified Specialist Program
- EERE Information Center
 - 1-877-EERE-INF (877-337-3463)
 - Email - eereic@ee.doe.gov



Summary

- Use the Steam System Scoping Tool to:
 - Do a qualitative assessment of your steam system compared to BestPractices in Industry
 - Identify potential energy cost reduction project areas
- Use the Steam System Assessment Tool to:
 - Model your steam system
 - Complete mass, energy, emissions balance before and after projects
 - Very quickly quantify the economic & environmental impact of one or multiple projects

Summary

- Use the 3EPLus software to:
 - Do an assessment of your thermal insulation
 - Identify potential insulation upgrade areas
 - Determine the surface heat transfer loss
 - Calculate insulation surface temperature
 - Determine the thermal cost-effectiveness of the insulation (new or retrofit)
 - Simple payback of an insulating project

Questions & Answers

