SSST Module

9/30/2009

Slide 1: Hello, and welcome to this introduction on the Steam System Tool Suite.

Slide 2: In this tutorial, I will give you a basic overview of each Steam tool, including the Steam System Scoping Tool, the Steam System Assessment Tool, and the 3E Plus Insulation Tool. These tools are available for download from the DOE Industrial Technology Program's Technology Delivery website.

Slide 3: Technology Delivery is a program area within the Industrial Technologies Program (ITP) that supports ITP's mission to improve the energy intensity of the U.S. industrial sector through a coordinated program of research and development, validation, and dissemination of energy-efficient technologies and practices. One of the ways Technology Delivery keeps you in touch with the latest developments is through training, publications, and software tools. Let's get started to show how to begin to develop a list of potential projects at your site.

Slide 4: I will show you how to use the Steam tools, to identify, analyze, quantify, and prioritize energy savings within your plant's steam system. The first tool you should use is the Steam System Scoping Tool, which will help you develop a potential list of projects or areas of investigation for your plant.

Slide 5: Our example steam system utilized the SSST and identified these areas for further consideration:

Boiler efficiency improvements, feedwater economizers, blowdown thermal energy recovery, condensate recovery, and insulation improvements.

These projects were evaluated in the Assessment Tool and the Insulation Tool and identified nearly 1,300,000 dollars per year in energy savings.

Let's keep going to discover how these projects were developed using our Steam Tool Suite.

Slide 6: When assessing the condition of your steam system the first tool you should use is the scoping tool, SSST. It comes in two versions, a Visual Basic program and an Excel program. The Excel program is preferred and will be demonstrated here. The Scoping Tool requires you to enter information about your steam system pertaining to energy consumption, fuel type, unit costs, maintenance and energy monitoring practices. From this information the SSST identifies areas to investigate for potential energy savings. The SSST provides a weighting factor or score and compares it to a Best Practices score to help prioritize the areas to investigate first, with the highest potential of savings to the lowest potential areas for savings. This is not an “exact calculation” tool-there can be a range of appropriate scores that could be assigned to each question. Additionally, the weight assigned to a particular question may not precisely reflect the importance of that area for your facility. The tool is intended to aid in information gathering and to support investigation identification.

Slide 7: The first thing you will see is the 'Introduction' tab, which explains the audience for the tool, the purpose of the tool, the different sections of the tool, and so forth. Note that you can go back and forth between different sections in the tool by clicking on the tabs at the bottom of the worksheets.

Slide 11: Click on the next tab to visit the next section of the tool, ‘2’, Steam System Basic Data.

Begin Tab 2- Steam System Basic Data

STEAM SYSTEM SCOPING TOOL, Version 1.0d **6/12/2002**

STEAM SYSTEM BASIC DATA

BASIC DATA ABOUT YOUR SYSTEM

What To Do Document some of the basic operating information about your steam system.

Why Important Documenting basic steam system data is important to help you to identify the current conditions of your steam system operations, and to establish a baseline/benchmark that you can refer to in the future.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
a	Briefly describe the type of production that your plant does in the column to the right. If you know the Standard Industrial Code (SIC) for your industry, please include that in your description.		
	IF YOU CONSUME STEAM BUT DO NOT GENERATE ANY OF YOUR OWN, PLEASE SKIP TO QUESTION "g"	**ANSWERS TO BASIC DATA QUESTIONS**	
b	What Is Your Total Annual Steam Production?		**Million lbs/year**
c	How Many Hours Per Year Is Your System In Operation?		**hours/year**
d	What Is Your Total Steam Generation Capacity?		**1000 lbs/hour, or**
			Boiler Horsepower
e	What Is Your Average Steam Generation Rate?		**1000 lbs/hour, or**
			Boiler Horsepower

	-CONTINUED-	ANSWERS TO BASIC DATA QUESTIONS	
f	What Is The % Distribution (On A Btu Basis) Of Your Fuel Sources For Steam Generation?		
	Coal		%
	Fuel Oil (#6)		%
	No. 2 Fuel Oil		%
	Natural Gas		%
	Process Waste Heat		%
	Biomass		%
	Solid Wastes		%
	Other		%
	TOTAL (Should add up to 100%)	0.0	%
	-Steam System Basic Data (page 2)		
		ANSWERS TO BASIC DATA QUESTIONS	
g	Do You Have Any Heat Engines In Use On Site?		
	Back Pressure Steam Turbines		
	Number		
	Total Capacity		kW
	Condensing Steam Turbines		
	Number		
	Total Capacity		kW
	Combustion Gas Turbines Without Heat Recovery Steam Generators (HRSGs)		
	Total Capacity		kW
	Combustion Gas Turbines With HRSGs		
	Total Capacity		kW
	Other (specify type)		
	Total Capacity		kW
h	How Much Steam Do You Buy Annually From Others?		Million lbs/year
i	How Many Steam Traps Do You Have In Your Steam System?		
j	What is Your Average Boiler Blowdown Rate?		% of average feedwater flow rate

Slide 12: This section allows you to input some of the basic operating information about your steam system. For now, we'll answer Question 'a.', which asks for information for the type of production our 'plant' does. We'll just write 'Pulp and Paper' at Row 10.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS
a	Briefly describe the type of production that your plant does in the column to the right. If you know the Standard Industrial Code (SIC) for your industry, please include that in your description.	Pulp and Paper

Slide 15: Look at the text in red. Let's say that, for our plant, we generate our own steam. Therefore, we have to answer Questions "B" through "F". Total annual steam production will be 2,278 million pounds per year.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
b	What Is Your Total Annual Steam Production?	2,278	Million lbs/year

Slide 16: The system is in operation 8,760 hours per year.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
c	How Many Hours Per Year Is Your System In Operation?	8,760	hours/year

Slide 17: The site is equipped with three boilers with a combined total steam generation capacity of about 360,000 pounds per hour, so enter 360, as the units are in 1,000 pounds per hour.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
d	What Is Your Total Steam Generation Capacity?	360	1000 lbs/hour, or
			Boiler Horsepower

Slide 20: The average steam generation rate is about 260,000 pounds per hour, so again enter 260 to correspond to the units in 1,000 pounds per hour increments.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
e	What Is Your Average Steam Generation Rate?	260	1000 lbs/hour, or
			Boiler Horsepower

Slide 21: For question "F", let's say we consume 35 percent green wood, so enter 35 at biomass, row 30;

Slide 23: 37 percent natural gas,

Slide 24: and 28 percent Number 6 Fuel Oil.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
f	What Is The % Distribution (On A Btu Basis) Of Your Fuel Sources For Steam		
	Coal		%
	Fuel Oil (#6)	28	%
	No. 2 Fuel Oil		%
	Natural Gas	37	%
	Process Waste Heat		%
	Biomass	35	%
	Solid Wastes		%
	Other		%
	TOTAL (Should add up to 100%)	0.0	%

Slide 27: Question 'g' asks if we have any heat engines in use on site. Also, what kind, and what is their total capacity? Let's say that we have three backpressure steam turbines.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
g	Do You Have Any Heat Engines In Use On Site?		
	Back Pressure Steam Turbines		
	Number	3	
	Total Capacity		kW

Slide 28: The steam turbine generators are rated to generate 4,200 kW of power, 3,500 kW of power, and 750 kW of power. This makes for a total of 8,450 kW.

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
g	Do You Have Any Heat Engines In Use On Site?		
	Back Pressure Steam Turbines		
	Number	3	
	Total Capacity	8450	kW
	Condensing Steam Turbines		
	Number		
	Total Capacity		kW
	Combustion Gas Turbines Without Heat Recovery Steam Generators		
	Total Capacity		kW
	Combustion Gas Turbines With HRSGs		
	Total Capacity		kW
	Other (specify type)		
	Total Capacity		kW

Slide 29: Now let's answer questions 'h' through 'j.' We do not purchase steam from other sources, so continue to question i. We have 3,550 steam traps in our steam system…….. and our average boiler blowdown rate is 6 percent (which is the percentage of the average feedwater flow rate that exits the boilers as blowdown.")

QUESTION NUMBER	QUESTION	ANSWERS TO BASIC DATA QUESTIONS	
h	How Much Steam Do You Buy Annually From Others?		Million lbs/year
i	How Many Steam Traps Do You Have In Your Steam System?	3550	
j	What is Your Average Boiler Blowdown Rate?	6	% of average feedwater flow rate

Slides 32 – 34: The next section is '3, Steam System Profiling.'

It poses a series of questions to determine what levels of steam and fuel consumption are being measured, monitored, trended and benchmarked against production levels. A score is assigned to each answer and totaled at the end of the tool. Higher levels of measuring, monitoring , trending and benchmarking will reflect in a higher score. This section is divided into three smaller sections, 'Steam Costs,' 'Steam/Product Benchmarks,' and 'Steam System Measurements.'

Begin Tab 3- Steam System Profiling

STEAM SYSTEM SCOPING TOOL, Version 1.0d **6/12/2002**

STEAM SYSTEM PROFILING

STEAM COSTS

What To Do Identify what it costs at your facility to produce steam (in units of $/1000 lbs), and use this as a benchmark for evaluating opportunities for improving your steam operations. Start with determining what your fuel costs are to make steam, then add other costs associated with your operations (chemical costs, labor, etc).

Why Important Understanding the cost to make steam can be an eye-opener - producing steam is not free! Any opportunity that reduces the amount of steam generated saves money, so understanding the cost to make steam is a key step to being able to quantify improvement opportunities.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
SC1	Do you monitor your Fuel Cost To Generate Steam - in terms of ($) / (1000 lbs. of steam produced)?	yes	10	
		no	0	
SC2	How often do you calculate and trend your Fuel Cost To Generate Steam?	at least quarterly	10	
		at least yearly	5	
		less than yearly	0	

STEAM/PRODUCT BENCHMARKS

What To Do Identify how much steam it takes to make your key products. Then track this benchmark: a) with what other facilities in your company do; b) with what other similar plants in your industry do; and c) with how this benchmark varies in your operations over time.

Why Important The bottom line of your operation is how cost effectively you make your products, and steam use has an impact on your productivity. Steam/product benchmarking is an excellent way to monitor productivity and how steam improvements translate to improved productivity.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
BM1	Do you Measure your Steam/Product Benchmark - in terms of (lbs. of steam needed) / (unit of product produced)?	yes	10	
		no	0	
BM2	How often do you Measure and Trend your Steam/Product Benchmark - in terms of (lbs. of steam needed) / (unit of product produced)?	at least quarterly	10	
		at least yearly	5	
		less than yearly	0	

STEAM SYSTEM MEASUREMENTS

What To Do Identify key steam operational parameters that you should monitor and ensure that you are adequately measuring them.

Why Important You Can't Manage What You Don't Measure! Measurement of key steam system parameters assists you in monitoring your system, diagnosing potential system problems, and ensuring that system improvements continue to provide benefits to your operations.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
MS1	Do you measure and record Critical Energy Parameters for your Steam System?			
	Steam Production Rate (to obtain total steam production)	yes	10	
	Fuel Flow Rate (to obtain total fuel consumption)	yes	6	
	Feedwater Flow Rate	yes	6	
	Makeup Water Flow Rate	yes	4	
	Blowdown Flow Rate	yes	2	
	Chemical Input Flow Rate	yes	2	
		no to all of above	0	
MS2	How intensely do you meter your steam flows? - CHOOSE ONE OF FIVE ANSWERS	by major user/equip	20	
		by process unit	10	
		by area or building	5	
		by plant as a whole (i.e., total boiler output)	2	
		not at all	0	

Slide 35: At the beginning of each section, the 'What to do' part gives you suggestions on what and how to measure different aspects of your site, and the 'Why important' part explains how these measurements help you improve your steam site.

For each question, decide on your answer, look at the score to the right, and type this score in the grey box next to it, hit enter or tab to move forward.

'Steam Costs' asks you if you monitor the cost of fuel to generate steam, as well as how often you calculate that cost. We generate our own steam and receive bills that tell us the cost of fuel. We monitor our bills for a score of 10 at SC1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
SC1	Do you monitor your Fuel Costs to Generate Steam – in terms of ($) / (1,000 lbs. o f steam produced)?	yes	10	10
		no	5	

Slide 36: We estimate our steam generation cost annually, so we can enter a score of 5 for SC2.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
SC2	How often do you calculate and trend your Fuel Cost To Generate Steam?	at least quarterly	10	
		at least yearly	5	5
		less than yearly	0	

Slide 39: 'Steam/Product Benchmarks' asks you to identify how much steam it takes to make your products, and to keep track of this benchmark over time and compare it with other facilities and plants. We estimate the amount of steam needed per pound of material produced and we trend this annually for scores of 10 for BM1 and 5 for BM2.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
BM1	Do you Measure your Steam/Product Benchmark - in terms of (lbs. of steam needed) / (unit of product produced)?	yes	10	10
		no	0	
BM2	How often do you Measure and Trend your Steam/Product Benchmark - in terms of (lbs. of steam needed) / (unit of product produced)?	at least quarterly	10	
		at least yearly	5	5
		less than yearly	0	

Slide 42: 'Steam System Measurements' asks you how often you measure and record various operational parameters of your system." We measure steam flow, feedwater flow rate and makeup water flow rate for a total of 20 points at MS1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
MS1	Do you measure and record Critical Energy Parameters for your Steam System?			
	Steam Production Rate (to obtain total steam production)	yes	10	10
	Fuel Flow Rate (to obtain total fuel consumption)	yes	6	
	Feedwater Flow Rate	yes	6	6
	Makeup Water Flow Rate	yes	4	4
	Blowdown Flow Rate	yes	2	
	Chemical Input Flow Rate	yes	2	
		no to all of above	0	

Slide 44: We have steam flow meters on our major process equipment for a score for 10 on MS2.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
MS2	How intensely do you meter your steam flows? - CHOOSE ONE OF FIVE ANSWERS	by major user/equip	20	
		by process unit	10	10
		by area or building	5	
		by plant as a whole (i.e., total boiler output)	2	
		not at all	0	

Slide 45: The next three sections work the same way.

Begin Tab 4- Steam System Operating Practices

STEAM SYSTEM OPERATING PRACTICES

STEAM TRAP MAINTENANCE

What To Do Implement a comprehensive program to correctly select, test, and maintain your steam traps.

Why Important Steam traps play three important functions: a) prevent steam from escaping from the system before the heat is utilized; b) remove condensate from the system; and c) vent noncondensable gases. Poor steam trap selection, testing, and maintenance can result in many system problems including water hammer, ineffective process heat transfer, steam leakage, and system corrosion. An effective steam trap selection and maintenance program is often an excellent investment with paybacks of less than half a year.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
ST1	Does Your System Steam Trap Maintenance Program Include The Following Activities?			
	Proper Trap Selection For Application	yes	10	
	At Least Annual Testing Of All Traps	yes	10	
	Maintaining A Steam Trap Database	yes	10	
	Repairing/Replacing Defective Traps	yes	10	
		none of the above	0	

WATER TREATMENT PROGRAM

What To Do Implement and maintain an effective Water Treatment Program in your steam system.

Why Important An effective steam system Water Treatment Program: a) reduces the potential for waterside fouling problems in your boilers; b) is critical to minimizing boiler blowdown and the resulting energy losses; c) can reduce the generation of wet steam; and d) greatly reduces the potential for corrosion problems throughout your steam system. Most effective water treatment programs include both mechanical (filtration, softening, and deaeration) and chemical treatment. Problems in this area can lead to significant plant productivity issues related to equipment failure and downtime - be sure to consult with a chemical treatment specialist on an ongoing basis.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
WT1	How often do you ensure that your Water Chemical Treatment System is functioning properly?	at least daily	10	
		at least weekly	5	
		less than weekly	0	
WT2	How often do you NEED to clean Fireside or Waterside deposits in your Boiler?	every 5-10 years	10	
		every 1-5 years	5	
		once/year or more	0	
WT3	How often do you measure Conductivity (or Total Dissolved Solids [TDS]) in your Boiler and determine what your Steam and Mud Drum Blowdown Rate (or Top and Bottom Boiler Blowdown Rate) should be?	continuous, or at least once/shift	10	
		once/day	5	
		once/week or less	0	

SYSTEM INSULATION

What To Do Ensure that the appropriate major components of your steam system are well insulated. Determine the economic insulation thickness for your system components, and perform system insulation reviews to identify exposed surfaces that should be insulated and/or unrestored or damaged insulation.

Why Important Effective insulation - on piping, valves, fittings, and vessels - serves many important purposes. Insulation keeps steam energy within the system to be effectively used by processes, it can reduce temperature fluctuations in the system, it can reduce space conditioning requirements, and it can reduce the potential for personnel burns.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
IN1	Is your Boiler Plant equipment and piping system insulation (refractory, piping, valves, flanges, vessels, etc.) maintained and in good condition?	insulation excellent	10	
		insulation good, but can be improved	7	
		insulation inadequate	0	
IN2	Is your Steam Distribution, End Use, and Condensate Recovery equipment insulation (piping, valves, flanges, heat exchangers, etc.) maintained and in good condition?	insulation excellent	20	
		insulation good, but can be improved	14	
		insulation inadequate	0	

STEAM LEAKS

What To Do Identify and quickly repair steam leaks in your steam system.

Why Important Steam leaks can result from failures associated with such things as improper piping design, corrosion problems, and joint and valve seal failures. In high-pressure industrial steam systems, energy costs associated with steam leaks can be substantial. Identifying and repairing steam leaks is essential to properly balancing your steam system.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
LK1	How would you characterize Steam Leaks in your Steam System?	none	10	
		minor	8	
		moderate	3	
		numerous	0	

WATER HAMMER

What To Do Detect and quickly eliminate Water Hammer in your steam system.

Why Important Water Hammer is a serious concern - it can lead to failure and rupture of piping and valves, and in many cases significant personnel injury due to contact with steam and condensate. There are two main types of water hammer: one caused by accumulation of condensate in steam distribution piping and transport of this condensate by high-velocity steam; and the other caused by a pressure pulse resulting from steam collapse (rapid condensation) in condensate return lines and heat exchange equipment. Water Hammer in your steam system always says FIX ME!!

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
WH1	How often do you detect noticeable Water Hammer in your Steam and Condensate Recovery System?	less than once a month	10	
		monthly or weekly	5	
		daily or hourly	0	

MAINTAINING EFFECTIVE STEAM SYSTEM OPERATIONS

What To Do Establish and carry out a comprehensive steam system maintenance program.

Why Important Effective steam system operating practices and improvements can provide benefits to your steam operations year after year - IF you have an effective system maintenance program in place. Major areas of maintenance that will provide year-after-year benefits to your operations include: a) steam traps; b) boiler performance; c) water treatment; d) turbines, piping, heat exchangers, pumps, motors, and valves; and e) system insulation.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
MN1	Do you periodically - at least once a year - inspect the following important Steam Plant Operational Equipment?			
	Boiler Plant Equipment - boiler, deaerator, feedwater tank, chemical treatment equipment, blowdown equipment, economizer, combustion air preheater, insulation, etc.?	yes	5	
	Distribution System Equipment - piping (including design), steam traps (types, sizes, locations), air vents, valves, pressure reducing stations, insulation, etc.?	yes	5	
	End Use System Equipment - turbines, piping (including design), heat exchangers, coils, jacketed kettles, steam traps (types, sizes, locations), air vents, vacuum breakers, pressure reducing valves, insulation, etc.?	yes	5	
	Recovery System Equipment - piping (including design), valves, fittings, flash tanks, condensate pumps, condensate meters, insulation, etc.?	yes	5	
		no to all of above	0	

Slide 46: "Section 4, Steam System Operating Practices" contains six smaller sections. 'Steam Trap Maintenance' asks you whether you correctly select, test, and maintain your steam traps. We have a steam trap database, which assists us with an annual inspection of all our traps, and we verify the right trap for the application during the inspections for a total of 30 points for ST1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
ST1	Does Your System Steam Trap Maintenance Program Include The Following Activities?			
	Proper Trap Selection For Application	yes	10	10
	At Least Annual Testing Of All Traps	yes	10	10
	Maintaining A Steam Trap Database	yes	10	10
	Repairing/Replacing Defective Traps	yes	10	
		none of the above	0	

Slide 51: We are a bit behind on repairing and replacing the traps, so we decided not to award any points for this activity.

Slide 53: 'Water Treatment Program' asks you how often you monitor your water treatment program and how often you need to clean deposits in your boiler." Our plant has a crew to inspect the Water Chemical Treatment system at the beginning of each shift, so we award 10 points to WT1. We have a third party maintenance contract to inspect the boilers and typically deposits are well controlled with the water treatment program and routine fire-side cleaning activities. As a result, a score of 10 is provided for WT2.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
WT1	How often do you ensure that your Water Chemical Treatment System is functioning properly?	at least daily	10	10
		at least weekly	5	
		less than weekly	0	
WT2	How often do you NEED to clean Fireside or Waterside deposits in your Boiler?	every 5-10 years	10	10
		every 1-5 years	5	
		once/year or more	0	

Slide 54: We continuously monitor boiler water conductivity so we award 10 points for WT3.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
WT3	How often do you measure Conductivity (or Total Dissolved Solids [TDS]) in your Boiler and determine what your Steam and Mud Drum Blowdown Rate (or Top and Bottom Boiler Blowdown Rate) should be?	at least daily	10	10
		at least weekly	5	
		less than weekly	0	

Slide 57: 'System Insulation' asks you how well your major steam system components are insulated and how your equipment insulation is maintained. Our boilers, auxiliary equipment, and the utilities piping are covered with appropriate insulation; only a few areas of missing insulation were noted. As a result, we award 7 points on IN1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
IN1	Is your Boiler Plant equipment and piping system insulation (refractory, piping, valves, flanges, vessels, etc.) maintained and in good condition?	insulation excellent	10	
		insulation good, but can be improved	7	7
		insulation inadequate	0	

Slide 58: Our distribution piping insulation is very old and damaged in many spots, and valves are not insulated; therefore we will score 5 points for IN2.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
IN2	Is your Steam Distribution, End Use, and Condensate Recovery equipment insulation (piping, valves, flanges, heat exchangers, etc.) maintained and in good condition?	insulation excellent	10	
		insulation good, but can be improved	7	7
		insulation inadequate	0	

Slide 61: 'Steam Leaks' asks you how many steam leaks you have in your system." Our distribution system has leakage issues as well as the insulation problems. We will score 3 points for LK1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
LK1	How would you characterize Steam Leaks in your Steam System?	none	10	
		minor	8	
		moderate	3	3
		numerous	0	

Slide 63: 'Water hammer' asks how often you find Water Hammer in your Steam and Condensate Recovery System." Our plant has little issues with water hammer, so we award 10 points for WH1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
WH1	How often do you detect noticeable Water Hammer in your Steam and Condensate Recovery System?	less than once a month	10	10
		monthly or weekly	5	
		daily or hourly	0	

Slide 66: 'Maintaining effective Steam System Operations" asks you whether you inspect, on a yearly basis, different operational equipment. Our third party maintenance contract does a thorough inspection of the boiler plant equipment and supporting equipment, piping system and its components, and many of our end user process equipment. We will award 15 points for MN1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
MN1	Do you periodically - at least once a year - inspect the following important Steam Plant Operational Equipment?			
	Boiler Plant Equipment - boiler, deaerator, feedwater tank, chemical treatment equipment, blowdown equipment, economizer, combustion air preheater, insulation, etc.?	yes	5	5
	Distribution System Equipment - piping (including design), steam traps (types, sizes, locations), air vents, valves, pressure reducing stations, insulation, etc.?	yes	5	5
	End Use System Equipment - turbines, piping (including design), heat exchangers, coils, jacketed kettles, steam traps (types, sizes, locations), air vents, vacuum breakers, pressure reducing valves, insulation, etc.?	yes	5	5
	Recovery System Equipment - piping (including design), valves, fittings, flash tanks, condensate pumps, condensate meters, insulation, etc.?	yes	5	
		no to all of above	0	

Begin Tab 5 – Boiler Plant Operating Practices

BOILER PLANT OPERATING PRACTICES

BOILER EFFICIENCY

What To Do Measure, trend, and look for opportunities to improve the efficiency of your boilers.

Why Important One of the key boiler plant functions is to generate steam at the highest possible efficiency. Major sources of boiler efficiency losses include: a) combustion and flue gas energy losses [typically the largest]; b) blowdown losses; and c) refractory insulation losses. It is important to measure and trend boiler efficiency, flue gas temperature, flue gas oxygen content, and flue gas carbon monoxide content on a regular basis. Measurement and control of excess oxygen is critical to minimizing boiler combustion energy losses. Trending flue gas temperature can provide indications of other potential boiler problems, such as waterside or fireside fouling problems.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
BE1	How often do you measure your overall Boiler Efficiency - [(heat absorbed to create steam) / (energy input from fuel)]?	at least quarterly	10	
		at least yearly	5	
		less than yearly	0	

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
BE2	Do you measure the following parameters as a function of boiler load and ambient temperature?			
	Flue gas temperature	yes	5	
	Flue gas Oxygen content	yes	5	
	Flue gas CO content	yes	5	
		no to all of above	0	

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
BE3	How do you control Excess Air in your Boiler to maximize Boiler Efficiency?	automatically	10	
		manually	5	
		not at all	0	

HEAT RECOVERY EQUIPMENT

What To Do Evaluate installation of Heat Recovery Equipment on your Boiler Plant.

Why Important In some boilers, high flue gas temperatures and high continuous blowdown rates can provide opportunities for installation of heat recovery equipment. Feedwater economizers and combustion air preheaters can, under appropriate conditions, be installed to extract excess flue gas energy and effectively increase the boiler efficiency. Blowdown heat recovery equipment can also, for some systems, be installed to extract otherwise lost heat from the blowdown system. For either potential opportunity, an economic analysis is needed to determine the feasibility of the opportunity, and the equipment should be designed and installed by qualified professionals.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
HR1	Do you have any of the following Heat Recovery Equipment installed on your Boilers?			
	Feedwater Economizer and/or Combustion Air Preheater	yes	10	
	Blowdown Heat Recovery	yes	5	
		no to all of above	0	

GENERATING DRY STEAM

What To Do Ensure that you generate high-quality dry steam in your boiler plant.

Why Important Steam of 100% quality contains no liquid water; wet steam contains liquid droplets. Generating wet steam in your boiler can cause many system problems, including: a) inefficient process heat transfer; b) equipment failure by water hammer; c) equipment failure by corrosion and erosion; and d) steam trap failure by overloading. Some typical causes for creation of wet steam and boiler carryover are: a) wide swings in boiler water level; b) reduced operating pressure; c) boiler overload; and d) poor boiler total dissolved solids (TDS) control. A critical step to ensuring generation of high-quality steam is to measure the quality of steam leaving your boiler; this is typically done using steam calorimeters.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
DS1	How often do you check the Quality of Steam that is output from your Boiler to the Distribution System, and ensure that you are generating Dry Steam?	at least quarterly	10	
		at least yearly	5	
		less than yearly	0	

GENERAL BOILER OPERATION

What To Do Ensure that your boilers perform their functions without large fluctuations in operating conditions.

Why Important How you control boiler operation can effect many elements of the steam system - including the operating life of the boiler, the quality of steam produced, and the effectiveness of steam use throughout your production operations.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
GB1	Do you have an operational automatic blowdown controller on your Boiler?	yes	5	
		no	0	

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
GB2	What is the frequency of High Level Alarms (possibly indicating boiler undersized) or Low Level Alarms (possibly indicating boiler oversized) for your Boiler?	less than 1/month	10	
		1-5 per month	5	
		more than 5/month	0	

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
GB3	How often do you experience steam pressure fluctuations of greater than 10% of your Boiler Operating Pressure?	less than 1/month	5	
		1-5 per month	3	
		more than 5/month	0	

Slide 69: 'Section 5, 'Boiler Plant Operating Practices,' contains four smaller sections. 'Boiler efficiency' asks you about how often you measure boiler efficiency, what parameters you use to make those measurements and how you control excess air." Our plant estimates the boiler efficiency each month, so we can award 10 points to BE1.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
BE1	How often do you measure your overall Boiler Efficiency - [(heat absorbed to create steam) / (energy input from fuel)]?	at least quarterly	10	**10**
		at least yearly	5	
		less than yearly	0	

Slide 70: We also measure flue gas temperature on each boiler, so we get a total of 5 points for BE2.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
BE2	Do you measure the following parameters as a function of boiler load and ambient temperature?			
	Flue gas temperature	yes	5	5
	Flue gas Oxygen content	yes	5	
	Flue gas CO content	yes	5	
		no to all of above	0	

Slide 71: Periodically, we measure and tune the excess air in the boiler; therefore, we assign a total of 5 points for BE3.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
BE3	How do you control Excess Air in your Boiler to maximize Boiler Efficiency?	automatically	10	
		manually	5	5
		not at all	0	

Slide 74: 'Heat recovery equipment' asks you about what kind of heat recovery equipment you have already installed on your boilers. One of our three boilers is equipped with a feedwater economizer. So what should we do? We don't want to give this a zero, but not award a full 10 points. We can consider 10 points divided by 3 boilers would give us a nominal 3 points for HR1 for the one feedwater economizer. This is a good time to mention that the scores suggested on the Scoping Tool are not fixed and you can use your best judgment to award the points for your specific configuration. You want this tool to help you identify areas of your system that can be improved. Low scores, of course, indicate areas that potentially could be improved. The scoping tool results should reflect the fact that potentially additional flue gas energy can be recovered.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
HR1	Do you have any of the following Heat Recovery Equipment installed on your Boilers?			
	Feedwater Economizer and/or Combustion Air Preheater	yes	10	
	Blowdown Heat Recovery	yes	5	3
		no to all of above	0	

Slide 76: ' Generating dry steam' asks how often you check the quality of steam that is output and ensure that it is dry. We generate superheated steam and are not experiencing any carryover type issues; as a result, we award a score of 10 points for DS1.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
DS1	How often do you check the Quality of Steam that is output from your Boiler to the Distribution System, and ensure that you are generating Dry Steam?	at least quarterly	10	10
		at least yearly	5	
		less than yearly	0	

Slide 78: 'General boiler operation' asks you about the blowdown controller, alarm frequency, and steam pressure fluctuations in your boiler. We utilize automatic blowdown control for 5 points on GB1.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
GB1	Do you have an operational automatic blowdown controller on your Boiler?	yes	5	5
		no	0	

Slide 79: We rarely experience a high or low alarm, so we award 10 points for GB2.

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
GB2	What is the frequency of High Level Alarms (possibly indicating boiler undersized) or Low Level Alarms (possibly indicating boiler oversized) for your Boiler?	less than 1/month	10	10
		1-5 per month	5	
		more than 5/month	0	

Slide 80: Our boiler pressure remains stable so we award 5 points for GB3

QUESTION NUMBER	QUESTION	ACTION	SCORE	YOUR SCORE
GB3	How often do you experience steam pressure fluctuations of greater than 10% of your Boiler Operating Pressure?	less than 1/month	5	5
		1-5 per month	3	
		more than 5/month	0	

Slide 82: The next section, '6, Steam Distribution, End Use, Recovery Operating Practices' will ask questions concerning your methods to reduce steam pressure, and recover and utilize condensate and flash steam.

Begin Tab 6 – Steam Distribution, End Use, Recovery, Operating Practices

STEAM SYSTEM SCOPING TOOL, Version 1.0d 6/12/2002

STEAM DISTRIBUTION, END USE, RECOVERY - OPERATING PRACTICES

OPTIONS FOR REDUCING STEAM PRESSURE - MINIMIZE STEAM FLOW THROUGH PRVs

What To Do Investigate potential to use backpressure turbines in parallel with pressure reducing valves in your steam system.

Why Important In many steam systems, pressure reducing valves (PRVs) are used to provide steam at pressures lower than generated from the boiler. A potential opportunity for improving a steam system is to minimize the flow of steam through PRVs. One opportunity for doing this is to install backpressure turbines in parallel with PRVs in your steam system; in this way you can provide the low-pressure steam required and generate electricity or shaft power that can be utilized. A detailed economic analysis must be performed to evaluate this type of opportunity.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
PR1	How do you reduce steam pressure in your steam system?	steam generated at required pressure, or PRVs appropriately applied	10	
		backpressure turbines used in parallel with PRVs	10	
		boiler control used to reduce pressure	5	
		excess steam vented and/or used inefficiently	0	

RECOVER AND UTILIZE AVAILABLE CONDENSATE

What To Do Determine how much of your available condensate you recover and utilize.

Why Important Returning a substantial portion of your condensate to your boiler can have both energy and chemical treatment benefits: a) condensate is hotter than makeup water, so less energy is required to convert condensate to steam; and b) condensate requires significantly less chemical treatment than makeup water, so there may be savings in chemical treatment costs associated with returning condensate. Returning as much condensate as possible also can help to reduce boiler blowdown (because fewer impurities are resident in condensate), and so minimize blowdown energy losses.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
CR1	How much of your available Condensate do you recover and utilize?	greater than 80%	10	
		40% to 80%	6	
		20% to 40%	3	
		less than 20%	0	

USE HIGH-PRESSURE CONDENSATE TO MAKE LOW-PRESSURE STEAM

What To Do Investigate opportunity to utilize high-pressure condensate to produce useable low-pressure steam.

Why Important An opportunity for utilizing high-pressure condensate is to allow it to pass through a flash tank and utilize the flash steam in low-pressure steam applications. The remainder of the condensate, now at lower pressure and temperature, can then be sent back to the boiler for use in producing steam.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
FS1	How much of your available Flash Steam do you recover and utilize?	greater than 80%, or flash steam unavailable	10	
		40% to 80%	6	
		20% to 40%	3	
		less than 20%	0	

Slide 82 - continued: We generate steam at 400 psig for high pressure applications and primarily utilize steam turbines to achieve other useable pressures. However, we operate with additional steam turbine capacity and some steam flow through pressure reducing stations. Therefore we will award 7 points for PR1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
PR1	How do you reduce steam pressure in your steam system?	steam generated at required pressure, or PRVs appropriately applied	10	
		backpressure turbines used in parallel with PRVs	10	7
		boiler control used to reduce pressure	5	
		excess steam vented and/or used inefficiently	0	

Slide 83: Once again, you can see flexibility when awarding a score. We use both steam turbines and PRVs to reduce the pressure. We have additional steam turbine capacity that could be used to manage low-pressure steam supply. The score of 7 helps capture this configuration.

Slide 84: We recover about 50 percent of the condensate for a score of 6 points for CR1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
CR1	How much of your available Condensate do you recover and utilize?	greater than 80%	10	
		40% to 80%	6	6
		20% to 40%	3	
		less than 20%	0	

Slide 85: We recover about 50 percent of our flash steam, so we score 6 points for FS1.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
FS1	How much of your available Flash Steam do you recover and utilize?	greater than 80%, or flash steam unavailable	10	
		40% to 80%	6	6
		20% to 40%	3	
		less than 20%	0	

Begin Tab 7 – Summary Results

Slide 88: The 'Summary Results' section, '7.,' shows your total section score out of a possible maximum BestPractices score for each section of the scoping tool. Again, the more you measure, monitor, trend and benchmark, the higher your score. Your score is reported for each question, then summarized by area, from the profiling and operating practices sections. From the comparison, you can see which area or areas could be improved upon. Enter the date you completed this SSST so it can be compared to future evaluations of the system.

SUMMARY RESULTS

1. STEAM SYSTEM PROFILING	POSSIBLE SCORE	YOUR SCORE
STEAM COSTS		
SC1: Measure Fuel Cost To Generate Steam	10	10
SC2: Trend Fuel Cost To Generate Steam	10	5
STEAM/PRODUCT BENCHMARKS		
BM1: Measure Steam/Product Benchmarks	10	10
BM2: Trend Steam/Product Benchmarks	10	5
STEAM SYSTEM MEASUREMENTS		
MS1: Measure/Record Steam System Critical Energy Parameters	30	20
MS2: Intensity Of Measuring Steam Flows	20	10
STEAM SYSTEM PROFILING SCORE	90	60

2. STEAM SYSTEM OPERATING PRACTICES	POSSIBLE SCORE	YOUR SCORE
STEAM TRAP MAINTENANCE		
ST1: Steam Trap Maintenance Practices	40	30
WATER TREATMENT PROGRAM		
WT1: Water Treatment - Ensuring Function	10	10
WT2: Cleaning Boiler Fireside/Waterside Deposits	10	10
WT3: Measuring Boiler TDS, Top/Bottom Blowdown Rates	10	10
SYSTEM INSULATION		
IN1: Insulation - Boiler Plant	10	7
IN2: Insulation - Distribution/End Use/Recovery	20	5
STEAM LEAKS		
LK1: Steam Leaks - Severity	10	3
WATER HAMMER		
WH1: Water Hammer - How Often	10	10
MAINTAINING EFFECTIVE STEAM SYSTEM OPERATIONS		
MN1: Inspecting Important Steam Plant Equipment	20	15
STEAM SYSTEM OPERATING PRACTICES SCORE	140	100

3. BOILER PLANT OPERATING PRACTICES	POSSIBLE SCORE	YOUR SCORE
BOILER EFFICIENCY		
BE1: Measuring Boiler Efficiency - How Often	10	10
BE2: Flue Gas Temperature, O2, CO Measurement	15	5
BE3: Controlling Boiler Excess Air	10	5
HEAT RECOVERY EQUIPMENT		
HR1: Boiler Heat Recovery Equipment	15	3
GENERATING DRY STEAM		
DS1: Checking Boiler Steam Quality	10	10
GENERAL BOILER OPERATION		
GB1: Automatic Boiler Blowdown Control	5	5
GB2: Frequency Of Boiler High/Low Level Alarms	10	10
GB3: Frequency Of Boiler Steam Pressure Fluctuations	5	5
BOILER PLANT OPERATING PRACTICES SCORE	80	53

SUMMARY RESULTS (page 2)

3. STEAM DISTRIBUTION, END USE, RECOVERY OPERATING PRACTICES	POSSIBLE SCORE	YOUR SCORE
MINIMIZE STEAM FLOW THROUGH PRVs		
PR1: Options For Reducing Steam Pressure	10	7
RECOVER AND UTILIZE AVAILABLE CONDENSATE		
CR1: Recovering And Utilizing Available Condensate	10	6
USE HIGH-PRESSURE CONDENSATE TO MAKE LOW-PRESSURE STEAM		
FS1: Recovering And Utilizing Available Flash Steam	10	6
DISTRIBUTION, END USE, RECOVERY OP. PRACTICES SCORE	30	19

SCOPING TOOL RESULTS	POSSIBLE SCORE	YOUR SCORE
STEAM SYSTEM PROFILING	90	60
STEAM SYSTEM OPERATING PRACTICES	140	100
BOILER PLANT OPERATING PRACTICES	80	53
DISTRIBUTION, END USE, RECOVERY OP. PRACTICES	30	19
TOTAL SCOPING TOOL QUESTIONAIRE SCORE	340	232
TOTAL SCOPING TOOL QUESTIONAIRE SCORE (%)		68.2%
Date That You Completed This Questionnaire		3/04/09

Slide 92: Here is an example of using the results. Overall, the steam system scored 232 points, or 68 percent of the possible score, which leaves room for improvement. To determine where to start looking, you can divide "Your Score" by the "Possible Score" to calculate the percentage for each section. Let's begin by looking at the lowest score, Distribution, End Use, Recovery Operations from Section 6.

Your results are:

67% for Steam System Profiling

71% for Steam System Operating Practices

66% for Boiler Plant Operating Practices

63% for Distribution, End Use, Recovery Operation Practices

We have room for improvement in all areas.

Slide 95: Where did you score less than the maximum score for a question? You utilize a combination of turbines and PRV, but perhaps additional turbine capacity could be incorporated to minimize the steam flow through pressure reducing valves.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
PR1	How do you reduce steam pressure in your steam system?	steam generated at required pressure, or PRVs appropriately applied	10	
		backpressure turbines used in parallel with PRVs	10	7
		boiler control used to reduce pressure	5	
		excess steam vented and/or used inefficiently	0	

-Additional turbine capacity for improvement!-

Slide 97: You could attempt to recover the remaining condensate and/or utilize more flash steam recovery for 8 more points for CR1 and FS1, respectively.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
CR1	How much of your available Condensate do you recover and utilize?	greater than 80%	10	
		40% to 80%	6	6
		20% to 40%	3	
		less than 20%	0	

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
FS1	How much of your available Flash Steam do you recover and utilize?	greater than 80%, or flash	10	
		40% to 80%	6	6
		20% to 40%	3	
		less than 20%	0	

Slide 98: Section 5, the Boiler Plant Operating Practices also has room for improvement at 66 percent.

Your results are:

67% for Steam System Profiling

71% for Steam System Operating Practices

66% for Boiler Plant Operating Practices

63% for Distribution, End Use, Recovery Operation Practices

We have room for improvement in all areas.

SCOPING TOOL RESULTS	POSSIBLE SCORE	YOUR SCORE
STEAM SYSTEM PROFILING	90	60
STEAM SYSTEM OPERATING PRACTICES	140	100
BOILER PLANT OPERATING PRACTICES	80	53
DISTRIBUTION, END USE, RECOVERY OP. PRACTICES	30	19
TOTAL SCOPING TOOL QUESTIONAIRE SCORE	340	232
TOTAL SCOPING TOOL QUESTIONAIRE SCORE (%)		68.2%
Date That You Completed This Questionnaire		3/04/09

Slide 101: You could monitor the flue gas oxygen and carbon monoxide content for 10 more points on question BE2 (rows 15-19).

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
BE2	Do you measure the following parameters as a function of boiler load and ambient temperature?			
	Flue gas temperature	yes	5	5
	Flue gas Oxygen content	yes	5	
	Flue gas CO content	yes	5	
		no to all of above	0	

-10 More Points!-

Slide 103: The lowest score is 3 of 10 for the heat recovery equipment HR1. (rows 30-33). In this case we only have one feedwater economizer. We could consider adding feedwater economizers to the other two boilers. This section also identifies that blowdown heat recovery could be added to the boilers. A possible 12 extra points is available in this question.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
HR1	Do you have any of the following Heat Recovery Equipment installed on your Boilers?			
	Feedwater Economizer and/or Combustion Air Preheater	yes	10	
	Blowdown Heat Recovery	yes	5	3
		no to all of above	0	

-Add Feedwater for More Points! -

These two sections can utilize the Steam System Assessment Tool, also known as the Assessment Tool, or SSAT, to help evaluate these potential projects to improve the scores as well as other areas. The Assessment Tool will be discussed in a subsequent module of this Introductory Training.

- Steam System Assessment Tool (SSAT)
-Evaluate Projects
-Improve Scores -

Slide 104: To look at one more area, return to Section 4 Steam System Operating Practices which scored 71 percent.

Slide 105: While this is the best of score for the sections the score indicates there is potential for improvement here as well. Beginning at question ST1 (rows 11-16), what things could you be managing better?

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
ST1	Does Your System Steam Trap Maintenance Program Include The Following Activities?			
	Proper Trap Selection For	yes	10	10
	At Least Annual Testing Of All	yes	10	10
	Maintaining A Steam Trap	yes	10	10
	Repairing/Replacing Defective	yes	10	
		none of the above	0	

-Repair/Replace Defective Traps for extra 10 points! -

Slide 107: Additional work on the System Insulation , questions IN1 and IN2 at rows 45 through 51, could have added up to 18 more points.

QUESTION NUMBER	QUESTION	ACTIONS	SCORE	YOUR SCORE
IN1	Is your Boiler Plant equipment and piping system insulation (refractory, piping, valves, flanges, vessels, etc.) maintained and in good condition?	insulation excellent	10	
		insulation good, but can be improved	7	7
		insulation inadequate	0	
IN2	Is your Steam Distribution, End Use, and Condensate Recovery equipment insulation (piping, valves, flanges, heat exchangers, etc.) maintained and in good condition?	insulation excellent	20	
		insulation good, but can be improved	14	5
		insulation inadequate	0	

The 3EPlus Insulation Thickness Computer Program, also called the Insulation Tool, or 3EPlus can be used to help evaluate the energy and cost savings from various insulation projects, as well as the cost to implement those projects. This software tool will be discussed in a subsequent module of this Introductory Training.

- 3EPlus Insulation Tool (SSAT)
- Cost savings of projects
-Cost to Implement those projects -

Slide 110: The last section, 8, 'Next Steps', provides you with some resources to help you improve your steam system. It gives you links to downloads for a guide, a sourcebook, and the other 2 Steam tools that we will discuss later in this training.

Begin Tab 8 – Next Steps

STEAM SCOPING TOOL, Version 1.0d **6/12/2002**

NEXT STEPS - Additional DOE BestPractices Steam Resources

WHAT'S YOUR NEXT STEP? Your steam system self-assessment using this Tool may have identified some potential steam system improvement projects. BestPractices Steam has developed additional tools and resources to help you to go the next step in improving your steam system. These tools are identified below.

START AT THE BESTPRACTICES WEB SITE! This web site includes links to all of the major tools and publications developed by BestPractices Steam. The web site address is **http://www1.eere.energy.gov/industry/bestpractices/about_bestpractices.html**.

STEAM SYSTEM SURVEY GUIDE: This guide is a reference document developed for plant energy managers and steam system operations personnel. It provides a technical basis for identifying and assessing many potential steam system improvement opportunities. It is complementary to the Steam System Scoping Tool, and provides quantitative descriptions of how to quantify major steam system improvement opportunities. It is available from the BestPractices web site.

STEAM TIP SHEETS. BestPractices Steam has developed 26 energy tip sheets that provide concise descriptions of common steam system improvement opportunities. The tips are available for download from the BestPractices web site. The topics for these tip sheets are listed below, by major topic groups:

STEAM SYSTEM PROFILING

- ***Benchmark the Fuel Costs of Steam Generation***

STEAM SYSTEM OPERATING PRACTICES

- ***Inspect and Repair Steam Traps***
- ***Insulate Steam Distribution and Condensate Return Lines***
- ***Install Removable Insulation on Uninsulated Valves and Fittings***

BOILER PLANT OPERATING PRACTICES

- ***Improve Your Boiler's Combustion Efficiency***
- ***Use Feedwater Economizers for Waste Heat Recovery***
- ***Clean Boiler Waterside Heat Transfer Surfaces***
- ***Minimize Boiler Blowdown***
- ***Recover Heat from Boiler Blowdown***
- ***Minimize Boiler Short Cycling Losses***
- ***Deaerators in Industrial Steam***

DISTRIBUTION, END USE, RECOVERY OPERATING PRACTICES

- ***Replace Pressure-Reducing Valves with Backpressure Turbogenerators***
- ***Consider Steam Turbine Drives for Rotating Equipment***
- ***Return Condensate to the Boiler***
- ***Flash High-Pressure Condensate to Regenerate Low-Pressure Steam***
- ***Use a Vent Condenser to Recover Flash Steam Energy Use Low Grade Waste Steam to Power Absorption Chillers***
- ***Use Vapor Recompression to Recover Low-Pressure Waste Steam***
- ***Cover Heated, Open Vessels***

NEXT STEPS - Additional DOE BestPractices Steam Resources (cont.)

IMPROVING STEAM SYSTEM PERFORMANCE: A Sourcebook for Industry. BestPractices Steam has developed a Sourcebook that is designed to provide steam system users with a reference that describes basic industrial steam system components, outlines opportunities for energy and performance improvements, and provides a comprehensive list of steam system contacts, resources, tools, software, videos, and training courses and technical services. This Sourcebook should be available on the BestPractices web site in June 2002.

3E-PLUS INSULATION APPRAISAL SOFTWARE. 3E-Plus was developed by the North American Insulation Manufacturer's Association (NAIMA) to increase awareness among steam system operations and management personnel of the benefits of insulation, and to allow these personnel to assess insulation improvement opportunities. The present version of 3E-Plus can be downloaded from the BestPractices web site.

STEAMING AHEAD WEB SITE. The Alliance to Save Energy "Steaming Ahead" web site publicizes the activities and information products developed by the DOE BestPractices Steam effort. This web site is also the source for a "Steaming Ahead" bi-monthly e-mail newsletter. This newsletter promotes best-in-class practices and technology applications in steam system design and management. The "Steam Digest" - a yearly compilation of articles and papers on steam efficiency measures - is also available from the Steaming Ahead web site. The web site address is **www.steamingahead.org**.

Slide 112: **I**t also provides you with links to download energy tip sheets, with concise descriptions of common projects that can be implemented to improve your steam system."

"Look under Steam Tip Sheets for the Steam System Operating Practices rows 15-18 and you can see two tip sheets for "Insulate Steam Distribution and Condensate Return Lines" and "Install Removable Insulation on Uninsulated Valves and Fittings' may help improve your score for the distribution piping insulation, include valves and fittings. Your example score was 5 for questions IN2, so opportunities may exist. Review the other resources listed and visit the BestPractices website for more publications to improve your score, as well as additional tools to help estimate savings potentials. "

http://www1.eere.energy.gov/industry/bestpractices/index.html

http://www1.eere.energy.gov/industry/bestpractices/publications.asp

http://www1.eere.energy.gov/industry/bestpractices/techpubs_steam.html

http://www1.eere.energy.gov/industry/bestpractices/software.html#ssat

When you are finished, you can save your information as an Excel file. Go to 'File',

Slide 114: 'Save as,'

Slide 116: choose a name for your file, then click 'save.'

Slide 118: Your filename will be whatever you chose, followed by 'dot XLS'.

Slide 119: You can also print out individual sections. Just navigate to (or group) whatever section(s) you want to print out, go to the file menu,

Slide 121: click print,

Slide 123: select 'active sheet or sheets, and click 'OK'.

Slide 125: You can also print the entire workbook by selecting ……

Slide 126: 'entire workbook' then clicking 'OK'.

Slide 129: The Steam System Scoping Tool can be considered a score card for your steam system performance. The scoping tool is a good first order look at your steam system, utilizing a minimum amount of information without the need for actual data collection, to determine where to begin looking for areas of improvement, so you can develop a potential project list.

Slide 130: By knowing where areas of improvement are, we can use the other tools to determine the impact of making changes to our system in order to select the best projects, or combination of projects, to consider for implementation. Insulation improvements are best evaluated with the 3E Plus Insulation Thickness Program. Steam System improvements are best evaluated with the Steam System Assessment Tool. Both of these tools can be used to make estimates of energy and cost savings.

Slide 131: To begin a further look into potential projects for feasibility, let's look at the Steam System Assessment Tool, or simply the Assessment Tool, or its acronym, SSAT. The Assessment Tool can help you further your investigation by modeling your system with site-specific details and then looking at selected projects for their impact on system efficiency, energy savings and cost savings.