4.3.2 Steam systems

Steam is a widely used heat transport medium because of its non-toxic nature, stability, low cost and high heat capacity, and flexibility in use. Steam utilisation efficiency is frequently neglected, as it is as not as easily measured as the thermal efficiency of a boiler. It may be determined using tools such as those in BAT 5 in conjunction with appropriate monitoring (see Section 2.10).

18. BAT for steam systems is to optimise the energy efficiency by using techniques such as:

- those specific to sectors given in vertical BREFs
- those given in Table 4.2

Techniques for sectors and associated activities where steam systems are not covered by a vertical BREF		
Techniques in the ENE BREF		
	Benefits	***Section in this document***
DESIGN		
Energy efficient design and installation of steam distribution pipework	Optimises energy savings	2.3
Throttling devices and the use of backpressure turbines: utilise backpressure turbines instead of PRVs	Provides a more efficient method of reducing steam pressure for low pressure services. Applicable when size and economics justify the use of a turbine	
OPERATING AND CONTROL		
Improve operating procedures and boiler controls	Optimises energy savings	3.2.4
Use sequential boiler controls (apply only to sites with more than one boiler)	Optimises energy savings	3.2.4
Install flue-gas isolation dampers (applicable only to sites with more than one boiler)	Optimises energy savings	3.2.4
GENERATION		
Preheat feed-water by using: • waste heat, e.g. from a process • economisers using combustion air • deaerated feed-water t o heat condensate • condensing the steam used for stripping and heating the feed water to the deaerator via a heat exchanger	Recovers available heat from exhaust gases and transfers it back into the system by preheating feed-water	3.2.5 3.1.1
Prevention and removal of scale deposits on heat transfer surfaces. (Clean boiler heat transfer surfaces)	Promotes effective heat transfer from the combustion gases to the steam	3.2.6
Minimise boiler blowdown by improving water treatment. Install automatic total dissolved solids control	Reduces the amount of total dissolved solids in the boiler water, which allows less blowdown and therefore less energy loss	3.2.7
Add/restore boiler refractory	Reduces heat loss from the boiler and restores boiler efficiency	3.1.7 2.9
Optimise deaerator ventrate	Minimises avoidable loss of steam	3.2.8
Minimise boiler short cycling losses	Optimises energy savings	3.2.9
Carrying out boiler maintenance		2.9
DISTRIBUTION		
Optimise steam distribution systems (especially to cover the issues below)		2.9 and 3.2.10
Isolate steam from unused lines	Minimises avoidable loss of steam and reduces energy loss from piping and equipment surfaces	3.2.10
Insulation on steam pipes and condensate return pipes. (Ensure that steam system piping, valves, fittings and vessels are well insulated)	Reduces energy loss from piping and equipment surfaces	3.2.11 and 3.2.11.1
Implement a control and repair programme for steam traps	Reduces passage of live steam into the condensate system and promotes efficient operation of end-use heat transfer equipment. Minimises avoidable loss of steam	3.2.12
RECOVERY		

Techniques for sectors and associated activities where steam systems are not covered by a vertical BREF				
Collect and return condensate to the boiler for re-use. (Optimise condensate recovery)	Recovers the thermal energy in the condensate and reduces the amount of makeup water added to the system, saving energy and chemicals treatment			3.2.13
Re-use of flash-steam. (Use high pressure condensate to make low pressure steam)	Exploits the available energy in the returning condensate			3.2.14
Recover energy from boiler blowdown	Transfers the available energy in a blowdown stream back into the system, thereby reducing energy loss			3.2.15
Techniques in the LCP BREF July 2006 by fuel type and by section				
	Coal and lignite	***Biomass and peat***	***Liquid fuels***	***Gaseous fuels***
Expansion turbine to recover the energy content of pressurised gases				7.4.1 and 7.5.1
Change turbine blades	4.4.3	5.4.4	6.4.2	
Use advanced materials to reach high steam parameters	4.4.3		6.4.2	7.4.2
Supercritical steam parameters	4.4.3, 4.5.5		6.4.2	7.1.4
Double reheat	4.4.3, 4.5.5		6.4.2, 6.5.3.1	7.1.4, 7.4.2, 7.5.2
Regenerative feed-water	4.2.3, 4.4.3	5.4.4	6.4.2	7.4.2
Use of heat content of the flue-gas for district heating	4.4.3			
Heat accumulation			6.4.2	7.4.2
Advanced computerised control of the gas turbine and subsequent recovery boilers				7.4.2

Table 4.2: Steam system techniques to improve energy efficiency