

Conclusions on BAT from the Industrial Cooling Systems (ICS) BAT Reference Document

READ ME:

The *Industrial Cooling Systems (ICS) BAT Reference Document* December 2001, is a horizontal BREF which addresses ICS techniques across a range of industries.

In this case, you are required to identify the Conclusions on BAT, set out in Chapter 4 of this BREF relevant to your installation. Please use the '**Scope**' box to describe the relevant activities/processes that come within the scope of this BREF and clearly identify the Conclusions on BAT (sections and subsections) that are '**Not Applicable**'.

For each applicable BAT, in the following table, state the status; '**Yes**' or '**Will be**' as appropriate in the '**State whether it is in place or state schedule for implementation**' box. The use of each of these terms is described below.

Information on compliance in the '**Applicability Assessment**' box should include, where applicable, the following:

- (i) Identification of the relevant process/ activity or individual emission points that the BAT requirement applies to at your installation;
- (ii) Where BAT is to use one or a combination of listed techniques, specify the technique(s) implemented/proposed at your installation to achieve the BAT; and
- (iii) A comment on how the requirements are being met or will be met, e.g., a description of the technology/operational controls/management proposed to meet the requirements.

Use of terms:

- (a) '**Yes**' – To be entered where the installation is currently compliant with this BAT requirement.
- (b) '**Will be**' – To be entered where a further technique is required to be installed to achieve compliance with the BAT requirement. In this case you must also specify the date by which the installation will comply with the BAT Conclusion requirement.

Conclusions on BAT from the ICS BAT Reference Document (extracts)

The full and complete ICS BAT reference document (December 2001) is available at the EIPPC Bureau website: <http://eippcb.jrc.ec.europa.eu/reference/>. You may need to refer to this document in completing the form below.

SCOPE

Identify here the particular processes and activities at the installation that come within the scope of the conclusions on BAT from the ICS reference document (BREF).

Conclusions on BAT	Applicability Assessment (describe how the technique applies or not to your installation)	State whether it is in place or state schedule for implementation
Integrated Heat Management:		
<p>BAT 1.</p> <p>BAT for all installations is an integrated approach to reduce the environmental impact of industrial cooling systems maintaining the balance between both the direct and indirect impacts. In other words, the effect of an emission reduction has to be balanced against the potential change in the overall energy efficiency. There is currently no minimum ratio in terms of the environmental benefits and the possible loss in overall energy efficiency that can be used as a benchmark to arrive at techniques that can be considered BAT. Nevertheless, this concept can be used to compare alternatives (Chapter 3.2 and Annex II).</p>		
<p>BAT 2.</p> <p>Reduction of the level of heat discharge by optimization of internal/external heat reuse. In a greenfield situation, assessment of the required heat capacity can only be BAT if it is the outcome of maximum use of the internal and external available and applicable options for reuse of excess heat.</p>		

<p>In an existing installation, optimizing internal and external reuse and reducing the amount and level of heat to be discharged must also precede any change to the potential capacity of the applied cooling system. Increasing the efficiency of an existing cooling system by improving systems operation must be evaluated against an increase of efficiency by technological measures through retrofit or technological change. In general and for large existing cooling systems, the improvement of the systems operation is considered to be more cost effective than the application of new or improved technology and can therefore be regarded as BAT.</p>		
<p>BAT 3. Cooling system and process requirements:</p> <ul style="list-style-type: none"> a) A change in cooling technology to reduce the environmental impact can only be considered BAT if the efficiency of cooling is maintained at the same level or, even better, at an increased level. See table 4.1' <i>Examples of process requirements and BAT</i>'. b) Hazardous process substances, which involve a high environmental risk to the aquatic environment in case of leakage, should be cooled by means of indirect cooling systems to prevent an uncontrollable situation. c) A change in cooling technology to reduce the environmental impact can only be considered BAT if the efficiency of cooling is maintained at the same level or, even better, at an increased level. 		
<p>BAT 4. Cooling system and site requirements:</p> <p>For temperature-sensitive processes it is BAT to select the site with the required availability of cooling water. See table 4.2 <i>Examples of site characteristics and BAT</i>.</p> <p>Groundwater - it can be BAT to apply a dry cooling system to minimise GW use.</p>		
<p>Application of BAT in industrial cooling systems:</p>		
<p>BAT 5.</p> <p>For new cooling installations it is BAT to start identifying reduction measures in the design phase, applying equipment with low energy requiring requirement and by choosing the appropriate material for equipment in contact with the process substance and/or the cooling water.</p>		

<p>BAT 6. For existing installations, technological measures can be BAT under certain circumstances. Generally, a change in technology is cost-intensive where overall efficiency must be maintained. Cost evaluation should then compare investment costs of the change versus the change in operational costs and validate the reduction effect versus other environmental consequences. For existing wet cooling systems where focus is largely on measures to reduce water use and emissions of chemicals to surface water BAT is operational rather than technological.</p>		
Reduction of energy consumption		
<p>BAT 7. It is BAT in the design phase of a cooling system:</p> <ul style="list-style-type: none"> • To reduce resistance to water and airflow • To apply high efficiency/low energy equipment • To reduce the amount of energy demanding equipment (Annex XI.8.1) • To apply optimised cooling water treatment in once-through systems and wet cooling towers to keep surfaces clean and avoid scaling, fouling and corrosion. 		
<p>BAT 8. In terms of the overall energy efficiency of an installation, the use of a once-through systems is BAT, in particular for processes requiring large cooling capacities (e.g. > 10 MWth). Table 4.3 <i>BAT for increasing overall energy efficiency</i>.</p>		
Reduction of water requirements		
<p>BAT 9.</p> <p>For new systems the following statements can be made:</p> <ul style="list-style-type: none"> • cooling with water is most efficient with respect to overall energy balance; • For new installations a site should be selected for availability of sufficient (surface) water and adequate receiving water in case of large cooling demand; • Cooling demand should be reduced by optimising heat re-use; • Where water is limited a technology should be chosen that enables different modes of 		

<p>operation requiring less water for required cooling capacity;</p> <ul style="list-style-type: none"> • In all cases recirculated cooling in an option. <p>See table 4.4 <i>BAT for reduction of water requirements.</i></p>		
<p>BAT 10. Reduction of entrainment of organisms.</p> <p>For once through systems or systems with intakes of surface water, BAT is analysis of biotope in surface water source and optimisation of water velocities in intake channels to limit sedimentation.</p>		
<p>BAT 11. Identified reduction techniques within the BAT-approach.</p> <p>Analysis of the biotope in surface water source, Optimise water velocities in intake channels to limit sedimentation; watch for seasonal occurrence of macrofouling. see table 4.5 <i>BAT for reduction of entrainment.</i></p>		
<p>Reduction of emissions to water</p>		
<p>BAT 12. General BAT approach to reduce heat emissions</p> <p>Where the measures generally aim at reducing the ΔT of the discharged cooling water, a few conclusions on BAT can be drawn. Pre-cooling (Annex XII) has been applied for large power plants where the specific situation requires this, e.g. to avoid raised temperature of the intake water. Discharges will have to be limited with reference to the constraints of the requirements of Directive 78/659/EEC for fresh water sources. The criteria are summarised in Table 3.6. Reference is made to a provision in Article 11 of this directive regarding derogation of the requirements in certain circumstances.</p>		
<p>BAT 13. General BAT approach to reduce chemical emissions to water.</p> <p>With respect to the selection of chemicals, it has been concluded that a ranking of treatments and the chemicals of which they are composed is difficult if not impossible to carry out in a</p>		

<p>general way and would be unlikely to lead to BAT conclusions. Due to the large variation in conditions and treatments only a site-by-site assessment will lead to the appropriate solution. Such an assessment and its constituent parts could represent an approach that can be considered BAT.</p>		
<p>BAT 14.</p> <p>80% of environmental impact is decided on design table, measures should be taken in the design of wet cooling system using the following order of approach:</p> <ul style="list-style-type: none"> • Identify process conditions (P, T, corrosiveness); • Identify chemical characteristics of cooling water sources; • select appropriate material for heat exchanger for both process and cooling water characteristics; • select appropriate materials for other parts of the cooling system; • Identify operational requirements of the cooling system; • Select feasible cooling water treatment using less hazardous chemicals or lower potential for environmental impact; • apply biocide selection scheme; • optimise dosage regime by monitoring of cooling water and systems conditions; 		
<p>Identified reduction techniques within the BAT-approach</p>		
<p>BAT 15. Prevention by design & maintenance</p> <p>See table 4.6 BAT for reduction of emissions to water by design and maintenance techniques</p>		
<p>BAT 16. Control by optimised cooling water treatment</p> <p>See table 4.7 BAT for reduction of emissions to water by optimised cooling water treatment</p>		

Reduction of emissions to air		
BAT 17. Identified reduction techniques within the BAT-approach See table 4.8. <i>BAT for reduction of emissions to air</i> Identified reduction techniques within the BAT approach for all wet cooling towers: i) Avoid plume reaching ground level ii) Avoid plume formation iii) Use of less hazardous material iv) Avoid affecting indoor air quality v) Reduction of drift loss		
Reduction of noise emissions		
BAT 18. Identified reduction techniques within the BAT-approach See table 4.9 <i>BAT for reduction of noise emissions</i> Identified reduction techniques within the BAT approach for natural draught cooling towers: i) reduce noise of cascading water at inlet: ii) reduce noise emission around tower base Identified reduction techniques within the BAT approach for mechanical draught cooling towers: iii) reduction of fan noise iv) optimised diffuser design No Standard commercial cooling tower utilised - low noise v) noise reduction		
BAT to reduce the risk of leakage		
BAT 19. Identified reduction techniques within the BAT-approach See table 4.10 <i>BAT to reduce the risk of leakage.</i> The following general measures to reduce the occurrence of leakages can be applied: i) select material for equipment of wet cooling systems according to applied water		

<ul style="list-style-type: none"> ii) quality operate the system according to its design iii) if cooling water treatment is needed, select the right cooling water treatment programme; iv) monitor leakage in cooling water discharge in recirculating wet cooling systems by analysing the blowdown 		
Reduction of biological risk		
BAT 20. Identified reduction techniques within the BAT approach		
<p>See table 4.11 <i>BAT to reduce biological growth</i> Identified reduction techniques within the BAT approach for all wet recirculating cooling systems:</p> <ul style="list-style-type: none"> i) reduce algae formation ii) reduce biological growth iii) cleaning after outbreak iv) control of pathogens <p>Identified reduction techniques within the BAT approach for all open wet cooling towers:</p> <ul style="list-style-type: none"> v) reduce risk of infection 		