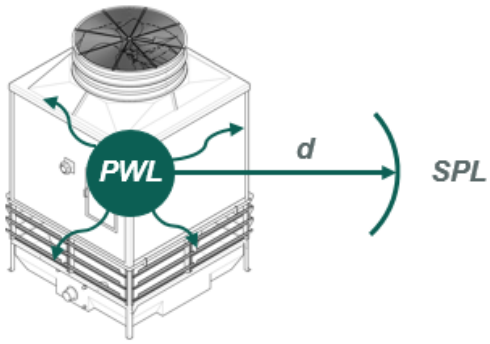
LIMITED NOISE

NOISE EMISSIONS and SILENCING for COOLING TOWERS

Sound power and sound pressure



- Sound power level (PWL) is the energy emitted over a surface enclosing the sound source per unit time.
- Sound pressure level (SPL) is the change in pressure due to the sound wave in a predefined point (usually set as a certain distance *d* from the emitting source)

Both values are expressed in dB (A) decibel on a weighted scale for judging loudness that corresponds to the hearing threshold of the human ear.

Two main Standards for establishing Sound Power and Sound Pressure are:

- ATC 128 from Cooling Tower Institute (applies only to cooling towers).
- ISO 3744 from International Organization for Standardization (applies to all sound emitters).

Results differ from one Standard to the other although both match for SPL at 15m. One should be cautious when comparing results established with different norms.

ISO 3744 is the most widely used given its interoperability with all contexts.

Noise Emitters

There are three noise emitters in cooling towers:

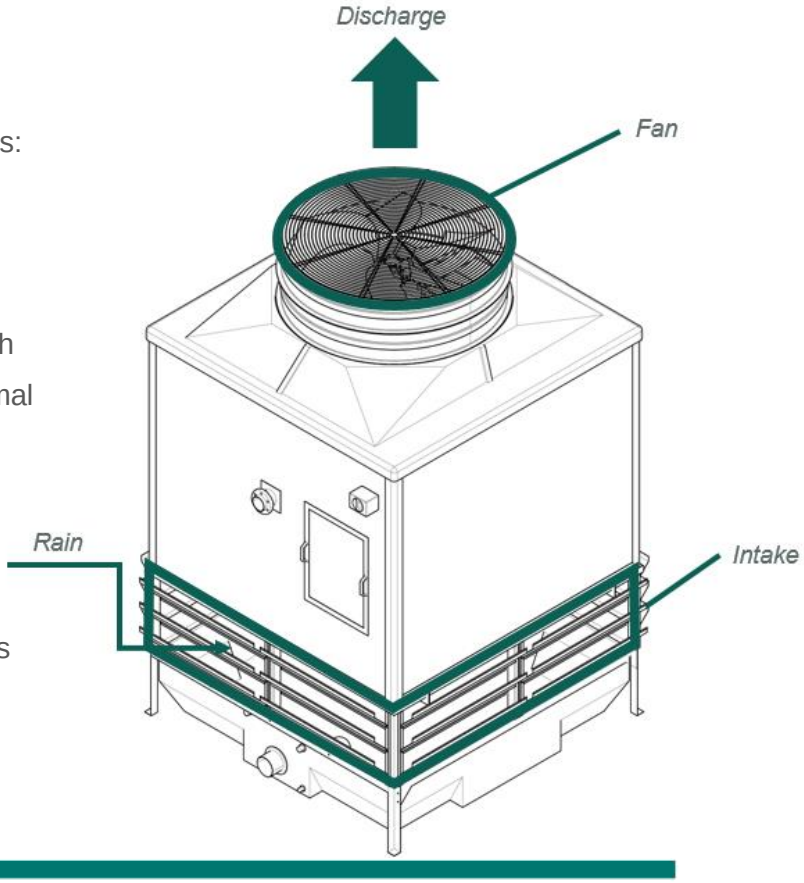
1. Fan
2. Air intake and discharge
3. Rain (Water fall)

In order to find the best overall solution to reach the required noise level one must find the optimal strategy to mitigate noise emitters.

Depending on cooling tower design, sound reduction devices are effective in different manners; this is due to the position of the fan.

We can identify two main cooling tower designs related to fan arrangement:

- Induced draft
- Forced draft



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NOISE EMISSIONS and SILENCING for COOLING TOWERS

Reducing noise in induced draft cooling towers

1. Reducing Fan noise:

Fan noise is mainly due to the blade tip speed. Two measures can be used to reduce it.

- Lower fan RPM
- Use special silent wing designs

Low RPM fan with special wings

2. Reducing air intake and discharge noise

Air intake and discharge creates turbulences and vortexes that contribute to the noise emission. Cone diffusers and inlet silencers help in mitigating this effect

Different diffuser cones

Air inlet silencers

3. Reducing rain noise

Rain noise is due to splash of drops over the water free surface in the basin. Sound emissions can be reduced by lowering the speed of falling water before its impact on the free surface by means of a layer such as sound absorbing mats.

Sound absorbing mats over the basin's free surface

NOISE EMISSIONS and SILENCING for COOLING TOWERS

Reducing noise in forced draft cooling towers

1. Reducing Fan noise

Use of EC low noise fans

2. Reducing air and discharge noise

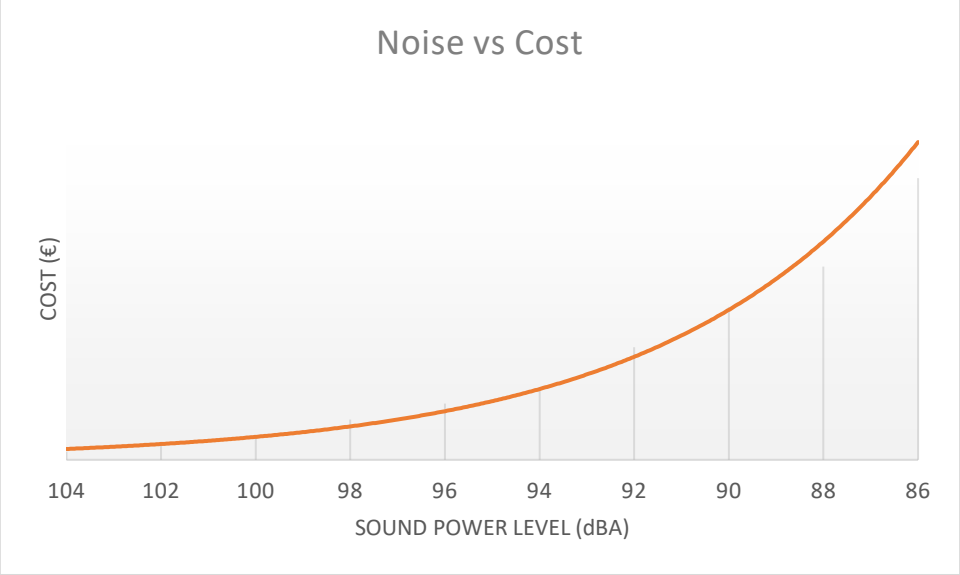
3. Reducing rain noise

The basin area in induced draft designs can be fully enclosed so to cancel completely this emitting source.

NOISE EMISSIONS and SILENCING for COOLING TOWERS

Noise vs Thermal Performance vs Cost

The impact of low noise solutions, on cooling tower design, is twofold.
Up to a certain level, it does not affect performance but only impacts cost due to the measures that must be implemented in order to cope with noise requirements.
As noise emission requirements become stricter, cooling tower performance, for any design whether induced or forces, for a given model or size must be downgraded in order to cope with those strict noise emissions requirements. It then become a compromise between noise and performance with great implication on cost.



Noise vs Cost for a fixed capacity

In some cases, it becomes more cost effective to erect a sound barrier around the unit rather than to silence it.