BALTIMORE AIRCOIL COMPANY
Baltimore Aircoil International nv › Industriepark, Zone A › 2220 Heist-op-den-Berg › Belgium › www.BaltimoreAircoil.eu

Water loss through overflow connections on forced draft cooling towers, condensers and fluid coolers.

Some water-loss through the overflow connection on a **forced draft** cooling tower like a VX or VL unit is completely normal.
It is not possible to obtain a 100% dry overflow connection on these types of units under all operating conditions.
When the fans are started on a forced draft tower an over-pressure is created inside the pan section (due to the resistance of heat exchanging surface and the eliminators and spray system.).
The overflow is a straight connection from this over-pressure chamber to atmosphere (outside of the unit). Hence it can not be avoided that some air will be blown out of the unit through the overflow connection. When the tower is in operation, this air is 100% humid and contains large water droplets. Part of these water droplets will eventually be evacuated through the overflow.
On smaller box size units, where the operating water level is quite close to the overflow level, a stilling chamber is installed in front of the overflow connection, to prevent the pan water being splashed out directly through the overflow. The stilling chamber is reducing the 'waves' inside it and therefore lowering the loss of direct water spilling. The stilling chamber may not be closed air tight to avoid risk of siphon effect. So there are always some holes in this stilling chamber which will create air loss to the outside of the tower and bringing some droplets of water to the overflow.
On larger towers this stilling chamber is not installed since the amount of air lost through the overflow is negligible versus the total air volume displaced by the tower. Furthermore the pan volumes of these towers are much bigger and the overflow is installed further away from the normal water level. Inside of the overflow connection a half circle plate is welded to make sure a large portion of splash water is returned. However, it remains impossible to retain all water droplets transported by the air which is evacuated through the overflow.
Most customers consider this water-loss as an additional consumption of water, especially when the water draining from the overflow is visible on a roof. It is important to put this water loss in perspective.
As a rule of thumb you can say the evaporation loss of this tower is approx 1.8 liter per 4180kJ. So if a unit rejects 1000kW, the water lost by evaporation is approx. 0.43l/s. In normal conditions the bleed rate will be similar to the evaporation loss. This means that bucket of water (10l) is bled each 25 seconds. The amount of water lost through the overflow is only a small fraction of this, so this is not important. The water loss through the overflow during operation can be considered as a constant bleed (this means less water will be bled through the automatic bleed of the water treatment system).
It is important to know that it is not possible to obtain a 100% dry overflow connection. **If there is uncertainty about the amount of water lost through the overflow, it is required to quantify the amount of water lost by the overflow (measure how much time it takes to fill a bucket of water) and to determine the corresponding operating conditions of the tower and calculate the cooling load in KW. BAC can then determine it the situation is normal or not.**

Paul Van den Driessche

Service Manager
Baltimore Aircoil International N.V.
Industriepark-Zone A
B-2220 Heist op den Berg, Belgium.