# 12 Selection of Remote Sump Tank

## 1. For an Open Cooling Tower

Remote sump tanks are used on evaporative cooling systems to provide a means of cold water basin freeze protection during cold weather operation. The remote sump tank is usually located in a heated, indoor space, and may preclude the need to winterize the evaporative cooling equipment. A remote sump tank must provide sufficient storage volume to accommodate all the water that will drain back to it during cooling system shutdown, including:

- **Cooling tower volume:** the total volume of water contained within the cooling tower during operation
- **System piping volume:** the volume of water contained in all system piping located above the operating water level of the remote sump tank
- **System components volume:** the volume of water contained within any heat exchanger, or other equipment located above the operating water level of the remote sump tank that will drain to the tank when the cooling system is shut down

The maximum volume of water contained within the cooling tower is the volume of water to the overflow level. Besides the water in the cold water basin during operation, this volume will take into consideration water in the distribution system, water in suspension in the wet deck, plus an allowance for the external pulldown from piping and other equipment. This simplified method is a conservative approach as it will not consider any volume reductions based on flow rates. For specific information for your application, contact your local BAC Representative.

*Safety Factor*
When designing a remote sump tank, make sure that your basin has a net available volume that is 5% greater than the total volume required. The net available volume is the volume between the operating level and the overflow level in the remote sump tank. The minimum operating level must be maintained in the remote sump tank to prevent vortexing of air through the tank's suction connection.

*Example*

A VTL-059-H will be installed on a cooling tower/heat exchanger system that will utilize a remote sump tank. The tower side volume contained in the heat exchanger is 95 liters. The system has been designed with 10 meter of DN 100 pipe that will be above the operating level of the remote sump tank. What is the correct remote sump tank volume?

Solution:
From the information on the website the cold water basin volume at overflow for the VTL-059-H is 555 liters.
From the information on the website, the DN 100 pipe will contain 8,2 liters of water per linear meter pipe. The total volume contained in the DN 100 pipe is 82 liters. The tower side volume of the heat exchanger is 95 liters.

The total volume required is:

Cooling Tower Volume at Overflow (555 liters)
+ System Piping Volume (82 liters)
+ System Components Volume (95 liters)
= Total Volume 732 liters

732 liters x 1,05 (safety factor) = 770 liters required.

From the above calculation the minimum volume of the remote sump tank must be 770 liters.

## 2. For a Closed Circuit Cooling Tower or Evaporative Condenser

*Note: This section provides instruction in the selection of a remote sump tank for a closed circuit cooling tower or evaporative condenser only.*

Remote sump tanks are used on evaporative cooling systems to provide a means of cold water basin freeze protection during cold weather operation. When the recirculating pump of a closed circuit cooling tower or evaporative condenser is not operating, all of the recirculating water drains by gravity to the remote sump. The remote sump tank is usually located in a heated, indoor space, and may preclude the need to winterize the cold water basin.

The remote sump must be sized to accommodate the suction head for the pump plus a surge volume to hold all the water that will drain back to the tank when the pump is shut down. This surge volume (also called drain down volume) includes water in the evaporative cooling equipment and water held in the piping between the unit and the remote sump. The volume of water in the evaporative equipment includes the water in suspension (water within the spray distribution system and falling through the heat transfer section) and water in the cold water basin during normal operation. The tables on the website provide the volume of water in suspension plus the water in the cold water basin, labeled as "basin volume at overflow level." The table on the website can be used to calculate the volume of water in the piping between the unit and the remote sump (includes riser and drain piping) for applications where piping is Schedule 40.

To select a remote sump tank for a particular application, determine the total volume (spray water volume plus piping volume) and select a remote sump tank with a net available volume that is 5% greater than required.
HFL hybrid closed circuit cooling towers do not require remote sumps. Due to their small water volume and the unique sump/ plenum design, they can switch from wet to dry operation and vice versa without the need to drain the sump. Electrical sump heaters will protect the sump from freezing at ambient temperatures as low as -25°C, even when the fan(s) is (are) in operation.

*Application Notes*
The standard close-coupled centrifugal pump normally furnished with BAC units is designed and selected specifically for the pump head and flow rate required when the pump is mounted on the unit. **This pump cannot be used for remote sump applications and is therefore omitted.**
The following factors should be considered when selecting remote pumps:

- Total static head from the remote sump tank operating level to the inlet of the evaporative equipment.
- Pipe and valve friction losses.
- For all closed circuit cooling towers and all evaporative condensers, 14 kPa water pressure is required at the inlet of the water distribution system.
- Required spray flow rate as shown in the relevant tables on the website

**A valve should always be installed in the pump discharge line so that the water flow can be adjusted to the proper flow rate and pressure.** Inlet water pressure should be measured with a pressure gauge installed in the water supply riser near the equipment inlet. The valve should be adjusted to permit the specified inlet pressure, which results in the design water flow rate.

Accurate inlet water pressure and flow rate are important for proper evaporative equipment operation. Higher pressure (in excess of 70 kPa) can cause leaks in the spray distribution system. Lower pressure or low flow may cause improper wetting of the coils, which will negatively affect thermal performance, promote scaling, and may also cause excessive drift.

On remote sump applications, the standard float valve(s) and strainer(s) are omitted from the cold water basin and a properly sized outlet connection is added. The remote sump outlet connection is located on the bottom of most units. On smaller counterflow forced draught units, the connection is located on the end or back side of the unit. To clarify the location of the remote sump outlet connection, refer to the appropriate unit print, available from your local BAC Balticare Representative or at www.BaltimoreAircoil.com.

Another effect of using a remote sump is that the operating weight of the evaporative unit is reduced (design changes, the omission of the integral spray pump, and/or changes in cold water basin volume can contribute to this deduct).

*Example*

An FXV-422 will be installed on a system that will also utilize a remote sump tank. The system has been designed with 12 meter of DN 150 mm pipe that will be above the operating level of the remote sump tank. What is the correct volume of the remote sump?

Solution:
From the table on the website, the spray water volume for an FXV-422 is 997 liters.
From the table on the website, the DN 150 mm pipe will contain 18,7 l/s of water per linear meter. The total volume contained in the DN 150 mm pipe is 12 meter x 18,7 liter/meter = 225 liters.

The total volume required is:

Spray Water Volume (997 litres)
+ System Piping Volume (225 litres)
= Total Volume 1222 litres

1222 litres x 1,05 (safety factor): 1283 liters required.

From the above calculation the minimum volume of the remote sump tank must be 1283 litres.