CROWN SOLUTIONS
CUSTOMER NEWSLETTER

Cooling Tower Sidestream Filtration

By Jeff Eldridge, Water Management Specialist

The ramps and taxiways in front of the main hangars in at an Air Force Base were replaced. Approximately 250,000 square feet of concrete was broken into large pieces and crushed to make gravel. The crushed concrete gravel was used for fill and as an ingredient in the concrete poured for the project. The construction project took about four months during the summer of 1985.

Adjacent to the construction project is Building 20489. This facility contains offices and laboratories. The air conditioning for the facility is produced by a 500-ton cooling tower system. The cooling tower is located at ground level next to the building.

Information:

- 500-ton Marley cross flow cooling tower
- Galvanized steel and PVC construction
- Concrete sump, 8' x 12' x 10'
- 2 vertical pumps, 1,500 gpm each, located in the sump, only one runs at a time
- 2 each 500-ton Trane centrifugal chillers
- System volume: 6,500 gallons

The cooling tower operated in an extremely dusty environment all summer. During the operating season, the strainers on the circulating system had to be cleaned multiple times. The mechanics said that the system was dirty, and they had operating problems all season. When the system was drained for winter, the sump was ½ full of sludge. The chillers contained sludge in low flow areas and strainers were partially plugged with sludge.

It took two mechanics two days labor to clean the sludge out of the sump.

What happened to cause this problem? Cooling towers are air washers. As such they remove airborne microorganisms, seeds, dust, and etc. from the air flowing through the cooling tower. The rock crusher for the construction project was located about 50 yards up wind from the tower. The dust from the rock crusher was pulled into the tower and washed out of the air. The dust accumulated and produced the sludge found in the system. Traditional chemical treatment and blowdown could not remove the debris. The concrete sump became the low flow area where the bulk of the debris settled out of the water.

What can be done to improve operations and minimize problems caused by airborne materials? Moving the cooling tower or the construction project was not an option. Other possibilities are:

- Install filter media on the intake louvers of the cooling tower.
- Install a sidestream filter on the circulating cooling tower water.

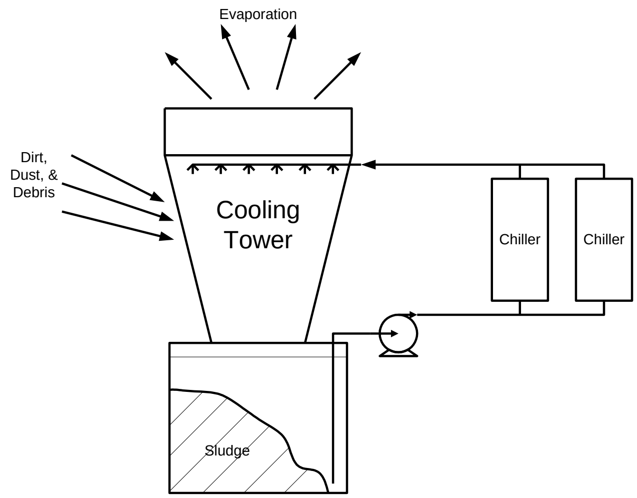

Figure 1: *Cooling tower system with sludge in sump due to dirt, dust, and debris scrubbed from the air.*

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Filter media on the intake louvers would remove the dust before it entered the cooling tower. The media comes in rolls and requires a mounting apparatus. The mechanics would need to replace the filter media periodically. This method has been used but is labor intensive and requires a large quantity of filter media.

A sidestream filter would be an effective device to remove debris from circulating cooling tower water. A bag filter, sand filter or multimedia filter could be installed on the cooling tower system to remove debris and prevent problems associated with suspended solids accumulating in low flow areas of the system. A bag filter would be more labor intensive than a sand filter. For the cooling tower system at Building 20489, a sand filter would be the best choice.

Both a bag filter and sand filter could be used. The decision to choose one over another is based upon site-specific factors:

- space
- manpower availability
- backwash water availability
- initial capital cost
- particle size analysis

Filters are normally sized based on a percentage of the recirculation rate. The general rule would be 5-10% of the recirculation rate. The type of suspended solid and its concentration, as well as the filtration efficiency needed determines the percentage of flow required. The *CROWN Equipment Division* specification for steel multimedia filters lists three grades of water quality. The grades of water quality are Superior, High, and Utility. Each is based upon water flow rates through the filter.

Utilizing recirculation rate the cooling tower system at Building 20489 would need a 75-150 gpm filter. This filter could produce all three grades of water quality depending upon the size (dimensions and cubic feet of media) of the filter.

Filters can also be sized based upon the system volume. The filter is typically sized to turn over the system volume 8 times in a 24-hour period. To determine filter flow rate multiply the system volume by 8 and divide by 1,440 minutes to get the gpm capacity of the filter.

Utilizing system volume, the cooling tower system at Building 20489 would need a 36-gpm filter. This filter would produce all three grades of water quality depending upon the size (dimensions and cubic feet of media) of the filter.

For the cooling tower at Building 20489, the system volume was determined by the salt test. A filter based upon system volume would be smaller and thus have a lower initial capital cost.

The filtered water should be returned to the cooling tower in the areas of lowest flow. Many times the filtered water is piped into a header system that discharges the water around the sump to sweep the debris into the suction of the filter.

Be careful if you choose to install a filter that robs flow from the equipment to be cooled. Many cooling tower systems are undersized and diverting flow could cause problems. If the system is of marginal capacity for flow, you may need a separate pump to supply the filtration equipment.

A multimedia or sand filter would have helped prevent the accumulation of sludge in the cooling tower system at Building 20489.

Crown Solutions Co., LLC
945 South Brown School Road
Vandalia, OH 45377

(937) 890-4075

www.crownsolutions.com