TOWER-FLO®
Water Filter Systems

TECHNICAL BULLETIN

SERIES: TFB

TOPIC: SIZING TO "LARGE" COOLING TOWERS

Whenever we are confronted with a cooling loop volume of 30,000 gallons and larger, we need to examine the one hour turnover standard for filtration against the turnover rate of the cooling water through the tower. This examination must take into account both objective and subjective factors. Our target ratio is for the filtration system to "see" the total volume one time to every 12 to 20 times the tower "sees" the total volume (one-hour turnover on a small tower falls within this ratio the vast majority of the time). Where within that 12 to 20 turnover range we want to be relies most heavily, but not entirely, on evaluation of subjective factors.

To do the objective portion of the evaluation, we must know the total volume and the total recirculation rate. For this example, we will use a volume of 180,000 gallons and a total recirculation rate of 20,800 gpm (four recirculation pumps at 5,200 gpm each). With these numbers, first we calculate the time it takes for the tower to see the total volume:

180,000 gallons ÷ 20,800 gpm = 8.65 minutes for the total volume to pass through the tower

Next, we calculate the acceptable time range for the filter to "see" the total volume:

8.65 min X 12 turns through the tower = 103.8 minutes
8.65 min X 20 turns through the tower = 173 minutes

Then, we calculate the filter flow rate(s) required for the filter to "see" the total volume once for 12 turns through the tower and for 20 turns through the tower:

180,000 gallons ÷ 103.8 min = 1,734 gpm filter flow rate
180,000 gallons ÷ 173 min = 1,040 gpm filter flow rate

Also useful to the objective evaluation (although, somewhat less objective than the above calculations) is to know the surface area of the cooling tower basin and/or any other open reservoirs in the cooling loop. Shallow basins with large surface areas tend to load with solids at a faster rate than deep basins with small surface areas. The smaller the surface area, the more freedom we have to push the turnover ratio out to 1:20. Conversely, the larger the surface area the less freedom we have to push the turnover ratio past the 1:12 range.

The final step of the process, selection of a filter system from within the flow rates just calculated, incorporates entirely subjective elements such as: the relative air quality in the immediate area of the cooling tower; the presence and extent of aggravating factors to air quality , i.e., freeways, adjacent industry, etc.; the extent of seasonal fluctuations in that air quality; the quality of the make up water source; the extent of solids loading from direct contact with production processes, etc. It also must examine the given flow rates available from the different single vessel and multiple vessel filter configurations.

With respect to our example, the closest we can come to 1,040 gpm filter flow rate is 1,005 gpm with a TFB-96 package filter system. It is marginal for our application. It cannot quite deliver the upper limit of our turnover ratio (180,000 ÷ 1,005 = 179.1 minutes ÷ 8.65 min = 20.7 turns through the cooling tower). The smallest filter we can possibly recommend would be a TFB-Component-102 with a flow rate of 1,135 gpm (180,000 ÷ 1,135 = 158.6 minutes ÷ 8.65 = 18.3 turns through the cooling tower). The subjective considerations are what will determine whether this is an appropriate selection or not.

At the other end of the ratio range, the most likely selection would be a TFB-Component-Dual-90 with a flow rate of 1,767 gpm (180,000 ÷ 1,767 = 101.9 minutes ÷ 8.65 = 11.8 turns through the tower). You could have a very high level of confidence that this system would do the job for our example tower.

For additional information about sizing to "large" cooling towers or for filter selection assistance, contact your local Tower-Flo® Representative or the Tower-Flo® Water Filter Systems Division of United Industries, Inc.

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