TOWER-FLO®

Water Filter Systems

REDUCE

Fouling
Energy Costs
Chemical Costs
Maintenance
Downtime
Legionella Risk

IMPROVE

Thermal Capacity

FILTER SIZING

The single most important determinant to the effectiveness of filtration is appropriate sizing. ***Bottom line, a filter must be sized large enough to stay ahead of the rate of dirt gain****.*

Sizing is an art and a science. It is unrealistic to think a simple mathematical formula can be devised which will reliably calculate the ideal filter size for every application. Filter professionals should be relied on to bring art into the equation. The art of defining the filtration objective; of understanding the cooling system's design, operation and their implications on filter sizing and selection; of assessing the aggravating factors in the application environment; and of assessing engineering considerations at the point of installation which may effect filter sizing and selection.

Simple, however, is what it's all about. Tower-Flo insists that filter sizing is an issue of managing a body of water. The volume of condenser water needs to be "turned-over" through a filter system a certain number of times per day in order to stay ahead of dirt loading. Tower-Flo's sizing "formula" is volume ÷ time (in minutes) = target filter flow rate. A reasonable estimate of volume can be calculated (the science), the turn-over rate is subjective (the art).

The ultimate in sizing "formula" simplicity uses a percentage of condenser water recirculation rate; recirc rate x X% = target filter flow rate. The percentages used typically range from 5% to 10%, but we've seen as low as 1% and as high as 25%. While recirculation rate is, arguably, a much easier number to find — often the only information available on plan & spec — it gives absolutely no credence to the host of other factors that influence a successful filter outcome.

The effort to devise a single mathematical "formula" for filter sizing, has resulted in some interesting variations:

- *one "formula" that results in what is refered to as "activity rate"; length of basin X width of basin X a factor for depth ranging from 5.33 to 10.5 (this factor has no unit of measure) = target filter flow rate. This "formula" suggests that filter sizing is simply about managing the square footage of surface area of the cooling tower basin floor.*
- *another diabolically confusing "formula" uses factors such as Design Recirc Rate, Design ΔT, Avg. Summer Load %, Evaporative Heat Loss %, Evaporation GPM, Blowdown or Bleed, Makeup and Filter Efficiency % in a convoluted formula that results in a "Cleanup %" that is somehow transformed to a filter flow rate. Does the word obfuscate mean anything to anyone? (obfuscate v. 1) to make indistinct or dark; 2) to confuse or becloud).*

Sizing starts with a formula for volume and then adds the art of defining the turnover rate which includes considering:

- *Expectations: Think of it this way, when the owner of the filter — you, your client or your customer — goes to the cooling tower, opens the plenum access, sticks their head inside, and looks down, what do they expect to see? C****lean water*** *or a* ***clean basin floor****? These are different objectives and require different sizing approaches. Clean water is volume and time sizing. Clean basin floor is the only time an "activity" rate is applicable.*
- *Cooling system design: How many towers / basins? Will some of the towers be turned off during winter months due to reduced heat load? Is there an indoor condenser water storage tank? These are examples of the design and operating questions that should be addressed, beyond the sizing formula, that effect both filter sizing and selection.*
- *Engineering considerations: Will piping from source to filter compromise pump operation or should the pump be mounted separately? Is a self-priming pump required? Is drain capacity sufficient for backwash or is a backwash surge tank or backwash lockout among multiple units needed? Is an installation style, other than independent sidestream, going to be used and does it present a pressure rating issue? These are examples of the types of engineering questions that should be addressed, beyond the sizing formula, that effect filter sizing and selection.*
- *Aggravating factors in the operating environment include the proximity to parking lots, freeways, construction sites, smokestacks, etc. In process water applications, what is the rate of introduction of process contaminants? Is tower makeup from municipal water supply or from well water, pond water, or river water? These are examples of the types of aggravating environmental factors that should be addressed, beyond the sizing formula, that effect both filter sizing and selection.*

Bottom line, filter sizing is an art and a science which must result in a filter sized large enough to stay ahead of the rate of dirt gain*.*

LESS
suspended solids in cooling water

IS MORE
thermal capacity

FOR LESS
operating cost

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