COOLING TOWER SYSTEMS – Current Best Practice Design

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It is good to see how quickly improved design practices for cooling tower systems have been developed and applied in response to recent public health concerns and regulatory change.

There are a number of new or retrofit cooling tower installations underway in Melbourne that feature the following attributes, most of which could characterised as current good design or current best practice design.

- Selection of induced draught cross flow towers over other design variants as this design is believed to have a lower carry over / drift potential.
- Cooling towers conservatively sized for 22^{o}C WB and even 23^{o}C WB instead of what was the industry de facto standard of 21^{o}C WB in Melbourne. This results in a tower that is more comfortably able to perform its duty with lower average air velocities.

  Anecdotally Cooling Towers often end up effectively undersized under site conditions when compared strictly with the manufacturers specifications. The practice of conservative sizing also means that the tower may be more capable of supporting efforts to lower condenser water temperatures.
- Lower condenser water temperatures. Systems that would have previously been designed to run at 29^{o}C and upwards are now being designed to run at lower and more tightly controlled temperatures for the greater part of the year. More thought is being given to high efficiency cooling tower fan motors and variable speed drives on larger installations where there may be significant cooling tower energy implications associated with running lower condenser water temperatures.
- ABS “plastic” piping systems that eliminate pipework corrosion problems. It is worthwhile noting that this is adding to the cost of systems because of the cost and relatively limited range of ABS fittings.
- Well thought out pipework design that eliminates deadlegs. In some instances this has required the review of a number of “time honoured” pipework fabrication practices.
- Side stream filtration installed on systems that are not in overtly dirty environments to help keep systems free of material that may support bacterial growth. Previously such systems would have been only considered for dusty or “dirty” locations. They can play an effective role in keeping all new systems clean and are especially effective when retrofitting new cooling towers to large old systems that have an existing level of pipework corrosion.

  Some of these filtration systems also feature sparge return to the cooling tower basins to help “sweep” the basin and keep it clean. There a number of “tricks” emerging to ensuring that this works well.
- Tenants Condenser Water Systems designed as “closed “ systems with fluid cooler or cooling tower / heat exchanger arrangements rather than as an “open” systems as may have been the case previously.
- Commissioning adjustment of by-pass lines and other system control features to ensure some degree of constant or regular flow in all parts of the system. It should be noted that this can also result in reductions in system capacity because of the by-pass effect.
- Installation of time controls or BAS programming to cycle cooling towers and cooling tower system components to ensure all sections of the system are “exercised“ regularly and exposed to biocide and biodispersent.
- Automatic dosing equipment for two biocides, especially in CBD and other high risk locations, and where oxidising biocides are used, the installation of monitoring equipment to manage biocide levels and raise alarms if problems occur.
- Safe storage arrangements for chemicals which now generally required in greater volumes. Provision of safety facilities such as eye wash points where hazardous chemicals are used for disinfection and cleaning.
- Labeling of sampling point locations and system water capacities to facilitate effective water testing and treatment regimes.
- Provision of appropriate cabinets for cooling tower maintenance records.
- Location of building exhausts and air intakes away from cooling towers.
- Safe access provisions for maintenance and service, the frequency of which in most cases, have increased significantly, and appropriate signage and security for cooling towers.

Cooling towers will continue to find application in commercial buildings and industry especially where large amounts of relatively “low-grade” heat must be rejected. The physics of cooling tower operation have been well understood for many years. Industry is now learning and coming to terms with the bacterial and public health aspects of the design and operation of cooling towers. As this understanding grows and matures design and operational practices will continue to improve. To hasten this development current good design practice, typically instigated by leading firms and individuals, should be actively communicated and promoted to the wider industry.