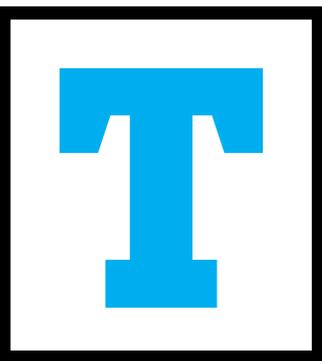




# FM-approved fire-rated cooling towers — a better bet

Arguing that even cooling towers could be prone to fires, Aslan Al Barazi makes a case for FRP FM-approved cooling towers as against conventional ones that use external fire sprinkler systems.



The cooling tower industry and, primarily, the industrial and district cooling sectors have, during the past year, begun incorporating FM-approved fire-rated standards on many ongoing or upcoming district cooling tenders and industrial projects, mainly in the UAE and in Qatar. The first question that would come to mind is, why would a designer specify a fire-rated

cooling tower in the first place, when the cooling tower has water running through it practically all the time? The answer to this question is that fires can occur (and have occurred) on many occasions in cooling towers, where the results have been catastrophic for the end-user, to say the least.

How can it happen? Usually, it may happen through an electric failure on the operating cooling towers, such as the case of short circuiting, or while the cooling towers are in the shutdown dry mode, and while having periodic maintenance being done to them. Cooling tower fires during tower maintenance can occur due to negligence by site maintenance workers, such as smoking a cigarette and then flipping it on to the

**This is like an insurance plan, where a small premium is paid for protection against an unlikely, yet very costly (or worse, a grave potential) event**

cooling tower fill, or welding work by technicians above the cooling tower fill area, where the sparks could ignite the fill. A recently recorded accident was on an eight-cell tower in

a plant room project in the United States, last year. The plant was completely wiped out in approximately two hours.

It may be argued that fires are rare occurrences in cooling towers. However, when the project is significant in cost, a relatively small additional cost investment in the cooling towers of approximately 10% to 15% is a small premium that many end-users find worth paying, to ensure safety and peace of mind on their project. This is like an insurance plan, where a small premium is paid for protection against an unlikely, yet very costly (or worse, a grave potential) event.

It is worth mentioning here that when an end-user purchases an FM-approved cooling tower from a reputed tower manufacturer, it adds many other salient features and advantages to the cooling towers. They include:

1. **Major reduction in the overall life cycle cost of the project:** The FM-approved towers typically outlive the standard corrugated single-wall FRP tower (Fibre-Reinforced Polymer tower) by a factor of two to one, with a 40- to 50-year design life compared to 20- to 25-year design life for a standard high-quality, highly specialised industrial range FRP cooling tower. There are several reasons for this, including the fact that an FM-approved cooling tower has an overall density of 32 oz per square foot in comparison with 12 oz per square foot for the single FRP wall that is properly specified. An unaccounted, yet very important hidden cost includes the fact that an FM-approved cooling tower does not require a sprinkler system, which costs a lot more than the additional cost of an FM-approved tower (10%

to 15%, as previously mentioned). This is not withstanding the additional maintenance costs and bi-yearly testing procedures for a certified sprinkler system, as required by NFPPA to operate in the United States. This, in fact, will run very high for a sprinkler system, not withstanding the potential of the system to fail, especially when needed most in an emergency case. This is because a sprinkler system is an electro-mechanical system with moving parts that are, therefore, subject to failure if it is not regularly maintained. This is not the case with an FM-approved tower, which is static in nature, and, therefore, not subject



Tile fill as used in FM-approved cooling tower

to regular maintenance and potential breakdowns, unlike a sprinkler system.

**2. There is an overall reduction in the noise level of the double FRP wall cooling tower:**  
This is because it comes with a wall thickness of approximately 29mm,

and the air acts as an insulating barrier between the two FRP walls (for both sound and heat insulation). Hence, there is a significant reduction in the noise level of the cooling tower in comparison to the 2mm- thick FRP panels for a standard FRP cooling tower.

**3. There is a better aesthetic appeal to the double wall FRP FM-approved cooling tower compared to a single-wall FRP corrugated wall cooling tower.**

**4. It has the potential to incorporate ceramic tile fill in comparison to the standard PVC fill normally used on the single wall FRP Towers:**  
The additional cost of the tile fill may be a further 10%, but the life cycle cost reduction and advantage of using tile fill over PVC fill is huge. This is owing to the fact that the PVC fill is not only costly to replace, but it also enforces a full or partial shut down on the plant room (ranging anywhere from one to



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► three months in major plants). It requires a replacement, normally every eight to 10 years, provided that the towers are properly maintained and with a particularly good water treatment system in place. If not, the lifecycle of the PVC fill becomes even lesser (maybe three to five years), as witnessed on many projects in the UAE, which use bad water treatment systems. Moreover, some ceramic tile fill tower manufacturers give a 25-year guarantee on their tile fill, including the supporting FRP lintels, compared to a one- to five-year warranty for the standard industrial grade PVC fill normally given by manufacturers. In addition, an important fact to be noted is that the tile fill may use any type of water quality, whether it is non-polished TSE, seawater, RO or potable water, compared to the case-sensitive PVC fill type of tower heat exchanger.

5. It further needs to be noted that in case of certain manufacturers, **their tower has further passed stringent hurricane and missile**

**testing, as well as FM fire rating**, which implies durability and rigidity of the double-walled FRP FM-approved cooling towers.

Having examined the merits of the double-walled FRP FM-approved cooling tower specifications, we can now turn to the subject of comparing the FM-approved towers with the age-old technology of fire sprinkler systems for fire protection, which also warrant FM approval if properly specified. The advantages of FM-approved cooling towers over conventional cooling towers using external fire sprinkler systems are easy to demonstrate, as the following clearly shows:

- Cost-wise it is more economical to own and operate an FM-approved cooling tower compared to one that has a fire sprinkler system, especially when you add the cost of a sprinkler system manufactured in stainless steel material, which is absolutely required in the Gulf region, due to the corrosive atmospheric conditions. This is in addition to the maintenance and bi-annual inspections needed for sprinkler systems.

### An FM-approved cooling tower requires no additional maintenance, compared to one that has an external sprinkler system

- An FM-approved cooling tower requires no additional maintenance, compared to one that has an external sprinkler system, which inherently comes with mechanical moving parts and electrical circuitry, both of which could be subject to failure, if not regularly maintained. However, in light of Murphy's Law that states that anything that can go wrong, will go wrong, should a fire occur, it is hoped that the sprinkler system will function in the right way at the right time, and that fire will not spread to the adjoining

cells. In contrast, in an FM-approved tower, should a fire occur, it is contained in the actual cell where the fire has originated, and naturally self extinguishes, allowing the rest of the cooling tower cells to continue operating even during the incident of fire in one of the cells. This is especially important for critical applications like hospitals, district cooling applications, data centers and power plants, which are mission-critical facilities and cannot, under any circumstance, allow the potential of full plant room shutdown, as would happen in the case of a fire sprinkler system operating in case of a fire.

- The sprinkler system requires a dedicated water supply and dedicated water storage system to provide water required in the event of a fire. It further requires regular maintenance of the controls, valves and piping. In the United States, sprinkler systems have to be inspected every six months by an independent, certified sprinkler system inspector. On the other hand, FM-approved cooling towers not requiring an external sprinkler system are practically maintenance-free.

It is well worth noting at this point that some manufacturers only use FRP material to achieve FM, with no wood or cement-gypsum board. It must be further noted that cement-gypsum boards have been used in the Gulf region and have extensively failed as a material for fire-rated walls on cooling towers due to its inherent relatively soft decomposition and breakup over time. Wood, on the other hand, though perhaps cheaper, has a short lifespan as a material, and is certainly not recommended in the Gulf region with high temperatures. Apart from these considerations, it is also regarded as old technology dating back to the 1970s and 1980s, whereas FRP, including

pultruded FRP structures, are clearly the way to go, as it is a new technology in cooling towers.

An interesting question that needs to be asked at this juncture is: How does the NFPA fire code relate to either the sprinkler system or the FM-approved cooling towers? To answer the question, NFPA 214 does not make a sprinkler system mandatory. According to Chapter 4, Section 4.2 of the NFPA 214 code, the customer must prepare a risk analysis and determine if a sprinkler system is required. In this scenario, having an FM-approved tower that is designed to ensure that a fire in one cell will not spread to adjacent cells is as good as or better than any sprinkler system that could be installed.

It is also important to note that FM approval also requires that the cooling tower materials come from FM-approved sources of manufacture identical to those used during the FM field fire testing and that they strictly comply with FM standards, which is usually from the United States as per FM standards. FM will do periodic random inspections of the supply chain to ensure compliance.

In the United States, FM approval also implies that there could be a significant reduction of overall insurance premiums paid by the end-user, due to the greatly lowered risk by fire damage to the cooling tower. Note that unless FM is the insurer, the owner must convince other insurers to follow FM standards to

obtain a break in premiums, among other things.

It needs to be mentioned here that there are already installations of FM-approved cooling towers in the UAE on major projects with reputed cooling tower manufacturers. ■



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