MEYDAAN NAD AL SHEBA





The Project

Meydan is an urban development of luxury residences, business blocks and facilities in Nad Al Sheba, UAE. The four major developments of the city are the Racecourse, Horizons, Godolphin parks and the Metropolis. The Meydan racecourse hosts the Dubai World Cup, which is the richest horseracing event in the world, attended by nearly 60,000 people every year. Hotels, restaurants and cinemas form a part of the project to offer a remarkable experience for its visitors. The city accommodates a vibrant community of luxurious residences by the Godolphin parks, and also a highly professional business environment in the Metropolis, suitable for major corporations.

This colossal development required a district cooling plant with a major capacity to cater to the various segments of the city. The plant had to provide chilled water for a five-star hotel, dining restaurants, a museum, a gallery, an IMAX theatre, the Dubai Racing club and the Emirates Racing Authority offices. The plant also had to be designed to allow for further expansion of the four chillers units for future needs.

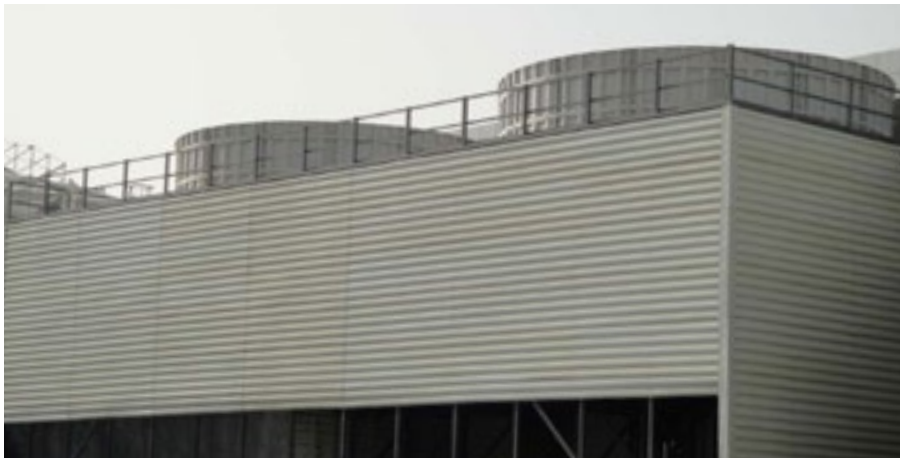
Location

The Meydan racecourse is in close proximity to Meydan city (Horizons) - a self-contained community consisting of high-end commercial and luxury residential plots, retail outlets and air-conditioned arcades with canal, waterfront and promenade views.

The Metropolis design is inspired by the elements of earth and metal and their associated values of strength, energy and determination, extensive office space across multiple blocks that are linked by an impressive LED animated covered mall.

The Godolphin parks are a celebration of riverfronts as the focal point for cities of the 21st century. The exceptionally planned Godolphin parks are a model for development that merges sustainable ecological engineering with urban lifestyle sophistication.

The project was envisaged and commissioned by Meydan LLC, responsible for the operations and up-keep of the Meydan premises.



Scope of DSE Work

DSE signed the contract agreement with M/S Meydan LLC to design, construct, commission and to provide two years operation for the central cooling plant at the Nad al Sheba race course development.

The DSE project team had to handle the complete design and construction of the chilled water generation plant, the associated cooling towers and thermal storage tanks, all civil and buried works including water, drainage and fire fighting provisions, and the SCADA system.

The central cooling plant consists of 20,000 TR (Tonnage Refrigeration – a measurement of chiller capacity) chillers and associated equipment such as cooling towers, 11 KV and 400 V switchgears, MV/LV transformers, chilled and condenser water pumps, chilled and condenser water piping, associated MEP services and controls.

In addition to the above, two make-up water tanks and two thermal storage tanks (capacity of 20,000 TR each) were part of plant equipment. Further, a provision for additional 20,000 TR in terms of civil, structural and architecture works including associated MEP services was constructed as per the client's request.

Part of the external chilled water piping network and the control of all energy transfer stations (ETS) at the Meydan racecourse itself were added to the scope of works of DSWP and constructed and installed to the satisfaction of M/s Meydan LLC.

Project Challenges

The Meydan project went through many challenges, the most important of which was that project main construction works started in the end of fourth quarter of 2008, which marked the beginning of the global recession period.

Continuous coordination and cooperation between the DSE team and the client eliminated obstacles that could have delayed the project past its announced launch date. The opening of Meydan race course was scheduled on 28th Jan 2010 and the Dubai World Cup was to be held on 27th March 2010. This meant that DSE roughly had a year to complete the construction, installation and testing of all District Cooling services.

The A/C system of Meydan racecourse was completely dependent on the central cooling plant. The high profile nature of the event and attendees meant that the cooling plants had to offer reliable levels of cooling throughout the year.

Initial testing results proved that traditional technologies were not up to the task of ensuring that the centrifugal chillers performed at an optimum level. New and alternative technologies related to water treatment such as ozone treatment, also failed due to various reasons in the field that had in turn, led to the failure of some centrifugal chillers.

Likewise, the use of a basic control package supplied along with dosing equipment from the previous water treatment service company was not sufficient for such a large district cooling plant.

District Cooling Challenges

In the four chilling stations, both new and old technologies were used to optimize efficiency and operation. The challenge was integrating the four chilling stations and optimizing their combined operation. DSE was called in to solve the following problems encountered previously:

- Attempts to save energy had resulted in frequent “hot calls” from building occupants, for which inefficient chilled-water operation was found to be responsible.
- Cooling demand capacity had increased as buildings in older areas of the campus were replaced or renovated. The facilities management was concerned about the capability of the older infrastructure to meet increasing capacity of demand.
- Aging building mechanical systems had begun returning chilled water well below design, resulting in low-delta-t syndrome.

Health hazards associated with District Cooling

Reliability and Safety aspects of water treatment are crucial because contaminated water has been proven to be a major health hazard for the community surrounding it.

Improper treatment of the water used in cooling towers can be harmful for occupants and facilities personnel, and could lead to outbreaks of diseases, repetitive surges or shutdown of chiller compressor and, in some cases, the complete loss of the compressor due to repetitive pitting of the compressor impellers. Algae build-up, along with precipitation of dissolved solids, and accumulation of dust and silt in the cooling tower basin, condenser water boxes and tubes also lead to rust acceleration and reduces overall efficiency of the cooling plant.

Energy Efficiency

Another district cooling issue that is relevant from an operations perspective is energy efficiency. And in this, the most serious problem faced in any district cooling project is the low Delta T syndrome.

District cooling operators typically maintain the supply chilled water to their consumers at a constant temperature around the clock. The clients that are connected to district cooling services in turn send back the used chilled water at varying temperatures, depending on the energy absorbed.

The difference between the temperatures of the supply chilled water and the return chill water is measured as Delta T. Ensuring that the Delta T figure remains at optimum levels becomes crucial for energy efficiency of DCPs. High return temperatures from chilled water customers contribute to a high “Delta T” and are critical in optimizing performance of a district energy central chilled water plant.

A poor “Delta T” (one which is below the optimal spread) requires more central plant distribution pumps to run than optimum and requires more chillers running to supply those pumps. Chillers, therefore, aren’t run on their most efficient settings and use higher amounts of electricity to deliver the same total tons of chilled water.

The major implication of low Delta T is that chillers have to operate at part load in order to maintain the supply chilled water temperature at a constant. This has an effect on the distribution network, which depletes the ability of the plant to deliver the full plant room capacity.

The distribution pumps and chilled water distribution piping in any District Cooling Plant are thus designed for a certain flow linked to the design Delta T.

DSE Innovation

DSE had to come up with several innovations to reduce the amount of time required to achieve key targets on the project, due to the strict deadline.

From a structural viewpoint, the district cooling plant consisted of a ground, mezzanine and roof floor. The first decision taken was to have all water tanks designed to be placed above ground which eliminated time related to excavation and foundation works for basement, encountered in traditional underground water tanks.

During the initial stages of the project, the DSE team changed the structure of the plant from concrete to complete steel (except for raft and slabs). DSE also replaced the traditional block walls with a precast solution for internal and external walls, which accelerated construction work and also achieved reduction of manpower.

The mechanical trench for chilled water piping was widened to install main headers which resulted in reduction of supports and loads on the steel structural columns. The 11KV and LV cable trays were installed in the trench which reduced the cable ladders at high levels and eliminated congestion above the main equipment.

The main cable routings for chillers and pumps were impeded on the ground foundation with the provision of sleeves, which also reduced the congestion above the main equipments. This was a major aid for easier Logistics on site.

The make-up water tanks were changed from concrete to bolted steel, which brought about 80% saving in the construction of the two tanks. The thermal storage tanks were also constructed from bolted steel which helped reduced the construction time. DSE also increased the pace of the project by limiting the use of scaffolding and increasing usage of man lifts and scissors.

In order to address water treatment concerns, DSE designers had to rely on proven technologies, such as chemical treatment; specify reliable and environmentally friendly products that have short half life; and allow for a full monitoring programme integrated with plant industrial control SCADA system.

Besides periodic monitoring, the other aspect overseen by DSE was Design Review, which enabled silt to be accumulated in easily accessible areas that could be cleaned by means of a wet vacuum system. This became a huge time saver from the maintenance aspect.

DSE overcame the Delta T challenge by adopting an integrated approach which included periodical reviews of the FCU and AHU, the air side control system, control valves and balancing valves, the whole hydraulic system (primary, secondary & tertiary), heat exchangers and their controls, customers' pumps and hydraulic balancing.

This led to outstanding Delta T performance for the cooling plant, thus matching the strict requirements laid out for it, in terms of energy efficiency and commercial feasibility.

The above changes and methods were introduced and managed by DSE with discussions and approvals by the client, who appreciated the savings in time, as well as design decisions that complied with all the requirements of the project. DSE was able to meet the client's requirements and complete all construction, testing and commissioning works in advance.

The Meydan Cooling plant was able to deliver around 40% savings in power consumption, compared to previous operations, and the plant was also designed to last longer, easier to maintain, and be more reliable.

DSE watched proudly as the plant became operational two months before the scheduled opening date of Meydan race course. The Meydan CCP project is a good example of DSWP's technical capabilities and has become a landmark project that acts as a benchmark to measure other district cooling projects in the region.