

# climate control

MIDDLE EAST

KEY PERSPECTIVES ON THE REGION'S HVACR INDUSTRY

JANUARY 2016

## EDITORIAL CAMPAIGN

### IEQ IN HEALTHCARE

- 'Downtimes can cost lives, and that ought to tell you how critical MEP is' – Syed Mahmood Akhter, M/S Builders and Contracting

## HEADLINES:

- Qatar Rail signs contract with Qatar Cool
- Daikin introduces ESMA-compliant product range
- Sustainable City launches Diamond Innovation Centre

# SECURING THE CHAIN

With the GCC region countries relying heavily on food imports, food safety is an issue of critical importance. But is the cold store sector doing its part to keep the cold chain unbroken?

## INTERVIEWS

John Mandyck,  
Chief Sustainability Officer,  
UTC

Mario Seneviratne,  
Managing Director, Green  
Technologies

Kamal Pharran,  
CEO, Saudi Tabreed

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A combination of heat and humidity is likely to threaten millions of lives in the future <http://buff.ly/10x7p41>



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# Shopping for PUMPS?

**Aslan Al Barazi** believes that design, material and other factors need to be carefully considered when selecting pumps for HVAC applications, and lists a few thumb rules.



**Aslan Al Barazi** is Executive-Director-IMEC. He can be contacted at [imec@emirates.net.ae](mailto:imec@emirates.net.ae).

When selecting a pump for HVAC applications, it is important to bear in mind certain basic criteria. Considering the issues one could face regarding locally assembled pumps, it would be wise for the designer to choose a pump supplier with several years of experience in the field, especially in areas of manufacturing, assembling and testing the pumps in their own factory. Here, the importance of testing of pumps at the factory before dispatching them cannot be emphasised enough, as this step insures that the product meets all the project requirements and does not have any maintenance issues when put into operation. A reputable pump manufacturer would typically have the facility for testing their entire product range, including large capacity pumps within the factory. However, such testing facilities are not normally available locally.

#### Know the pumps

There are a number of different centrifugal pumps that are normally used

by designers for HVAC applications. For smaller flow rates up to around 4-6,000 GPM (250-380L/s) designers mainly consider using horizontal end suction or vertical inline (VIL) pumps. Both horizontal end suction and VIL pumps can be either direct close-coupled or flexible coupled pumps with spacer-type coupling. Each has its advantages. Direct-coupled pumps have a smaller footprint (or height, in case of vertical systems), requiring no alignment, as

the motor shaft is directly coupled with the impeller shaft, and are also less expensive than flexible coupled pumps. However, in the case of flexible coupled pumps, their maintenance can be achieved without disturbing the motor or the electrical connections.

A VIL pump would be a better option for an engineer, as it combines the advantages of both the end suction direct-coupled pump, as well as the flexible coupled pump, as also other





## THE CORRECT SELECTION OF THE OPERATING POINT OF THE PUMP IS WHERE THE PUMP PERFORMANCE CURVE INTERSECTS WITH THE SYSTEM CURVE

advantages. A VIL pump requires around 50% less space compared to an end suction pump, and requires much less maintenance, due to the fact that the motor shaft is centre lined with the pump's shaft via the motor bracket, and, therefore, does not require any alignment during the pump's life. VIL pumps are also available with spacer coupling for easy maintenance without the need to disturb the motor or pipe works. It also produces less noise due to less vibration, demands lower maintenance and has a longer life than other types of pumps in the market.

For larger pump capacities at lower pump heads above 5-6,000USGPM (315-280L/s), the double suction vertical or horizontal split case pump would be the natural selection. The vertical split case pump, it should be mentioned here, would also be preferred over the horizontal split case pump for the same advantages mentioned above regarding the VIL version.

Another major advantage of vertical-arranged pumps is that the in-situ alignment that horizontal-arranged pumps require is not needed. That is why many locally assembled horizontal split case pumps have many O&M and vibration issues and failures after installation. Considering that the pump is literally the heart of the chiller system,

one cannot afford to have such problems at the site when the system is put into operation.

Other pumps used for HVAC applications include multistage pumps for plumbing and booster pump applications for high-pressure requirements. For some special applications, the self-priming pump is used where the NPSH is low, or where the water is required to be lifted from below-grade tanks into the pump without special priming equipment, as well as for ice or water thermal energy storage systems.

### Give a thought to BEP

A key point to be remembered for the right and professional selection of pumps is that the pump chosen needs to be as close to the Best Efficiency Point (BEP) as possible, in order to insure minimum radial/axial thrust, energy consumption, wear and tear, vibration and maintenance, as well as offering maximum longevity. When a pump is selected at points beyond the BEP, radial and axial forces increase, which further increases noise and vibration levels, and damages the pump foundation over time, thus reducing the bearing's life.

Selection of a pump beyond the BEP will also cause energy losses due to hydraulic losses, as well as have the potential for cavitation, which is likely

to occur due to the higher rate of NPSH required. Moreover, lower flow rates to the BEP causes water recirculation to occur at both suction and discharge side of the pump impeller, which causes both energy loss due to water recirculation, as well as potentially damage the impeller due to hydraulic surging. It is important to note that vibration is kept at a minimum for the pump selected at the BEP. As a general rule, the selection of the pump should be within + or - 15% of the BEP.

In terms of actual pump efficiency levels, it is normal for a pump manufacturer to attain efficiency levels for pumps in the 60-70% range, though it is also possible for a few manufacturers to attain efficiency levels of over 80% at a competitive price by using a special coating and finishing on the internal pump surface and utilising double curved vanes on the impeller.

Another key point to be noted is that the pump's shut off head should always be slightly higher than the system's maximum static head for proper operation of the pump, and account for and overcome all the system head losses in the piping circuit. The correct selection of the operating point of the pump is where the pump performance curve intersects with the system curve.

### Choose the right material

In terms of material selection for the Gulf region, what need to be factored in are the different water types used here, such as TSE and seawater and the corrosive climate. This applies particularly to water-cooled chillers using



## COOLING TOWERS ARE THE BEST "AIR WASHERS" CLEANING ALL THE SAND, SEDIMENTS AND DIRT FROM THE AIR

open cooling tower condenser pumps circuit, where the sea air with salts emitted enter into the pump condenser circuit for projects close to the sea. Thus, it would be good engineering practice to include in the pump specifications for corrosion-free materials, such as bronze/nickel/aluminum alloy impellers typically used in the marine environment, as also duplex stainless steel shafts.

It needs to be noted that a few pump manufacturers do this in a competitive manner against the standard materials used in the market for pumps, the reason being cooling towers are the best "air washers" cleaning all the sand, sediments and dirt from the air, while also absorbing a good deal of sea air salts on projects close to the sea, and sending them right across the pumping circuit.

Salts from the sea air have been witnessed on the air inlet side of several cooling towers close to the sea, normally at the air inlet louvre side, which look similar in shape to big snowflakes. This is due to the fact that the sea air in the region is humid and concentrated with salts, which the cooling tower collects and washes into the water flow pumping circuit.

### VFDs for greater efficiency and longevity

Finally, VFDs on pumps should definitely be seriously

considered, preferably supplied by the pump manufacturer for single source responsibility. A VFD can normally run as low as 30% speed without any negative effect on the pump. A lower pump speed would further reduce both the radial thrust on the pump, as well as related wear and tear. The salient advantages of a VFD include reduced energy consumption, lower noise, short payback (normally around two to three years for the VFD) and longer pump life, which is also good for the lifecycle cost analysis (LCC) modelling.

However, care should be invested on VFDs for condenser pumps, as this depends on the cooling tower manufacturers. This is because a few cooling tower manufacturers have the ability to have variable flow on their cooling tower nozzles, while most others cannot. Also, some chiller manufacturers do not like VFDs on their water condensers from an O&M and design perspective. Therefore, this aspect needs to be carefully considered in consultation with a specialist in cooling towers.

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