

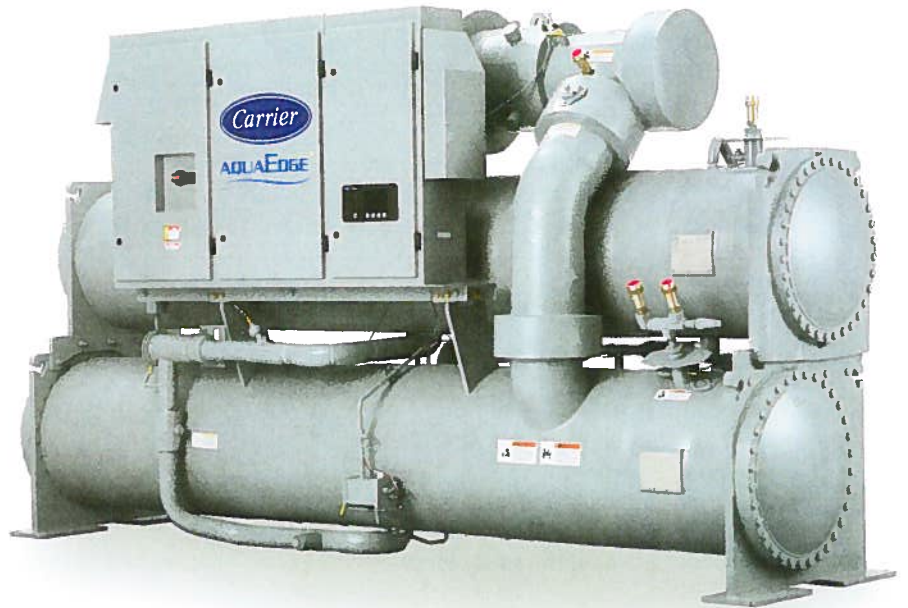
What to Know About Chiller Plants

Many buildings lack the certification required by code

BY JOHN ARIZUMI

Many buildings in Hawaii have reached more than 25 years in age and many are renovating and upgrading their air conditioning chiller plants. With many “energy warriors” offering expertise and products, building owners and engineers should be knowledgeable of what they are getting. This article will shed some light on making better decisions.

There are lots of discussions about variable speed chillers as it provides improved energy efficiencies. And there is talk about magnetic-bearing chillers, which adds to the confusion on improving energy efficiency. No way—magnetic bearings only eliminate the use of lubricant oil, but be aware mag-bearing chillers have maintenance costs for its bearing capacitors that need periodic



HVAC

The right chiller plant can improve energy efficiency

Think of the control system as the conductor of a symphony. You can have the best violinists, cellists, bassists, brass section, percussion, etc., but without a great conductor it is hard to make great music.

replacement in lieu of oil changes. In addition, most mag-bearing chillers do not have seismic certification required by many building codes.

Many consider variable frequency drives (VFDs) are the panacea to energy savings. We should be aware of range of speed reduction when comparing a centrifugal chiller and a screw chiller. A centrifugal compressor behaves by the same

laws as for centrifugal fans (h.p. proportional to cube of rpm, pressure proportional to square of rpm, and flow rate proportional to rpm). Unlike positive displacement compressors such as screw or reciprocating compressors, centrifugals use pressure “lift” to create the pressure differential. Therefore, VFD centrifugals can only reduce compressor speeds by 35 percent by virtue of design and the rest of the load reduction is accomplished by the time-proven inlet guide vanes.

In addition, because centrifugal compressor speeds determine the head pressure (lift) to transfer heat, in Hawaii variable speed reduction for centrifugals is not as significant as in cooler climates. With variable-speed screw chillers, the speed turndown is 75 percent and is not dependent on the weather but is proportional to the load, so it offers better energy savings because of the range of speed reduction depending on the load, not the weather.

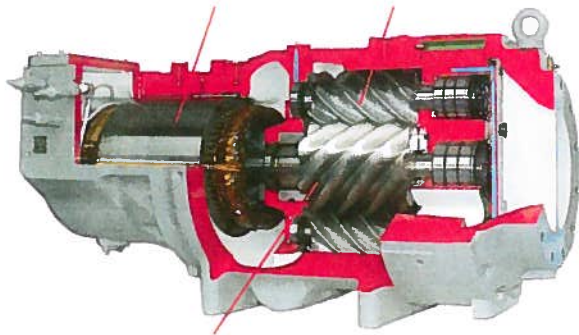
Another interesting point is screw

chillers have quick response and can drop from 100 percent to 25 percent in less than a minute. Centrifugals will take seven to 10 times longer, which most likely means nuisance safety shutdowns and alarm codes during fast-changing conditions, such as tower fan failure or low water temperature.

Integrated part-load value (IPLV) is value established by AHRI 550/590, so one can easily compare part-load efficiencies for different chillers of the same capacities. Chillers rarely run at full load. Keep in mind the weather data of AHRI 550/590 originally was compiled in Atlanta, whose weather is very different from Hawaii. Even with the present use of 29 cities averaged, it is far different. For example, in Atlanta 55 percent of the annual hours have entering condensing water temperatures less than 70F; in Hawaii it is less than 2.5 percent. In addition, IPLV is based on single chiller plant operation at AHRI 550/590 conditions. Today, most plants have multiple chillers and IPLV is an inaccurate way

Hermetic motor cools operation for longer life.

Tri-Rotor design reduces bearing loads.



Shorter rotor length increases compression efficiency

to determine energy efficiency of the multiple chiller plant.

The most accurate methodology to compare energy consumption of a proposed chiller plant is to establish a system part-load value (SPLV). This entails computing the energy consumption of all energy-using components of the plant—chillers, chilled water pumps, condenser water pumps, cooling tower fans, secondary pumps (VFD or constant flow)—using actual local weather data and building occupancy schedule of the design.

This analysis will provide the most accurate energy consumption comparison as well as the life-cycle cost.


You will easily see the big difference from just judging efficiencies on IPLVs for a single chiller.

Most important are the chiller plant controls. You can have the most efficient chillers and components of the mechanical plant, but if the controls are not designed and commissioned properly, your plant will not perform to the optimum design efficiency. It is so important the DDC controls are integrated to operate as the system was designed.

Think of the control system as the conductor of a symphony. You can have the best violinists, cellists, bassists, brass section, percussion, etc., but without a great conductor it is hard to make great music. Make sure the DDC controls integrate to the exact requirements of the chiller controls as this is the command center of the plant and the biggest consumer of energy.

Work with reputable chiller suppliers when designing or upgrading a plant. Owners should get the chiller suppliers involved early during preliminary discussions, not just during the bid, to remain abreast of the latest technology. And have potential suppliers do presentations for their proposed plant.




With so many innovations on the market, it is difficult to make clear, strategic decisions. Remember to look at the big picture, not just the chillers. Remember the old adage: You get what you pay for. Use a trusted equipment supplier with a solid reputation of understanding chiller plant systems and controls to provide good pre- and post-sale support, strong engineering support, field technical assistance,



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Once the decision is made and the plant is installed remember it is between the building owner and the chiller supplier for the life of the plant. The developer, designers and

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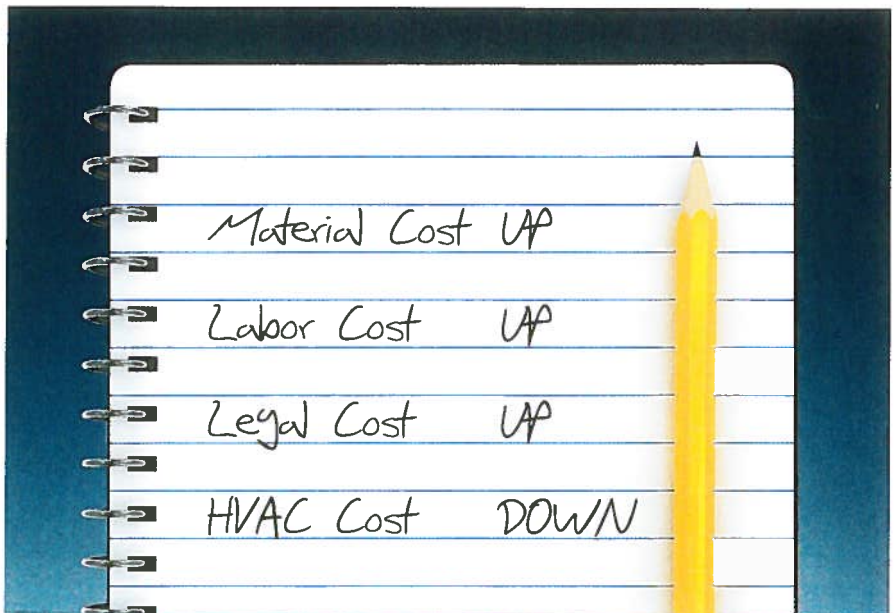
contractors are pretty much out of the picture once installed. It comes down to just you and your supplier, and how well your supplier supports you will determine how reliable your plant operates for its useful life. And make sure your supplier will be around for the long haul.

Choose wisely. Many systems never match up to their promises. ▾



John Arizumi is the president of Carrier Hawaii, distributor for Carrier Air Conditioning equipment. A registered mechanical engineer, he has been with Carrier Corporation of Syracuse, N.Y. since 1975 and

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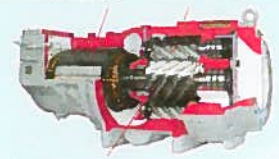


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