

# Looking at HVAC

KEEPING CURRENT WITH HVAC CONCERNS.

>> INFORMATION COMPILED BY JOSEPH H. MAYTON III



■ Great River Energy's new corporate headquarters emphasizes indoor environmental quality while reducing energy use by 50 percent. Photo by Don Wong.

**S**ustainable Facility approached a mechanical and electrical engineering firm with a series of questions regarding modern HVAC systems. Randy Olson and Dale Holland at Dunham Associates, Inc. ([www.dunhameng.com](http://www.dunhameng.com)) are consulting engineers who provided some professional feedback to the HVAC queries posed.

## Q&A

**Sustainable Facility: How difficult a process is it (both in terms of financial and energy management tailoring) to keep current and maximize performance?**

**Dunham Associates:** In terms of the economic repercussions of meeting and/or going above and beyond current codes and standards put into place by American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE), it is easy to exceed the code to a certain extent without incurring significant expense. This is done routinely in quality projects with good architecture, sound lighting designs, and efficient mechanical systems. More aggressive strategies are needed to reach higher levels, and with added cost. However, the perception is likely worse than the reality; studies by the U.S. Green Building Council (USGBC), Davis Langdon, and the General Service Administration put the upcharge to LEED Gold certification levels at between 2 and 8 percent.

"Staying current with the latest technology is part of remaining a student of the business, so I view this as a professional duty" said Randy Olson of Dunham Associates. "However, it is important to note that the fundamentals of good, energy-efficient design do not change and should be part of every project (that we do)."

**SF: Can you share any particular projects that demonstrate the impact that fine-tuning the HVAC system performance can have?**

**DA:** Great River Energy's new corporate headquarters in Maple Grove, Minn., is a shining example of sustainability. This project emphasizes indoor environmental quality while reducing energy use by 50 percent. LEED Platinum certification is expected by fall 2008, and [www.greatriverenergy.com](http://www.greatriverenergy.com) offers real-time data on building performance for all to see.

**SF: What are primary concerns of aging buildings in terms of outdated systems and equipment? When does commissioning a total system overhaul come into play?**

**DA:** Infiltration and exfiltration obviously become a greater concern as buildings age.

Commissioning of new buildings provides the value of ensuring that the systems are set up and running as intended. When it comes to existing buildings, commissioning may not offer all of the benefits that it does for new, but it becomes a means by which to reveal shortcomings or areas to improve on in the building.

**SF: Acoustical requirements / performance is a growing concern, especially in educational facilities. Discuss the relationship between HVAC systems and acoustical concerns.**

**DA:** HVAC systems always make noise, and hence the design must consider this acoustical component.

"Acoustics are an area where the expectations need to be established early," said Dale Holland. "Noise issues are inherently perceptual and subjective, so meeting expectations cannot be verified without previously agreed upon performance levels. Additionally, there exist multiple

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performance standards, so designers and owners need to agree on what will govern.”

Acoustical treatment in existing facilities can be extremely challenging for two reasons: First, the solutions often involve structural, architectural, and space-planning considerations, which may be very difficult to change. Secondly, mechanical changes may either require additional space or replacement of equipment, which is seldom considered in the budget of a remodel project.

**SF: Discuss the role of glazing / fritting / exterior shading systems.**

**DA:** Solar heat gain through glass plays a huge role in HVAC design; often accounting for 50 percent of the cooling requirements in some spaces. Selecting the right glass, shading it, and avoiding significant amounts of east or west-facing glass can significantly reduce the first costs by cutting down on the peak cooling load. In turn, this also reduces the energy consumption in the space.

“There is, however, a balance between this energy savings and that gained through daylighting,” said Holland. “Careful glass selection can retain high visible transmittance while still reducing the solar heat gain through it.”

**SF: We would like to touch on first costs, and take into consideration maintenance and mechanical concerns, as well as fine-tuning for maximum performance, etc.**

**DA:** “We’ve recently expanded our basic services to include early energy modeling,” said Olson. “This allows for comparison of building forms, orientation and even mechanical systems with the goal of informing the owner on how these choices will affect their carbon footprint. By bringing modeling into the pre-schematic phase, we can affect broad design decisions before it’s too late to change.”

Full energy modeling is costly and not always accurate: A recent report analyzing measured versus predicted energy savings (USGBC, March 2008) indicates there is significant room for improvement in prediction accuracy. Energy modelers have far greater faith in the accuracy of a comparison between options, than in the absolute values they predict.

**SF: Discuss design challenges facing owners and FMs.**

**DA:** The most important challenge is education; owners and facility managers want to go green, but don’t always know what it means. An experienced design team needs to lead them to consider appropriate options at an early stage.

Certainly the USGBC stands as a great resource. Again, Great River Energy is one company that offers green design information on an easy-to-use website. It is this type of transparency and information that helps people to see examples in action.

Envelope loads (walls, roof, glass) oftentimes account for less than 10 percent of the cooling load, but factor heavily into the heating load. Changes to wall, roof and glass insulation values typically don’t have as much impact as other strategies. However, another aspect to windows is the solar heat gain from light that passes through the glass. This is a very significant part of the cooling load; at times 50 percent or more of the space load, and is an area where careful glass design and selection can save energy while reducing mechanical first cost.

Internal gains, such as lighting and equipment, account for perhaps 20 to 30 percent of the cooling load, but this should be viewed as a double hit. This energy is first directly consumed, and then the resulting heat needs to be cooled by the HVAC system. Lighting control strategies and the use of efficient equipment directly reduce both energy consumption and cooling demand. **SF**

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